

WHISTLER

AGENDA

**REGULAR MEETING OF MUNICIPAL COUNCIL
TUESDAY, APRIL 10, 2018, STARTING AT 5:30 P.M.**

**Franz Wilhelmsen Theatre at Maury Young Arts Centre
4335 Blackcomb Way, Whistler, BC V0N 1B4**

ADOPTION OF AGENDA

Adoption of the Regular Council Meeting Agenda of April 10, 2018.

ADOPTION OF MINUTES

Adoption of the Regular Council Meeting Minutes of March 20, 2018 and Public Hearing Minutes of March 20, 2018.

PRESENTATIONS AND DELEGATIONS

Olympic and
Paralympic
Athletes
Homecoming

A presentation by Mayor Nancy Wilhelm-Morden welcoming home the Olympians and Paralympians and recognizing their achievements at the PyeongChang 2018 Winter Games.

PUBLIC QUESTION AND ANSWER PERIOD

MAYOR'S REPORT

INFORMATION REPORTS

Planning and
Building
Departments'
Application
Activity Report –
2017 Fourth
Quarter
File No.
7076.01
Report No.
18-035

A presentation by municipal staff.

That Information Report No. 18-035 regarding the Planning Department and Building Department application activity for the fourth quarter of 2017 be received.

ADMINISTRATIVE REPORTS

Process for
Employee
Housing
Analysis
File No. 7734
Report No.
18-040

A presentation by municipal staff.

That Administrative Report No. 18-040 regarding a process for moving forward with the Mayor's Task Force on Resident Housing Recommendation No. 6 (to allow for development of resident restricted rental housing on private lands that may be currently under-developed) be endorsed by Council.

DP1541 –
Wedge Park
Road Allowance
Development
Permit,
SEC0018 –
8030 Alpine
Way Flood
Proofing
Exemption
File No.
DP1541,
SEC0018
Report No. 18-
041

A presentation by municipal staff.

That Council approve the issuance of Development Permit DP1541 for the development of a flood control training berm within the road allowance at Wedge Park as shown in the Site Servicing Plans Key-2, ESC-1, ESC-2, ESC-3, ESC-DET-1, R-1, W-1, XS-1, DET-4 prepared by Creus Engineering Limited dated October 26, 2017, attached as Appendix “C” to Administrative Report to Council No.18-041 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of an easement for the construction, servicing and maintenance of the training berm located within the road allowance at Wedge Park between White Glacier International Limited and the Resort Municipality of Whistler,
2. Environmental Monitoring for the duration of the development works, and
3. Receipt of a landscape security for 135 per cent of the cost of landscaping the sides of the training berm with native planting and hydro seeding; and further

That Council grant an exemption in accordance with Section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit construction of new buildings within the flood proofing area specified in “Zoning and Parking Bylaw No. 303, 2015” at 8030 Alpine Way as shown in Site Plan A1.0A, prepared by Lamoureux Architect Inc., dated March 12, 2018 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of a Section 219 covenant for the exemption, indemnifying the Municipality and attaching the Flood Construction Level Report prepared by LaCas Consultants Incorporated, dated October 11, 2017, confirming that the proposed building designs and locations are safe for the intended use,
2. Registration of a Section 219 covenant for regular Environmental Monitoring during construction of the works proposed under DP1541 and SEC0018, and
3. Registration of a Section 219 covenant that restricts development of the lands to that proposed under SEC0018, and limits any further proposed development to a maximum of 200 square metres, which would be subject to future approval requirements.

SEC0025 –
2038 Karen
Crescent –
Flood Proofing
Exemption
File No.
SEC0025
Report No.
18-042

A presentation by municipal staff.

That Council grant an exemption in accordance with Section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit a new duplex to be constructed within flood proofing area specified in “Zoning and Parking Bylaw No. 303, 2015” at 2208 Lake Placid Road as shown in Architectural Plans A0, A1, A2, A3, A4, A6, A6.1, A7, prepared by Don Stuart Architect Inc, attached as Appendix “B” to Administrative Report to Council No.18-042 subject to registration of a Section 219 covenant for the exemption, indemnifying the Municipality and attaching the geotechnical report prepared by Terran Geotechnical, dated March 22, 2018 confirming that the proposed building location and design are safe for the intended residential use, to the satisfaction of the General Manager of Resort Experience.

Outdoor
Potable Water
Usage Bylaw
No. 2179, 2018
File No. 2179
Report No. 18-
036

A presentation by municipal staff.

That Council consider giving first, second and third readings to “Outdoor Potable Water Usage Bylaw No. 2179, 2018” as described in Administrative Report to Council 18-036.

Five-Year
Financial Plan
2018-2022
Bylaw
File No. 4530
Report No. 18-
037

No presentation.

That Council consider giving first, second and third readings to the “Five-Year Financial Plan 2018-2022 Bylaw No. 2176, 2018.”

2018
Community
Enrichment
Program Grant
Funding Awards
File No. 3004
Report No. 18-
038

No presentation.

That Council approve the 2018 Community Enrichment Program grants funded from general revenue as follows:

Association of Whistler Residents for the Environment – Sea to Sky Climate Change Symposium	\$4,000
Association of Whistler Residents for the Environment – Zero Waste	\$6,000
Whistler Naturalists Society	\$10,000
Pathways Serious Mental Illness Society (formerly North Shore Schizophrenia Society)	\$3,700
Sea to Sky Community Services Society – Communities that Care	\$2,500
Community Foundation of Whistler	\$2,500
Sea to Sky Community Services Society – Whistler Parent and Tot	\$10,000
Sea to Sky Community Serviced Society – Whistler Multicultural Network	\$5,000
Howe Sound Women’s Centre – Whistler Women’s Centre – Drop In	\$12,000
Howe Sound Women’s Centre – Prevention, Education, Advocacy, Counselling and Empowerment	\$8,000
Whistler Waldorf School Society	\$3,000
Zero Ceiling Society of Canada	\$4,000
Whistler Centre for Sustainability – Resilient Streets	\$4,000
Whistler Adaptive Sports Program	\$8,000
BC Luge Association	\$3,000
Whistler BMX Club	\$3,000
Oros Whistler Gymnastics Centre – (Whistler Gymnastics Club)	\$6,250
Whistler Mountain Ski Club	\$2,125
Whistler Nordics Ski Club	\$5,000
Whistler Blackcomb Freestyle Ski Club	\$1,750
Whistler Sailing Association	\$5,650
Whistler Sea Wolves Swim Club	\$1,875
Whistler Skating Club	\$3,000

Whistler Youth Soccer	\$8,000
Whistler Writing Society	\$3,000
The Point Artist-Run Society	\$4,500
Whistler Singers	\$2,350
Whistler Valley Quilters' Guild Society	\$2,000
Whistler Secondary Scholarships	\$2,000
TOTAL	\$136,200

MINUTES OF COMMITTEES AND COMMISSIONS

Transit
Management
Advisory
Committee

Workshop Meeting Minutes of the Transit Management Advisory Committee of October 11, 2017.

Transportation
Advisory
Group

Workshop Meeting Minutes of the Transportation Advisory Group of January 8, 2018.

Forest and
Wildland
Advisory
Committee

Regular Meeting Minutes of the Forest and Wildland Advisory Committee of February 14, 2018.

Whistler Bear
Advisory
Committee

Regular Meeting Minutes of the Whistler Bear Advisory Committee of February 14, 2018.

BYLAWS FOR FIRST, SECOND AND THIRD READINGS

Five-Year
Financial
Plan 2018-2022
Bylaw No. 2176,
2018

That "Five-Year Financial Plan 2018-2022 Bylaw No. 2176, 2018" be given first, second and third readings.

Outdoor Potable
Usage Bylaw No.
2179, 2018

That "Outdoor Potable Usage Bylaw No. 2179, 2018" be given first, second and third readings.

BYLAWS FOR THIRD READING

Zoning
Amendment
Bylaw (Creekside
Plaza) No. 2165,
2017

That "Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017" be given third reading.

OTHER BUSINESS

CORRESPONDENCE

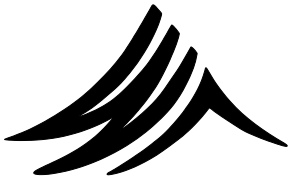
RZ1144 – 2077 Garibaldi Way File No. RZ1144	<p>Correspondence, received from March 8, 2018 to April 4, 2018, regarding Rezoning Application No. 1144 – 2077 Garibaldi Way from the following individuals:</p> <ul style="list-style-type: none">• Scott Humby, Bruce Pegram, Kevan Kobayashi and Paul Maki, owners and management of Fanatyk Co. Ski and Cycle;• Neil Collins;• John Crawford;• Patrick Basarah;• Mariano Zacsek;• Robert Currie;• Brittany Schumcher;• Erin Rolandi;• Stephen Aikins and Leslie Scott;• Brad and Irene Unger;• Braden Douglas;• Michel Berthoud;• Lorna Doucette;• Edgar Daryl Crozier;• Cathy Goddard; and• Lynda Hydamaka.
Artificial Turf Field File No. 3009	<p>Correspondence, received from March 22, 2018 to April 4, 2018, regarding the Artificial Turf Field from the following individuals:</p> <ul style="list-style-type: none">• Sarah Valentine;• Debra Browning;• Karen Kay;• John and Karen Wood;• Cathy Owen;• Alison Bradford;• Susie Zabilka;• Kary Firstbrook and Geordie Trusler; and• Sandra Jorgenson.
Variance Application for 5140 Alta Lake Road File No. DVP1149	<p>Correspondence from Stephanie Sloan, dated March 22, 2018, regarding Variance Application for 5140 Alta Lake Road.</p>
Federal Budget 2018 Feedback File No. 2014	<p>Correspondence from Pamela Goldsmith-Jones, Member of Parliament, dated March 26, 2018, regarding the federal Budget 2018.</p>

Walk for Values Proclamation Request File No. 3009.01	Correspondence from Manish Rughani, dated April 2, 2018, requesting that April 24, 2018 be declared "Human Values Day" in Whistler, B.C.
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BC Schizophrenia Society Light Up Request File No. 3009.01	Correspondence from Jean Fong, B.C. Schizophrenia Society, dated April 4, 2018, requesting that on May 24, 2018, the Fitzsimmons Bridge be lit up purple in support of Schizophrenia and Psychosis Awareness Day.
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TERMINATION

That the Regular Council Meeting of April 10, 2018 be terminated.



WHISTLER

MINUTES

**REGULAR MEETING OF MUNICIPAL COUNCIL
TUESDAY, MARCH 20, 2018, STARTING AT 5:30 P.M.**

**Franz Wilhelmsen Theatre at Maury Young Arts Centre
4335 Blackcomb Way, Whistler, BC V0N 1B4**

PRESENT:

Mayor: N. Wilhelm-Morden
Councillors: S. Anderson, J. Crompton, J. Ford, J. Grills, C. Jewett and S. Maxwell

Chief Administrative Officer, M. Furey
General Manager of Infrastructure Services, J. Hallisey
General Manager of Corporate and Community Services, N. McPhail
General Manager of Resort Experience, J. Jansen
Director of Planning, M. Kirkegaard
Municipal Clerk, B. Browning
Manager of Communications, M. Comeau
Senior Planner, M. Laidlaw
Capital Projects Manager, T. Shore
Senior Planner, J. Belobaba
Engineering Technologist, L. Perreault
Protective Services Planning Analyst, K. Creery
Planning Analyst, R. Licko
Council Coordinator, S. Termuende

ADOPTION OF AGENDA

Agenda

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That Council adopt the March 20, 2018 Regular Council Meeting Agenda as amended to include correspondence from Brenda Heikkinen and Margie Berthoud regarding Rezoning Application No. RZ1144.

CARRIED

ADOPTION OF MINUTES

Minutes

Moved by Councillor J. Grills
Seconded by Councillor C. Jewett

That Council adopt the Regular Council Meeting Minutes of March 6, 2018 as amended to reflect that Councillor J. Ford was opposed to the main motion, as amended for the Nesters Crossing Rezoning Application.

CARRIED

Public Question
and Answer Period

PUBLIC QUESTION AND ANSWER PERIOD

Bruce Hall
2-2070 Garibaldi
Way
Re: 2077 Garibaldi
Way

Mr. Hall asked if Council will use the same logic for approving employee housing requests as used when reviewing the Nesters Crossing Rezoning Application No. RZ1135 when considering the 2077 Garibaldi Way Rezoning Application No. RZ1144. Mr. Hall requested that Council consider reducing the density of the project at 2077 Garibaldi Way to create a good fit with the neighbourhood and the surrounding zoning.

Mayor Nancy Wilhelm-Morden stated that she cannot speak on behalf of other Council members and stated that she always tries to be consistent. Mayor Nancy Wilhelm-Morden stated that 2077 Garibaldi Way is an ongoing process and project. She stated that Council is awaiting a staff report and stated that Council will go forward from there.

MAYOR'S REPORT

Mayor's Report

Alison Raspa condolences

On behalf of Council and the Resort Municipality of Whistler (RMOW), Mayor Nancy Wilhelm-Morden offered condolences to the family and friends of Alison Raspa stating Council's thoughts are with her loved ones at this time.

Federal Gas Tax funding to support two RMOW infrastructure projects

The RMOW has been awarded \$1.5 million from the Federal Gas Fund. This funding will support the asset management investment plan and the organic waste system upgrade.

These projects will be further supported with RMOW investments. This partnership and the federal funding is a major contributor to accomplishing the RMOW's regional goals and completing this key infrastructure projects for Whistler. Mayor Nancy Wilhelm-Morden thanked Member of Parliament Pam Goldsmith Jones for her continued work on behalf of Whistler and the Government of Canada for investing in the Whistler community.

Earth Hour, March 24

This Saturday between 8:30 and 9:30 p.m. the RMOW will join the global Earth Hour event. Earth Hour asks people to be involved by turning off all non-essential lights and electronics for one hour. In doing so, it helps start the conversation and raise our awareness to the amount of energy used.

Energy conservation is the foundation to Whistler's approach to addressing our climate responsibilities. Council encourages residents and businesses to get involved in Earth Hour and help spread the message about saving energy and reducing energy use.

Mayor Nancy Wilhelm-Morden stated that reducing Kilowatt usage makes a difference by increasing awareness, helps move the municipality towards action items and sends a message to children about how everyone can reduce their energy use. Mayor Nancy Wilhelm-Morden encouraged everyone to participate.

Community Vision feedback opportunities set up at RMOW Sites

Community engagement activities are continuing as part of the process to renew Whistler's Community Vision and Official Community Plan. The community is encouraged to share their input on their hopes for Whistler's future.

There are many ways to provide input. You can complete a Postcard to the Future, these are available the Whistler Public Library, Municipal Hall and Meadow Park Sports Centre. You can go online to whistler.ca/MyFutureWhistler. Online there is the option to complete a brief survey. You can also download the comprehensive ideabook and provide more detailed feedback on specific topics of the Official Community Plan and Vision.

Mayor Nancy Wilhelm-Morden encouraged everyone to get involved in sharing their thoughts and being involved in this important process.

Whistler Poet's Pause poetry challenge open to submissions

The RMOW's annual Poet's Pause Poetry competition is now open for submissions. Mayor Nancy Wilhelm-Morden stated that she looks forward to the poems every year. Writers are invited to submit their original, unpublished poems to enter. The winning poems will be displayed at the Poet's Pause sculpture site in Alta Lake Park for a year. The winners will also receive \$200 and have their poems read during the April 24, 2018 Regular Council Meeting. The deadline to submit entries is March 29, 2018.

Transit Driver Appreciation Day:

Last Sunday, March 18, was Transit Driver Appreciation Day. On behalf of Council and the RMOW, Mayor Nancy Wilhelm-Morden thanked the hardworking Whistler Transit System drivers, as well all the transit staff that keep Whistler's buses running. The RMOW has seen increased bus patronage as part of efforts to reduce personal car use and reduce the environmental impacts of increased cars on the road.

As part of these efforts there were also 1,750 new transit service hours, an additional bus added to Whistler's fleet and the introduction of the new Compressed Natural Gas buses. Mayor Nancy Wilhelm-Morden thanked Whistler's drivers for their work during the busy winter season and their ongoing commitment to the safety of all passengers. Mayor Nancy Wilhelm-Morden reminded the community that the regular seasonal service changes to Whistler's transit system begin on Tuesday, April 3, 2018. Check BC Transit Whistler's website for the updated schedules.

WHA Wins Award for Best Public-Private partnership

Congratulations to the Whistler Housing Authority, along with Schreyer Construction, who were announced as winners of the Canadian Home Builders Association of BC's Georgie Award for Best Public-Private Partnership. The award was for the resident-restricted Spruce Grove dwelling constructed last year. The Georgie Awards celebrate exceptional work in residential construction. The award noted the Spruce Grove building's Passive House technology, innovation, energy efficiency and creative partnership.

Congratulations to local student awarded high school scholarship

On behalf of Council, Mayor Nancy Wilhelm-Morden congratulated local student Jun Jeong who was one of just 85 students across Canada to be awarded a Horatio Alger Canadian Scholarship. These scholarships are for eligible high school and CEGEP students. To receive this award is a testament to Jun's strength of character, strong academics, a commitment to higher education and a desire to contribute to society – which are key requirements for the scholarship.

Council wished Jun Jeong all the best for his ongoing studies and congratulate him on this great accomplishment.

Karuizawa Sister City Exchange

Mayor Nancy Wilhelm-Morden toured 10 students from Whistler's Sister City, Karuizawa, Japan, through the Municipality this afternoon. Mayor Nancy Wilhelm-Morden stated that 10 Whistler students will travel to Karuizawa in October. She stated that the visiting students are having a great time in Whistler. Karuizawa students provided a letter from the Mayor of Karuizawa to Mayor Nancy Wilhelm-Morden. In this letter Mayor Fujimaki stated that the Olympic Men's and Women's curling teams practiced in their city, and stated that in honour of Whistler and Karuizawa's 20 year Sister City anniversary, an inuksuk is being constructed for placement at the entrance to Karuizawa.

Congratulations to Canadian Paralympic Team

Mayor Nancy Wilhelm-Morden congratulated the Canadian Paralympic team on their 29 medals.

Mayor Nancy Wilhelm-Morden extended congratulations to all the athletes who participated in the 2018 Olympic and Paralympic Games. She advised that a ceremony will be held for athletes on April 10, 2018 at the Regular Council Meeting and advised that the athletes have been invited to be a part of the 2018 Canada Day Parade.

Councillor Cathy Jewett advised that she was invited to be a part of a housing report by the Whistler Secondary Grade 9 students in preparation for a Housing and Transportation conference for students which will be held at Whistler Secondary School on April 6, 2018.

Mayor Nancy Wilhelm-Morden advised that the RMOW will be hosting a Water Use Open House from 4:30 p.m. to 6:30 p.m. at the Whistler Conference Centre on Thursday, March 22, 2018.

ADMINISTRATIVE REPORTS

A Bylaw for the
Prohibition of
Once-Through
Cooling
Devices Within the
Resort Municipality
of Whistler
File No. 220
Report No. 18-027

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That Council permit staff to engage community stakeholders and proceed with the development of a bylaw prohibiting the use and installation of once-through cooling devices within the Resort Municipality of Whistler.

CARRIED

Lower Mainland
Local Government
Association –
Resolution for
Consideration –
Collection of Unpaid
Bylaw Fines
File No. 4700.5
Report No. 18-029

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That Council approve the draft resolution attached to this report as Appendix “A” to be sent to the Lower Mainland Local Government Association regarding the collection of unpaid bylaw fines; and

That Council endorse that a letter be sent to the Insurance Corporation of BC regarding the collection of unpaid bylaw fines in response to the Insurance Corporation of BC Rate Fairness Survey.

CARRIED

Mayor Nancy Wilhelm-Morden called a recess of the Regular Council Meeting at 6:00 p.m. for a Public Hearing.

Mayor Nancy Wilhelm-Morden reconvened the Regular Council Meeting at 6:12 p.m.

SEC0018 – 8030
Alpine Way Flood
Proofing
Exemption and
DP1541 – 8010
Alpine Way
Development
Permit
File No. SEC0018,
DP1541
Report No.18-031

Moved by Councillor J. Crompton
Seconded by Councillor J. Ford

That Council approve the issuance of Development Permit DP1541 for the development of a flood control training berm within the road allowance at Wedge Park as shown in the Site Servicing Plans Key-2, ESC-1, ESC-2, ESC-3, ESC-DET-1, R-1, W-1, XS-1, DET-4 prepared by Creus Engineering Limited dated 2017-10-26, attached as Appendix C to Administrative Report to Council No.18-031 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of an easement for the construction, servicing and maintenance of the training berm located within the road allowance at Wedge Park between White Glacier International Limited and the Resort Municipality of Whistler,
2. Environmental Monitoring for the duration of the development works, and
3. Receipt of a landscape security for 135% of the cost of landscaping the sides of the training berm with native planting and hydro seeding; and further

That Council grant an exemption in accordance with section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit construction of new buildings within the flood proofing area specified in “Zoning and Parking Bylaw 303, 2015” at 8030 Alpine Way as shown in Site Plan A1.0A, prepared by Lamoureux Architect Inc., dated 12/ March 18 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of a Section 219 covenant for the exemption, indemnifying the Municipality and attaching the Flood Construction Level Report prepared by LaCas Consultants Incorporated, dated October 11, 2017, confirming that the proposed building designs and locations are safe for the intended use; and
2. Registration of a Section 219 covenant for regular Environmental Monitoring during construction of the works proposed under DP1541 and SEC0018.
3. Registration of a covenant that restricts development of the lands to that proposed under SEC0018, and limits any further proposed development to a maximum of 200 square metres, which would be subject to future approval requirements.

Moved by Councillor S. Maxwell
Seconded by Councillor J. Crompton

That the motion be deferred.

OPPOSED: Councillor J. Grills and Councillor S. Anderson

CARRIED

SEC0026 – 2208
Lake Placid
Road
File No. SEC0026
Report No. 18-032

Moved by Councillor S. Anderson
Seconded by Councillor J. Ford

That Council grant an exemption in accordance with section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit a building addition to an existing dwelling to be constructed within flood proofing area specified in “Zoning and Parking Bylaw 303, 2015” at 2208 Lake Placid Road as shown in Architectural Plans A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15 prepared by Permit Masters dated 09/ 08/ 2017, attached as Appendix “B” to Administrative Report to Council No.18-032; and further

That Council authorize the Mayor and Municipal Clerk to execute a Section 219 covenant on the title of the subject property for this exemption, indemnifying the Municipality and attaching the geotechnical report prepared by EXP Geotechnical, dated March 8, 2018 confirming that the proposed building location and design are safe for the intended residential use.

CARRIED

LUC008—Alpine
Meadows Land
Use Contract
Termination
File No. LUC008
Report No. 18-033

Moved by Councillor J. Ford
Seconded by Councillor J. Grills

That Council direct staff to schedule a second Public Hearing for “Land Use Contract Termination Bylaw (Alpine Meadows) No. 2166, 2017”.

CARRIED

2018 Emerald
Pump Station
Upgrades
File No. 271.4
Report No. 18-028

Moved by Councillor C. Jewett
Seconded by Councillor J. Grills

That Council award the contract in the amount of \$1,069,391.00 (exclusive of GST) to Carver Construction Ltd. in accordance with their tender proposal dated October 6, 2017.

CARRIED

MINUTES OF COMMITTEES AND COMMISSIONS

Recreation and
Leisure Advisory
Committee

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That the Regular Meeting Minutes of the Recreation and Leisure Advisory Committee of January 11, 2018 be received.

CARRIED

BYLAWS FOR THIRD READING

Zoning
Amendment
Bylaw (Creekside
Plaza) No. 2165,
2017
As Revised

No action was taken regarding “Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017”.

BYLAWS FOR ADOPTION

Bylaw Notice
Enforcement
Bylaw
No. 2174, 2018

Moved by Councillor J. Crompton
Seconded by Councillor S. Anderson

That "Bylaw Notice Enforcement Bylaw No. 2174, 2018" be adopted.

CARRIED

Land Use
Contract
Termination
Bylaw
(Brio) No. 2169,
2018

Moved by Councillor J. Grills
Seconded by Councillor C. Jewett

That "Land Use Contract Termination Bylaw (Brio) No. 2169, 2018" be adopted.

CARRIED

OTHER BUSINESS

FWAC
Membership
Extensions

Mayor N. Wilhelm-Morden notified the public that the terms of the following Forest and Wildland Advisory Committee members were extended for one year:

- Johnny Mikes;
- Candace Rose-Taylor;
- Arthur DeJong; and
- Derek Bonin.

CORRESPONDENCE

Cannabis Sales
Revenue
Sharing
File No. 2014

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That correspondence from Aaron Stone, Mayor of the Town of Ladysmith, dated February 28, 2018, requesting support from British Columbia municipalities regarding implementing a Cannabis Sales Revenue Sharing program be received and referred to staff.

CARRIED

AVICC Resolution
Re: Common
Asset
Management
Policy
File No. 2014

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That correspondence from John Ward, Director of Legislative and Corporate Services, and Deputy Chief Administrative Officer, City of Courtenay, dated February 13, 2018, advising of the City of Courtenay's submission to the Association of Vancouver Island and Coastal Communities Annual General Meeting regarding a Common Asset Management Policy be received.

CARRIED

Brain Tumour
Foundation of
Canada
Light Up Request
File No. 3009.01

Moved by Councillor J. Grills
Seconded by Councillor C. Jewett

That correspondence from Susan Marshall, Chief Executive Officer, Brain Tumour Foundation of Canada, dated March 1, 2018, requesting that on May 22, 2018 the Fitzsimmons Bridge be lit up orange to support Brain Tumour Awareness Month be received and referred to staff.

CARRIED

Vacant Lot with
Employee Suite
Covenant

Moved by Councillor J. Crompton
Seconded by Councillor S. Anderson

That correspondence from Shauna O'Callaghan, dated March 6, 2018, regarding an

File No. 3009	Employee Covenant registered on title and construction concerns be received and referred to staff.	CARRIED
Whistler Music Video File No. 3009	Moved by Councillor J. Grills Seconded by Councillor J. Ford That correspondence from Martin Mayer, dated March 6, 2018, showcasing his Whistler Music Video be received and referral to staff.	CARRIED
2018 Budget Feedback File No. 4530	Moved by Councillor J. Ford Seconded by Councillor J. Crompton That correspondence from Dawn Titus, dated March 7, 2018, regarding the Cultural Connector project be received and referred to staff.	CARRIED
SLRD RGS Bylaw File No. 2014	Moved by Councillor J. Grills Seconded by Councillor J. Ford That correspondence from Jack Crompton, Squamish-Lillooet Regional District Board Chair, dated March 7, 2018, regarding the adoption of the “Regional Growth Strategy Bylaw No.1062, 2008, Amendment Bylaw No. 1514-2017” be received and referred to staff.	CARRIED
Condo Tourism Fees File No. 3009	Moved by Councillor J. Crompton Seconded by Councillor J. Ford That correspondence from Mary Meratla, received March 7, 2018, regarding condo tourism fees be received.	CARRIED
Opposition to RZ1146 File No. RZ1146	Moved by Councillor J. Grills Seconded by Councillor S. Anderson That correspondence from Trevor and Judy Hill, dated March 7, 2018, expressing opposition for Rezoning Application No. RZ1146 be received and referred to staff.	CARRIED
BC HEROS Proposal File No. 3009	Moved by Councillor J. Ford Seconded by Councillor C. Jewett That correspondence from Hanz Dysarsz, BC HEROS Executive Director, and Ted Clarke, BC HEROS Vice-President, dated March 13, 2018, regarding BC HEROS’ proposal for better emergency pre-hospital care be received.	CARRIED
Resident Rental Housing File No. 3009	Moved by Councillor J. Ford Seconded by Councillor J. Crompton That Correspondence from Ken Melamed, dated March 13, 2018, regarding resident rental housing in Whistler be received and referred to staff.	CARRIED

Correspondence
received
regarding RZ1132
File No. RZ1132

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That correspondence from the following individuals received from February 11, 2018 to March 13, 2018 regarding Rezoning Application No. RZ1132 be received and referred to staff:

- Ru Mehta;
- Theresa Ginter;
- Kaori and Ray Zage;
- Chris Enns;
- Graham Sibbald; and
- Henrick Zessel.

CARRIED

Opposition to
RZ1144 –
2077
Garibaldi Way
File No. RZ1144

Moved by Councillor J. Grills
Seconded by Councillor C. Jewett

That Correspondence, received from March 9, 2018 to March 14, 2018, expressing opposition to Rezoning Application No. 1144 – 2077 Garibaldi Way from the following individuals be received and referred to staff:

- Kerry Martin;
- Patricia Moore;
- Harriet Parnis;
- Bruce Hall;
- Marnie Gibson;
- Paul and Jane Manning;
- Alan Erickson;
- M. Janice Erickson;
- Mike and Elaine McRory;
- Connie Cathers;
- Arthur Weinstein;
- Margie Berthoud;
- Brenda Heikkinen;
- Marilyn Weinstein;
- Terry Spence;
- Bruce Goldsmid;
- Robin Innes;
- Bernard Cramford;
- Heather Rivers;
- Roland Pfaff; and
- Nila Dougalis.

CARRIED

Update on Working
Group on
Responsible
Conduct
File No. 2014

Moved by Councillor J. Crompton
Seconded by Councillor J. Ford

That correspondence from, Selina Robinson, Minister of Municipal Affairs and Housing, Wendy Booth, President, UBCM, and Patti Bridal, President, LGMA, dated March 6, 2018, updating on the progress of the Working Group for Responsible

Conduct be received.

CARRIED

LMLGA Call for
Resolutions and
Nominations and
LMLGA AGM and
Convention, and
CivX 2018
File No. 2014

Moved by Councillor J. Ford
Seconded by Councillor J. Crompton

That correspondence from Jamee Justason, Executive and Association Services Coordinator, UBCM, dated March 14, 2018, calling for resolutions to LMLGA, Nominations for the LMLGA Executive, the LMLGA AGM and convention and CivX 2018 be received.

CARRIED

TERMINATION

Motion to
Terminate

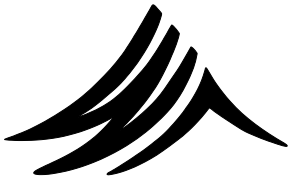
Moved by Councillor J. Crompton
Seconded by Councillor J. Ford

That the Regular Council Meeting of March 20, 2018 be terminated at 7:13 p.m.

CARRIED

Mayor, N. Wilhelm-Morden

Municipal Clerk, B. Browning



WHISTLER

MINUTES

**PUBLIC HEARING OF MUNICIPAL COUNCIL
TUESDAY, MARCH 20, 2018 STARTING AT 6:00 P.M.**

**In the Franz Wilhelmsen Theatre at Maury Young Arts Centre
4335 Blackcomb Way, Whistler, BC V0N 1B4**

PRESENT:

Mayor: N. Wilhelm-Morden
Councillors: S. Anderson, J. Crompton, J. Ford, J. Grills, C. Jewett and
S. Maxwell

Chief Administrative Officer, M. Furey
General Manager of Infrastructure Services, J. Hallisey
General Manager of Corporate and Community Services, N. McPhail
General Manager of Resort Experience, J. Jansen
Director of Planning, M. Kirkegaard
Municipal Clerk, B. Browning
Manager of Communications, M. Comeau
Senior Planner, J. Belobaba
Senior Planner, M. Laidlaw
Engineering Technologist, L. Perreault
Council Coordinator, S. Termuende

This Public Hearing is convened pursuant to section 464 of the *Local Government Act* to allow the public to make representations to Council respecting matters contained in "Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017" (the "proposed Bylaw").

Everyone present shall be given a reasonable opportunity to be heard or to present written submissions respecting matters contained in the proposed Bylaw. No one will be discouraged or prevented from making their views known. However, it is important that remarks be restricted to matters contained in the proposed Bylaw.

When speaking, please commence your remarks by clearly stating your name and address.

Members of Council may ask questions following presentations; however, the function of Council at a Public Hearing is to listen rather than to debate the merits of the proposed Bylaw.

As stated in the Notice of Public Hearing, the purpose of the proposed Bylaw is to modify the existing CL3 Zone regulations to allow auxiliary residential dwelling units for employee housing, increase the allowable density, increase the maximum site coverage and include additional regulations pertaining to the auxiliary residential housing units for employee housing. The proposed Bylaw is as revised by Council on March 6, 2018 to remove liquor retail sales use from the proposed Bylaw.

MINUTES

Public Hearing: Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017

March 20, 2018

Page 2

Presentation by municipal staff	Senior Planner Melissa Laidlaw gave a presentation regarding the proposed Bylaw.
Submissions from the Public	Mayor Wilhelm-Morden called for submissions by the public.
Submissions from the Public	Mayor Wilhelm-Morden called twice more for submissions by the public.
Dan Jekubik Owner Creekside Plaza	Mr. Jekubik thanked Mayor and Council for allowing the revitalization of Boston Pizza, but stated that he was disappointed regarding Council's decision to remove packaged liquor from the Rezoning Application. Mr. Jekubik stated that he is committed to the redevelopment of Creekside Plaza even without the BC Liquor store moving and stated that he looks forward to improving the livability of Whistler by providing employee housing.
Kaori Zage Owner Franz' Trail	Ms. Zage stated that she wanted to work with everyone in the community to make Creekside a better place. She stated that employee housing is important and understands the concerns of employers and staff. Ms. Zage thanked Mayor and Council for listening to concerns and considerations of the community and stated she looks forward to the opportunity to work with Council in the future.
Mark Ricou 8612 Fissile Lane	Mr. Ricou stated that he strongly supports Rezoning Application No. RZ1132. He stated that the Creekside property is a gateway site to Whistler, and stated that a new building with new alpine architecture will benefit Creekside and Whistler. He stated that the employee housing component is excellent. Mr. Ricou stated he was sympathetic to staff and employees in Whistler in terms of housing. He hopes that this is beginning of trend for more investment and vitality in Creekside.
Submissions from the Public	Mayor Wilhelm-Morden called three more times for submissions by the public.
Correspondence	The Municipal Clerk Brooke Browning indicated that 18 pieces of correspondence had been received expressing both support and opposition to the proposed Bylaw.

Mayor Nancy Wilhelm-Morden advised that Council will not be considering third reading of the proposed Bylaw at tonight's Regular Council Meeting.

MOTION TO CLOSE THE PUBLIC HEARING

Moved by Councillor J. Ford

Seconded by Councillor J. Crompton

That the Public Hearing for "Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017" be closed at 6:11 p.m.

CARRIED

Mayor, N. Wilhelm-Morden

Municipal Clerk, B. Browning



REPORT | INFORMATION REPORT TO COUNCIL

PRESENTED: April 10, 2018
FROM: Resort Experience
SUBJECT: PLANNING AND BUILDING DEPARTMENTS' APPLICATION ACTIVITY
REPORT – 2017 FOURTH QUARTER

REPORT: 18-035
FILE: 7076.01

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the General Manager of Resort Experience be endorsed.

RECOMMENDATION

That Information Report No. 18-035 regarding the Planning Department and Building Department application activity for the fourth quarter of 2017 be received.

REFERENCES

Appendix “A” – Table A.1: Planning Department New Applications by Type
Table A.2: Planning Department Application Processing Status
Table A.3: Building Department New Applications by Type
Table A.4: Building Department Application Processing Status
Table A.5: Building Department – Demolition Permits
Table A.6: Summary of Active Rezoning and Development Permit Applications

PURPOSE OF REPORT

The purpose of this Report is to provide Council with an overview of Planning Department and Building Department application activity for the fourth quarter of 2017 and for 2017 year-end. This Report also provides additional information on active rezoning and development permit applications.

DISCUSSION

Activity Report

Reporting on Planning Department and Building Department application activity is prepared quarterly for Council, at Council's request. The reporting provides information on the volume of new applications and their processing status for both the Planning and Building Departments.

Planning Department

Table A.1 of Appendix “A” shows that the Planning Department received 31 new applications in the fourth quarter of 2017. This compares to 33 received in the fourth quarter of 2016. A total of 183 new applications we received for all of 2017, which compares to 205 new applications in 2016, 220 in 2015 and 258 in 2014. These numbers show a general decline in new applications over the last three years.

The decrease in number of new applications from 2016 to 2017 was associated with a decrease in land use contract amendments by 13, sign permits by 10, development permits by 9, temporary use permits for artist studios by 4 and covenant modifications by 3. There was an increase in the following types of new applications from 2016 to 2017: development variance permit by 8, liquor license by 6 and floodplain applications by 2.

Of the application types, development permit applications (8) continue to represent the largest number of applications by type, consistent with previous quarterly updates.

Historically, the second and third quarters are the busiest for intake of new applications into the Planning Department and this continued to be the case for 2017.

Table A.2 of Appendix "A" shows three tables that provide the processing status of new Planning Department applications received in 2017, outstanding applications from previous years and their processing status at the end of 2017, and lastly, the total volume of applications being processed in 2017. In total, the Planning Department had 290 applications in process in 2017, of which 167 were approved, one denied, 19 withdrawn or cancelled, and 103, representing 35 per cent, remained in process at the end of 2017. The per centage remaining in progress at year end 2017 is generally consistent with the two previous reporting years.

The 290 total applications in process in 2017 compares to 290 in 2016 and 343 in 2015.

New policy direction affects application volume. Of note:

- The municipality initiated 9 of the land use contract amendment applications in 2016 when we began the process of terminating land use contracts following a change in provincial legislation;
- Temporary use permit regulations for home based artist studios adopted in 2016 and related temporary use permit applications;
- In ground basement gross floor area exclusions adopted in 2012 and related covenant modification applications;
- Increase in Board of Variance application fees in 2015 and effect on number of Board of Variance applications submitted;
- Increased development permit exemptions for detached and duplex development in 2015 following the quashing of the OCP in 2014;
- Free FireSmart home assessments provided by Whistler Fire Rescue Services and related development permit applications for tree removals;
- Changes in provincial liquor licensing policy; and
- Recommended actions of the Mayor's Task Force on Resident Housing and related rezoning applications and inquiries related to development of resident restricted rental housing on private lands.

General volume of applications does not address complexity. While intake of new applications in 2017 was less than in the previous three reporting years, revenues associated with application processing fees and staff recoverables increased two per cent in 2017 over 2016, indicating the type of recoverable files being processed in 2017 were likely more complex.

Building Department

Table A.3 of Appendix "A" shows that the Building Department received 264 new files in the fourth quarter of 2017, for a total intake of 1,272 new files for all of 2017. This compares to 1,291 new files in 2016, 1,091 new files in 2015 and 1,146 new files in 2014 (Note: 2014 and 2015 totals did not include reporting of Business License referrals).

There was an increase in the following types of new files from 2016 to 2017: demolition permit by 26, plumbing permit by 9, red file by 6, and business license referral by 5. There was a decrease in the following types of new files from 2016 to 2017: building permit by 27, site alteration permit by 17, information request by 16, and fireplace permit by 4.

Of the file types, information requests (98) continue to represent the majority of the files, consistent with all previous quarterly updates. Information requests are requests made by homeowners, or through their agent (designer, real estate agent) for historical permit information including occupancy certificates, drawings and surveys, gross floor area calculations, or confirmation that works and services charges were paid. This information is not public and therefore is not available on the RMOW website, and can only be obtained through an information request.

Historically, the second and third quarters are the busiest for intake of new applications into the Building Department and this was the case for 2017.

Table A.4 of Appendix "A" shows three tables that provide the processing status of new Building Department files received in the first four quarters of 2017, outstanding applications from 2016 and their processing status at the end of 2017, and lastly, the total volume of applications being processed in 2017. In total, the Building Department had 1,897 files in process in 2017, of which 835 were approved, one denied, 54 withdrawn or cancelled, 741 completed or granted occupancy, and 266, representing 14 per cent, remained in progress at the end of 2017. The per centage remaining in progress at year end 2017 is generally consistent with the two previous reporting years.

Table A.4 of Appendix "A" further breaks down the type of demolition permits. There were 7 single family tear downs approved in 2017 out of a total of 61 demolition permits approved in 2017.

Rezoning and Development Permit Files

As requested by Council, staff have also prepared a summary table of rezoning and development permit files, including a brief description of the nature of the file, the property location and processing status. This is intended to give Council more insight into files which are in process and will require Council approvals. This table is presented as Table A.6 of Appendix "A".

Of the 35 files, 21 are under active review and 14 are with the applicant to address staff comments, issuance conditions, or bylaw adoption conditions.

WHISTLER 2020 ANALYSIS

W2020 Strategy	TOWARD Descriptions of success that resolution moves us toward	Comments
Built Environment	The built environment is attractive and vibrant, reflecting the resort community's character, protecting viewsapes and evoking a dynamic sense of place.	The municipality's Planning and Building policies, regulations and application processes uphold and support these DOS. Quarterly reporting provides information on activity that furthers the DOS.
Built Environment	The built environment is safe and accessible for people of all abilities, anticipating and accommodating wellbeing needs and satisfying visitor expectations.	
Partnership	Residents, taxpayers, businesses and local government hold a shared vision for the resort community and work in partnership to achieve that vision.	

The Building and Planning Activity Report does not move our community away from any of the adopted Whistler2020 Descriptions of Success.

OTHER POLICY CONSIDERATIONS

Planning and Building applications are processed consistently with established municipal procedures and legislated requirements. The Planning and Building Departments maintain on-going project tracking to monitor and manage work flow and project assignments.

BUDGET CONSIDERATIONS

There are no direct external costs to prepare the quarterly reports. All internal costs to prepare the reports are accommodated within the annual operating budget of the municipality.

The processing of applications by the Planning and Building Departments supports department budgets and cost recovery of services provided.

The amounts of these revenues also reflect the level of application activity. In 2017, the actual Planning Department revenues associated with application processing fees and staff recoverables were \$162,838, representing a two per cent increase over 2016. In 2017, the actual Building Department Building Permit revenues were \$1,274,614, representing a 12 per cent increase over 2017.

COMMUNITY ENGAGEMENT AND CONSULTATION

This Report provides publicly available information regarding Planning and Building Department application activity on a regular and on-going basis.

The status of active rezoning, development permit, development variance permit and board of variance, building permit, plumbing permit, site alteration permit and demolition permit applications is available on the RMOW website. This information is public and shows active permits, once a permit is issued or closed it can no longer be viewed. Applicants, neighbours and contractors typically access this information.

Also available on the RMOW website are a listing of Whistler Village Enhancement projects, including an overview of their construction timeline, expected impacts (eg. detours, areas fenced off), and construction site management plan. This information is uploaded to the website upon issuance of the associated development permit. Several Whistler Village Enhancement projects are anticipated for 2018 based on development permit applications currently being processed.

SUMMARY

This Report presents an overview of Planning and Building Department application activities for the fourth quarter of 2017. This Report also provides additional information on active rezoning and development permit applications.

Respectfully submitted,

Melissa Laidlaw
SENIOR PLANNER

For
Jan Jansen
GENERAL MANAGER OF RESORT EXPERIENCE

Table A.1
Planning Department
New Applications Received By Type

Type	Q4-2017	Q3-2017	Q2-2017	Q1-2017	Total 2017	Total 2016
Antenna Siting	0	0	0	0	0	0
Blackcomb Benchland Permit	0	0	0	0	0	0
Board of Variance	1	3	6	1	11	10
Covenant Modification	4	4	5	3	16	19
Crown Referral	0	2	5	2	9	10
Development Permit	8	13	17	13	51	60
Development Variance Permit	1	10	5	3	19	11
Land Use Contract	0	0	0	0	0	13
Liquor Licence	7	7	10	6	30	24
Official Community Plan	0	0	0	0	0	0
Rezoning	2	5	1	5	13	12
Section 524 (floodplain)	2	2	0	0	4	2
Sign Permit	6	8	11	5	30	40
Temporary Use Permit	0	0	0	0	0	4
TOTAL Planning	31	54	60	38	183	205

Table A.2
Planning Department
Application Processing Status 2017 Q1 thru Q4

New Applications Received 2017

Type	2017 YTD	Approved	Denied	Withdrawn/ Cancelled	In Progress
Antenna Siting	0	0	0	0	0
Blackcomb Benchland Permit	0	0	0	0	0
Board of Variance	11	6	0	3	2
Covenant Modification	16	9	0	0	7
Crown Referral	9	7	0	0	2
Development Permit	51	35	0	2	14
Development Variance Permit	19	3	0	5	11
Land Use Contract	0	0	0	0	0
Liquor Licence	30	26	0	2	2
Official Community Plan	0	0	0	0	0
Rezoning	13	6	0	0	7
Section 524 (floodplain)	4	0	0	1	3
Sign Permit	30	27	0	0	3
Temporary Use Permits	0	0	0	0	0
TOTAL	183	119	0	13	51

2016 and Older Applications Processed in 2017

Type	2017 YTD	Approved	Denied	Withdrawn/ Cancelled	In Progress
Antenna Siting	0	0	0	0	0
Blackcomb Benchland Permit	0	0	0	0	0
Board of Variance	1	1	0	0	0
Covenant Modification	19	4	0	1	14
Crown Referral	4	3	0	0	1
Development Permit	27	16	0	2	9
Development Variance Permit	15	11	0	0	4
Land Use Contract	13	3	0	0	10
Liquor Licence	3	3	0	0	0
Official Community Plan	1	0	0	0	1
Rezoning	14	3	0	2	9
Section 524 (floodplain)	4	3	0	0	1
Sign Permit	6	1	1	1	3
Temporary Use Permit	0	0	0	0	0
TOTAL	107	48	1	6	52

Total Applications in Process in 2017

Type	2017 YTD	Approved	Denied	Withdrawn/ Cancelled	In Progress
Antenna Siting	0	0	0	0	0
Blackcomb Benchland Permit	0	0	0	0	0
Board of Variance	12	7	0	3	2
Covenant Modification	35	13	0	1	21
Crown Referral	13	10	0	0	3
Development Permit	78	51	0	4	23
Development Variance Permit	34	14	0	5	15
Land Use Contract	13	3	0	0	10
Liquor Licence	33	29	0	2	2
Official Community Plan	1	0	0	0	1
Rezoning	27	9	0	2	16
Section 524 (floodplain)	8	3	0	1	4
Sign Permit	36	28	1	1	6
Temporary Use Permit	0	0	0	0	0
TOTAL	290	167	1	19	103

Table A.3
Building Department
New Applications Received By Type

Type	Q4-2017	Q3-2017	Q2-2017	Q1-2017	Total 2017	Total 2016
Building Permit	53	76	81	84	294	321
Business Licence	19	9	24	20	72	67
Comfort Letter	1	6	3	1	11	12
Fireplace Permit	1	1	0	0	2	6
Information Request	98	123	135	109	465	481
Red File	11	10	10	4	35	29
Plumbing Permit	62	78	76	79	295	286
Demolition	17	28	14	12	71	45
Site Alteration	2	5	8	12	27	44
TOTAL Building	264	336	351	321	1272	1291

Table A.4
Building Department
Application Processing Status

New Applications Received 2017 - Q1 thru Q4

Type	2017 Total	Approved	Denied	Withdrawn / Cancelled	Completed/ Occupancy	In Progress
Building Permit	294	194	0	7	33	60
Business Licence	72	0	0	0	49	23
Comfort Letter	11	0	0	0	11	0
Fireplace Permit	2	2	0	0	0	0
Information Request	465	0	0	0	440	25
Red File	35	0	0	2	5	28
Plumbing Permit	295	182	0	5	52	56
Demolition	71	40	0	3	23	5
Site Alteration	27	18	0	1	5	3
TOTAL Building	1272	436	0	17	618	200

2016 Applications Processed in 2017 - Q1 thru Q4

Type	2017 Total	Approved	Denied	Withdrawn / Cancelled	Completed/ Occupancy	In Progress
Building Permit	278	204	0	14	37	23
Business Licence	19	0	1	0	8	10
Comfort Letter	0	0	0	0	0	0
Fireplace Permit	0	0	0	0	0	0
Information Request	4	0	0	0	4	0
Red File	22	0	0	0	1	21
Plumbing Permit	243	160	0	19	54	10
Demolition	37	23	0	1	11	2
Site Alteration	22	12	0	2	8	0
TOTAL Building	625	399	1	36	123	66

Total 2016 and 2017 Applications in Process 2017 - Q1 thru Q4

Type	2017 Total	Approved	Denied	Withdrawn/ Cancelled	Completed/ Occupancy	In Progress
Building Permit	572	398	0	21	70	83
Business Licence	91	0	1	0	57	33
Comfort Letter	11	0	0	0	11	0
Fireplace Permit	2	2	0	0	0	0
Information Request	469	0	0	0	444	25
Red File	57	0	0	2	6	49
Plumbing Permit	538	342	0	24	106	66
Demolition	108	63	0	4	34	7
Site Alteration	49	30	0	3	13	3
TOTAL Building	1897	835	1	54	741	266

Table A.5
Building Department
Application Processing Status - DEMOLITION PERMITS

New Applications Received 2017 - Q1 thru Q4

Type	2017 YTD	Approved	Denied	Withdrawn / Cancelled	Completed/ Occupancy	In Progress
DEMOLITION	0	0	0	0	0	0
COM-FLD/FI	1	0	0	0	1	0
DUPLEX-FUL	1	0	0	0	0	1
DUPLEX-PAR	1	0	0	0	1	0
MF-PARTIAL	21	11	0	2	7	1
RES-FLD/FI	17	11	0	0	6	0
SF-PARTIAL	13	9	0	1	2	1
SF-TEARDOWN	9	5	0	0	2	2
T.I.	8	4	0	0	4	0
TOTAL Building	71	40	0	3	23	5

2016 Applications Processed in 2017 - Q1 thru Q4

Type	2017 YTD	Approved	Denied	Withdrawn / Cancelled	Completed/ Occupancy	In Progress
DEMOLITION	3	2	0	0	0	1
COM-FLD/FI	0	0	0	0	0	0
DUPLEX-FUL	0	0	0	0	0	0
DUPLEX-PAR	0	0	0	0	0	0
MF-PARTIAL	12	11	0	0	0	1
RES-FLD/FI	1	0	0	0	1	0
SF-PARTIAL	7	3	0	1	3	0
SF-TEARDOWN	4	2	0	0	2	0
T.I.	10	5	0	0	5	0
TOTAL Building	37	23	0	1	11	2

Total 2016 and 2017 Applications in Process 2017 - Q1 thru Q4

Type	2017 YTD	Approved	Denied	Withdrawn/ Cancelled	Completed/ Occupancy	In Progress
DEMOLITION	0	0	0	0	0	0
COM-FLD/FI	1	0	0	0	1	0
DUPLEX-FUL	1	0	0	0	0	1
DUPLEX-PAR	1	0	0	0	1	0
MF-PARTIAL	33	22	0	2	7	2
RES-FLD/FI	18	11	0	0	7	0
SF-PARTIAL	20	12	0	2	5	1
SF-TEARDOWN	13	7	0	0	4	2
T.I.	18	9	0	0	9	0
TOTAL Building	105	61	0	4	34	6

Legend

DEMOLITION	Demos that are not noted from list below
COM-FLD/FI	Commercial - Flood and Fire
DUPLEX-FUL	Duplex - Full
DUPLEX-PAR	Duplex - partial
MF-PARTIAL	Multi-family - partial
RES-FLD/FI	residential - flood and fire
SF-PARTIAL	single family - partial
SF-TEARDOWN	single family - teardown
T.I.	tenant improvement

Table A.6				
Summary of Active Rezoning and Development Permit Applications 2017 Fourth Quarter				
File #	Address	Subject	Application Date	Status
DP001033	VILLAGE GREEN 4154 7	ND: Village - expansion to Beacon Pub (former Citta)	6-Aug-08	Staff reviewing concurrently with RZ1102. Refer to status of RZ1102.
DP001337		ND: Function - development of vacant site with 4 buildings for light industrial, commercial, offices	29-Jan-14	Approved for issuance by Council on 03-Oct-17 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001408	INDIGO LANE 8413	ND: Rainbow 12 unit condo development	18-Nov-14	Approved for issuance by Council on 15-Sept-15 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001440	GOLFERS APPROACH 4111	ND: Village - Tapley's - patio expansion &	8-Apr-15	Applicant addressing 8-Jun-16 staff
DP001551	GLACIER DR 4701 2	ND: Benchlands - Cedar Hollow - proposed one car garage for unit #2	24-Jan-17	Approved for issuance by Council on 15-Aug-17 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001556	INNSBRUCK DR 2011	ND: Creekside - Gateway Plaza - redevelopment of a 2-storey commercial building	9-Feb-17	Staff reviewing concurrently with RZ1132. Refer to status of RZ1132.
DP001562	BLUEBERRY DR 3200	ND: Blueberry - 8 unit townhouse development	4-Apr-17	Approved for issuance by Council on 20-Jun-17 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001577	SUNDIAL PL 4420	ND: Village - Powder Lodge building envelope and balcony refurbishment	13-Jun-17	Approved for issuance by Council on 15-Aug-17 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001599	NESTERS RD 8056	ND: Nesters Crossing - new industrial building	27-Oct-17	Approved for issuance by Council on 6-Mar-18 subject to conditions. Applicant is working on fulfilling issuance conditions.
DP001604	MAIN ST 4314	ND: Village - Town Plaza rain gutters	30-Jan-18	Received. Under review.
DP001606	BLACKCOMB WAY 4355	ND: Village - Brewhouse - building facade	13-Feb-18	Received. Under review.
LUC00002		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00003		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00004		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00005		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00006		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00008		Land Use Contract Discharge Division 16 Section 548 LGA: Alpine Meadows	11-Apr-16	2nd reading on 21-Jan-18. Public Hearing on 20-Feb-18.
LUC00009		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00010		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
LUC00011		Land Use Contract Discharge Division 16 Section	11-Apr-16	RMOW initiated. Under review.
RZ001003	MONS CRT 8069	Mons - Pomroy Property rezone - existing non-permitted uses and proposed new uses	22-Apr-08	Awaiting response from applicant to 2013 staff request.
RZ001009	GONDOLA WAY 2501	Whistler Creek South -Bunbury lands - zoning for revised 5 lot subdivision, no new BUs required	11-Jan-06	New information received on 21-Feb-18. Under review.
RZ001073	MONS RD 8021	Mons - Sabre Property zoning to legitimize siting and proposed additional uses and GFA	26-Mar-13	Applicant addressing 19-May-17 staff comments.
RZ001094	MCKEEVERS PL 8104	Alpine - Alpine Cafe & Market rezoning for	10-Jul-14	Applicant addressing 12-Jun-15 staff
RZ001102	VILLAGE GREEN 4154 7	Village - Crystal Lodge Restaurant Expansion	30-Jan-15	Applicant addressing 22-Mar-17 staff
RZ001104	LAKE PLACID RD 2121	Creekside - proposed rezoning to permit continued use of existing triplex	20-Feb-15	3rd reading on 9-Jun-15. Applicant working on fulfilling conditions of bylaw adoption.
RZ001129	BLACKCOMB WAY 4365 4375	Village - Whistler Olympic Plaza	4-Oct-16	RMOW initiated. Under review.
RZ001132	INNSBRUCK DR 2011	Creekside - Gateway Plaza - rezoning to add retail sale of liquor and resident housing use	9-Feb-17	2nd reading as revised on 6-Mar-18, Public Hearing on 20-Mar-18.
RZ001133	ALTA LAKE RD 5302	Tyrol Lodge - rezoning to legitimize tourist accommodation and residential use	22-Feb-17	Applicant advised in Sept-17 that staff do not support application as proposed.
RZ001135	NESTERS RD 8040	Nesters Crossing - rezoning to add additional uses to the CTI1 Zone	3-Mar-17	Council granted authorization for staff to proceed with further processing of rezoning application on 6-Mar-18.
RZ001141	GLACIER DR 4700	Benchlands - Pinnacle Ridge - discharge LUC, increase density, no increase in number of units or bed units	7-Jul-17	Council granted authorization for staff to proceed with further processing of rezoning application on 6-Mar-18.
RZ001143	ALTA LAKE RD 1501	Alta Lake Road (Prism)- rezoning for for parkland, residential housing and 5 estate lots	25-Sep-17	Council granted authorization for staff to proceed with further processing of rezoning application on 17-Oct-17.
RZ001144	GARIBALDI WAY 2077	Nordic - zoning amendment to increase density and permit employee apartment use	21-Nov-17	Council granted authorization for staff to proceed with further processing of rezoning application on 19-Dec-17. Public Open House
RZ001145		General amendments for driveway widths, # of bedrooms, density clarification	14-Dec-17	RMOW initiated. Under review.
RZ001146	NANCY GREENE DR 7104	Zoning amendment to increase density and permit	9-Jan-18	Received. Under review.



REPORT | ADMINISTRATIVE REPORT TO COUNCIL

PRESENTED: April 10, 2018

REPORT: 18-040

FROM: Resort Experience

FILE: 7734

SUBJECT: PROCESS FOR EMPLOYEE HOUSING ANALYSIS

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the General Manager of Resort Experience be endorsed.

RECOMMENDATION

That Administrative Report No. 18-040 regarding a process for moving forward with the Mayor's Task Force on Resident Housing Recommendation No. 6 (to allow for development of resident restricted rental housing on private lands that may be currently under-developed) be endorsed by Council.

REFERENCES

Appendix "A" – Guidelines for Evaluating Private Sector Rezoning Proposals for Employee Housing
Appendix "B" – Official Community Plan Criteria for Evaluating Proposals for OCP and Zoning Amendments

PURPOSE OF REPORT

The purpose of this Report is to provide Council with an overview of proposed next steps toward implementing Recommendation No. 6 of the Mayor's Task Force on Resident Housing, which is to allow for development of resident restricted rental housing on private lands that may be currently under-developed. Staff have developed a process for moving forward, which addresses concurrent evaluation of prospective developments relative to the target of 500 beds of new employee housing from this initiative over the next five years.

DISCUSSION

The Resort Municipality of Whistler (RMOW) initiated the Mayor's Task Force on Resident Housing ("Housing Task Force") in November 2016 with the objective of analyzing Whistler's employee housing needs and recommending housing initiatives to Council. The Housing Task Force and its sub committees convened over the course of 2017 and significant research on trends and conditions affecting housing in Whistler was carried out. The community provided input through a community survey on housing needs and a community engagement forum held on November 2, 2017. Seven final recommendations of the Housing Task Force were received and endorsed by Council on December 19, 2017:

1. enforce new legislation to ensure residential homes are not being used for tourist accommodations;

2. continue to pursue the Home Run program to match resort businesses with property owners;
3. ensure new developments provide employee housing or contribute cash-in-lieu to the employee housing fund;
4. RMOW to build more resident restricted inventory to meet the needs of the permanent resident workforce;
5. new and expanded infill program to address loss of market homes;
6. allow for development of resident restricted rental on private lands that may be currently under-developed; and
7. further refine the Whistler Housing Authority (WHA) resident restricted housing program to protect employee housing.

Council directed staff to implement the recommended actions of the Housing Task Force as a priority.

Recommendation No. 6

The public consultation process carried out by the Housing Task Force demonstrated that there are many permanent residents in the community, from front line staff through to middle level workers and professionals, looking for secure, long-term rental housing. The intent of Recommendation No. 6 is to provide the opportunity for privately owned, under-developed lands in the RMOW to be used for employee housing. This would include privately funded construction of rent-restricted rental properties for a broad range of Whistler's community workforce – from potential employer-provided dormitory style accommodations for seasonal staff housing through to multi-family homes. A target of 500 bed units of employee housing was established for proposed private sector employee housing developments over the next five years (2018-2023).

Guidelines for Evaluating Rezoning Proposals

On December 5, 2017, Council passed a resolution endorsing a set of guidelines for evaluating rezoning proposals for private sector employee housing developments (the "Guidelines", see Appendix "A"). The resolution directed staff to evaluate rezoning proposals for private sector employee housing developments relative to the Guidelines. Recommendations to Council regarding support for further review and processing would be based on these Guidelines, providing an equitable and comprehensive approach. Council also directed staff to communicate the Guidelines to potential applicants and to attach Canadian Mortgage and Housing Corporation Affordability Criteria to any report presenting a rezoning proposal for its consideration.

In addition staff have summarized applicable Official Community Plan policies. These are presented in Appendix "B".

Rezoning Proposals Received that Incorporate Employee Housing

On December 19, 2017 Council authorized further review and processing of Rezoning Application RZ1144, an application to create a new site specific zone for the lands at 2077 Garibaldi Way for an employee housing development (see Administrative Report No. 17-142). RZ1144 is a proposal to develop vacant lands in the Nordic Estates subdivision with three buildings containing a total of 74 rental units. All units would be price restricted and consistent with WHA eligibility criteria for employee occupancy. The existing bed unit allocation for this property is six bed units. This proposal would increase the allocation to 222.

Another application that has been received is RZ1146, an application to construct a 5-storey building for employee rental housing at 7104 Nancy Greene Drive. The existing allocation for this property is six bed units and the proposal would increase the allocation to 184 bed units.

In addition to the applications above, a number of land owners, developers, and others working in the industry have contacted staff to discuss proposals for privately constructed employee housing in various neighbourhoods across the RMOW. These proposals range in size from infill triplexes, to dormitories, to 300 dwelling unit multi-family developments. All of the proposals would require zoning amendments and would increase the subject parcel's bed unit count. To date, the interest expressed by prospective applicants is far greater than the target of 500 bed units of employee housing.

A Process for Implementing Recommendation No. 6

A number of the proposals referenced above may be viable options for achieving the target of 500 privately-constructed, employee-restricted bed units by 2023, and warrant further evaluation. Although the proposals are in different stages of conceptual development, staff recommend a process by which all proposals are given equal and consistent consideration through a comparative evaluation process. Through this process, proposals would be evaluated against both the OCP policies and guidelines, as well as the limited target of 500 bed units. The result of this process would be a report to Council, with recommendations for which, if any, proposals should be authorized for further review and consideration.

To initiate the process, staff propose to formally notify interested parties of the proposed process and a closing date of May 15, 2018 to submit a preliminary rezoning application. Any other parties who have not already contacted the RMOW, would also be eligible to submit an application within this time frame.

Staff will then complete a preliminary review of all applications received, and will provide comments back to each applicant on their proposed rezoning identifying any concerns and requirements for additional information. Applicants will be provided one opportunity to revise their submission to address any concerns and any additional information required. After that, all proposals will undergo further staff review and staff will prepare a report to Council with an evaluation of each proposal and recommendations for further review and processing of any of the applications. Any applications that receive approval by Council for further consideration would then follow the standard rezoning process. The two existing applications, for 2077 Garibaldi Way and 7104 Nancy Greene Drive, would also be part of the comparative evaluation brought before Council.

The following provides a summary of the proposed process and target dates for completion with an overview of the timeline for delivering on the target of 500 privately constructed employee housing bed units by 2023.

TARGET DATE	TASK
April 2018	<ul style="list-style-type: none">• Notification for Preliminary Rezoning Applications.
May 15, 2018	<ul style="list-style-type: none">• Application Deadline.
May 15, 2018 - June, 15 2018	<ul style="list-style-type: none">• Staff completes review of preliminary applications against OCP policies and guidelines and provides comments to applicants.•
June 15 to July 15, 2018	<ul style="list-style-type: none">• Applicants provide revised application materials.

July 15 to August 15, 2018	<ul style="list-style-type: none"> Staff complete evaluation of revised applications and prepare recommendations for Council.
September 2018	<ul style="list-style-type: none"> Council provides direction on which, if any, applications are supported for further review and processing.
September 2018 – May 2019	<ul style="list-style-type: none"> Processing of zoning amendment bylaw and development permit applications that receive approval for further consideration. This includes submission and review of further detailed information and studies.
May 2019 – December 2023	<ul style="list-style-type: none"> Building permit application and construction.

Preliminary rezoning application submittals would be required to include the following information:

- Dimensioned site plan;
- Preliminary building massing;
- Number, type, and size of dwelling units;
- Site data including site area, and proposed useable site area, site coverage, gross floor area, building height, building setbacks, number of parking stalls;
- Written summary of how the development meets the applicable guidelines, and;
- Initial assessment of access and servicing options from a qualified professional.

WHISTLER 2020 ANALYSIS

W2020 Strategy	TOWARD Descriptions of success that resolution moves us toward	Comments
Built Environment	Continuous encroachment on nature is avoided.	Existing disturbed sites are preferred for development.
	Residents live, work and play in relatively compact, mixed-use neighborhoods that reflect Whistler's character and are close to appropriate green space, transit, trails, amenities and services	The proposals that best meet these guidelines will be invited for further review.
Natural Areas	A policy of no net habitat loss is followed, and no further loss is preferred	Existing disturbed sites are preferred for development.
	Developed and recreation areas are designed and managed to protect as much of the natural environment within and around them as possible	The proposals that best meet these guidelines will be invited for further review.
Partnership	Partners work together to achieve mutual benefit	The process proposed allows for private developers to contribute to Whistler's employee housing rental pool.
Resident Housing	Resident Restricted housing is affordable for permanent and short-term residents, through innovative and effective policy and financial models.	The proposals that best meet these guidelines will be invited for further review.
	The planned flexibility within neighbourhood design, housing form, and housing tenure enables the adaptability to meet changing housing needs and future affordability considerations.	

	Residents enjoy housing in mixed-use neighbourhoods that are intensive, vibrant and include a range of housing forms.	
	Housing has been developed close to transit, pedestrian and bicycle routes, and amenities and services to reduce auto dependency.	
	Whistler has a sufficient quantity and appropriate mix of quality housing to meet the needs of diverse residents.	This initiative and the recommended process will assist in most effectively achieving the Housing Task Force target of 500 units by 2023.
Transportation	Whistler policy, planning and development prioritizes preferred methods of transportation in the following order: 1. pedestrian, bicycle and other non-motorized means, 2. transit and movement of goods, 3. private automobile (HOV, and leading low-impact technologies), 4. private automobile (SOV, traditional technology)	The proposals that best meet these guidelines will be invited for further review.

W2020 Strategy	AWAY FROM Descriptions of success that resolution moves away from	Mitigation Strategies and Comments
Built Environment	Limits to growth are understood and respected.	The 500 units of privately constructed employee housing rental units does represent additional accommodation capacity subject to OCP policies.

OTHER POLICY CONSIDERATIONS

Compliance with “Zoning and Parking Bylaw No. 303, 2015” regulations and other RMOW policies will be assessed as part of the zoning amendment process.

BUDGET CONSIDERATIONS

All costs associated with individual rezoning applications, including staff review time, public meetings, notices, and legal fees will be paid by the applicant.

COMMUNITY ENGAGEMENT AND CONSULTATION

There will be a formal notification to all parties who have expressed interest in submitting a proposal related to this initiative. The deadline for any application to be received and considered through this process will be May 15, 2018. At the time a rezoning application is submitted and received by the Planning Department, a rezoning application sign must be posted on the property within seven days. Staff will also prepare a report to Council that identifies all applications received and these will be posted to the municipal website.

Any correspondence received from members of the public becomes part of the rezoning application file for staff and Council consideration.

For any proposals that are recommended for further review and processing staff also recommend a public information meeting be held respecting each, in advance of bringing forward a zoning amendment bylaw for consideration of first and second readings by Council. Any proposed zoning amendment bylaw would be also be subject to a Public Hearing, adhering to statutory public notice requirements, prior to Council consideration of third reading of the Bylaw.

SUMMARY

The purpose of this Report is to provide Council with an overview of next steps toward implementing Recommendation No. 6 of the Mayor's Task Force on Resident Housing, which is to allow for development of resident restricted rental housing on private lands that may be currently under-developed. Staff have developed a process for moving forward, which provides for a concurrent evaluation of alternative proposals, and this report seeks Council's endorsement of this process.

Respectfully submitted,

Amica Antonelli

PLANNER

for

Jan Jansen

GENERAL MANAGER OF RESORT EXPERIENCE

Appendix “A” – Guidelines for Evaluating Private Sector Rezoning Proposals for Employee Housing

Employee Housing Requirements - Occupancy and Rent Restrictions
1. Projects shall be 100 percent employee housing with occupancy and rent restrictions registered through a Housing Agreement Bylaw and Housing covenant registered on title in favour of the Resort Municipality of Whistler. Rezoning proposals proposing new unrestricted market accommodation as part of the project are not supported.
2. To secure on-going availability and utilization by employees actively working in the local economy, 100 percent of the housing shall be rental housing.
3. Occupancy eligibility is restricted to Whistler Employees as defined by the Whistler Housing Authority.
4. Projects shall seek to achieve housing affordability objectives, with an allowance for reasonable returns on investment. Projects that are easily serviced and require minimal site disturbance, alteration and preparation are expected to have lower capital costs and are best-suited for further consideration. High cost projects that do not meet affordability objectives will not be supported.
5. For a project to be considered, proposed rents must be less than unrestricted market rents for comparable housing. The project proponent will be required to submit a confidential project pro forma that identifies the proposed unit mix, rents per unit, land cost, capital costs, revenues, operating costs, financing costs, equity contributions, cash flow projections and return on equity for review. Proposed monthly rents will be evaluated relative to the proposed unit mix and median incomes of targeted employee occupants.
6. Initial maximum monthly rents will be established prior to project approval and secured through the Housing Agreement Bylaw and Housing Covenant. Rents will be permitted to increase on an annual basis commencing after the first year of occupancy by up to the maximum allowable rent increase published for each calendar year on the Province of BC's website for residential tenancies (BC Residential Tenancy Office).
7. Rental agreements, rent rolls, and unit occupancy must be submitted by the project owner/agent to the RMOW/WHA on an annual basis so that employee occupancy, rent restrictions and rates are verified. Failure to submit this documentation on an annual basis will result in enforceable penalty.
8. Proposed housing types, unit mixes and sizes shall meet identified housing needs in consultation with the RMOW/WHA. 9. Current priorities for private sector employee housing are for rental tenancies that include dormitory style housing for seasonal employees located in close proximity to location of work and amenities; apartments and/or townhomes for permanent resident employees on underdeveloped sites within existing neighbourhoods; and projects that provide opportunities for employers to participate in securing housing for their employees.
Community Planning Considerations
10. Proposed developments shall be located within an area designated for development of residential accommodation.
11. The community supports an increase in Whistler's development capacity for additional employee housing, which is considered to provide clear and substantial benefits to the community and resort. A target of 500 bed units of employee housing has been established for proposed private sector employee housing developments over the next five years (2018-2023).
12. Sites that are located within or adjacent to existing neighbourhoods and developed areas are preferred. Proposed densities and scale of development should be appropriate for the site context.

13. Proposed developments shall be within a comfortable walking distance to a transit stop, and in close proximity to the valley trail, parks and community facilities, convenience goods and services and places of work.

14. Proposed developments must be capable of being served by Municipal water, sewer and fire protection services, and must be accessible via the local road system. Sites that are located in close proximity to, and are easily served by existing infrastructure and services, are preferred.

15. Previously disturbed sites, and sites that require minimal alteration and disruption are supported.

16. An Initial Environmental Review must be conducted. The proposed development shall not have unacceptable negative impacts on any environmentally sensitive lands, and shall adhere to all development permit guidelines for protection of the natural environment and applicable provincial and federal regulations.

17. Additional traffic volumes and patterns shall not exceed the service capacity of adjacent roadway.

Development Standards

18. Proposed developments shall achieve a quality of design, construction, finishing, and livability consistent with WHA standards for similar developments. Outdoor spaces and amenity areas should be integrated within site planning. Individual units should have access to outdoors through patios, balconies or common spaces, and should have adequate storage.

19. Proposed developments must meet RMOW green building standards.

20. Parking shall be provided on site and shall meet the requirements specified in Zoning and Parking Bylaw 303. 2015.

Appendix “B” - Official Community Plan Criteria for Evaluating Rezoning Proposals

Policy No.	Policy
4.1.1	The lands outlined in Schedule B are designated for development of accommodation.
4.2.2	Where there is a demonstrated need, the RMOW will encourage affordable housing to accommodate permanent residents and employees
4.13.2	Proposed rezonings that increase the bed-unit capacity will only be considered if there is a clear and substantial benefit to the community, is supported by the community in the opinion of Council, does not cause unacceptable impacts, and meets all applicable criteria of the OCP.
4.13.3	Meets the mandatory conditions of:
	<ul style="list-style-type: none"> • meets all applicable policies of the OCP,
	<ul style="list-style-type: none"> • serviceable by municipal services,
	<ul style="list-style-type: none"> • accessible via local road system,
	<ul style="list-style-type: none"> • satisfactory evaluation of impacts on: <ul style="list-style-type: none"> ○ traffic volumes and patterns on Highway 99,
	<ul style="list-style-type: none"> ○ traffic volumes and patterns on the local road system,
	<ul style="list-style-type: none"> ○ overall patterns of development of the community and resort,
	<ul style="list-style-type: none"> ○ Municipal finance,
	<ul style="list-style-type: none"> ○ views and scenery,
	<ul style="list-style-type: none"> ○ existing community and recreational facilities,
	<ul style="list-style-type: none"> ○ employee housing,
	<ul style="list-style-type: none"> ○ community greenhouse gas emissions and heritage resource,
	<ul style="list-style-type: none"> • must exhibit high standards of design, landscaping, and environmental sensitivity.
4.13.7	Additional criteria for proposed resident housing; <ul style="list-style-type: none"> • infill sites preferred • appropriate to development and neighbouring uses • measures to minimize operating and maintenance costs • have adequate storage and parking • employee use restrictions • Close proximity to Whistler Village or Whistler Creek
4.13.8	Proposal cannot negatively impact RMOWs trails, rec. areas, or open spaces.



REPORT | ADMINISTRATIVE REPORT TO COUNCIL

PRESENTED: April 10, 2018

REPORT: 18-041

FROM: Resort Experience

FILES: DP1541, SEC0018

SUBJECT: DP1541 – WEDGE PARK ROAD ALLOWANCE DEVELOPMENT PERMIT
SEC0018 – 8030 ALPINE WAY FLOOD PROOFING EXEMPTION

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the General Manager of Resort Experience be endorsed.

RECOMMENDATION

That Council approve the issuance of Development Permit DP1541 for the development of a flood control training berm within the road allowance at Wedge Park as shown in the Site Servicing Plans Key-2, ESC-1, ESC-2, ESC-3, ESC-DET-1, R-1, W-1, XS-1, DET-4 prepared by Creus Engineering Limited dated October 26, 2017, attached as Appendix “C” to Administrative Report to Council No.18-041 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of an easement for the construction, servicing and maintenance of the training berm located within the road allowance at Wedge Park between White Glacier International Limited and the Resort Municipality of Whistler,
2. Environmental Monitoring for the duration of the development works, and
3. Receipt of a landscape security for 135 per cent of the cost of landscaping the sides of the training berm with native planting and hydro seeding; and further

That Council grant an exemption in accordance with Section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit construction of new buildings within the flood proofing area specified in “Zoning and Parking Bylaw No. 303, 2015” at 8030 Alpine Way as shown in Site Plan A1.0A, prepared by Lamoureux Architect Inc., dated March 12, 2018 subject to the following conditions to the satisfaction of the General Manager of Resort Experience:

1. Registration of a Section 219 covenant for the exemption, indemnifying the Municipality and attaching the Flood Construction Level Report prepared by LaCas Consultants Incorporated, dated October 11, 2017, confirming that the proposed building designs and locations are safe for the intended use,
2. Registration of a Section 219 covenant for regular Environmental Monitoring during construction of the works proposed under DP1541 and SEC0018, and
3. Registration of a Section 219 covenant that restricts development of the lands to that proposed under SEC0018, and limits any further proposed development to a maximum of 200 square metres, which would be subject to future approval requirements.

REFERENCES

DP1541

Location: Wedge Park (no civic address)
Legal: Block D, District Lot 4755, Group 1 NWD, and District Lots 7248 and 7923.
Owners: Resort Municipality of Whistler

SEC0018

Location: 8030 Alpine Way
Legal: District Lot 1759 Group 1 NWD, except portions in Plans 12579 and 13114
Owners: White Glacier International Ltd.
Zoning: RR1 (Rural Resource One)

Appendix “C”: Wedge Park Site Servicing Plans (Creus)
Appendix “D”: Flood Control Level Memo (McElhaney)
Appendix “E”: Flood Construction Level Exemption Report (LCI)
Appendix “F”: Nineteen Mile Creek Training Berm Design Report (LCI)
Appendix “G”: RAR Report 3725E (CERG)
Appendix “H”: QEP Wedge Park Development Permit Memo 1 (CERG)
Appendix “I”: QEP Wedge Park Development Permit Memo 2 (CERG)
Appendix “J”: QEP Memo Responding to Council's Inquiries (CERG)
Appendix “K”: Geotechnical Report Site 1 (EXP)
Appendix “L”: Geotechnical Report Site 2 (EXP)
Appendix “M”: Geotechnical Report Site 3 (EXP)
Appendix “N”: Geotechnical Memo – Water Table (EXP)
Appendix “O”: Geotechnical Memo – Water Table (TETRA)
Appendix “P”: Site Sections (LAI)
Appendix “Q”: Design Rationale (LAI)

PURPOSE OF REPORT

This Report provides supplementary information to Council Report No. 18-031 (describing applications DP1541 and SEC0018), reviewed by Council at their regular meeting of March 20, 2018. At that meeting, Council had some questions regarding the proposal and requested additional information. Members of Council also requested to view various geotechnical, hydrological, and environmental reports submitted to the RMOW during the course of the review of Applications DP1541 and SEC0018. The requested technical reports make up Appendices “C” through “Q” to this Council Report. Council deferred its decision on the application pending receipt of this additional information. This report provides the additional information and brings forward the previous staff recommendation for Council consideration.

DISCUSSION

Background

As noted in Council Report No. 18-031, applications DP1541 (Wedge Park) and SEC0018 (8030 Alpine Way) together form a coordinated flood protection solution for proposed development at 8030 Alpine Way. This solution involves development of a flood control berm spanning both the park road allowance and 8030 Alpine Way. Essentially, the flood control berm proposed under DP1541 must be in place for development to occur at 8030 Alpine Way.

The proposed development of the flood protection training berm requires an easement agreement with the Municipality, as it is located within the existing road allowance that accesses 8030 Alpine Way across Wedge Park, which is Municipal property. This easement is subject to Council approval, therefore the development permit required for the berm is also presented to Council for consideration relative to the applicable development permit guidelines.

Council has the authority to exempt a parcel from flood proofing requirements enacted by bylaw under Section 524 of the *Local Government Act* provided a report prepared by a professional

geotechnical engineer or geoscientist is received stating that the land may be used safely for the use intended.

A detailed description of the proposals for both DP1541 and SEC0018 is available in the March 20th Council Report No. 18-031. Council identified specific questions at their Regular Meeting of March 20, 2018; this Report endeavours to address the issues identified by Council.

The proposed redevelopment involves removal of the existing Edgewater Lodge facilities from the Riparian Area and replacement with five new buildings plus a pavilion all located on the lands per the recommendations of the applicants' Environmental Consultant (Cascade Environmental Resource Group - CERG), Geotechnical Consultant (EXP Geotechnical and McElhanney Consulting Services), and Hydrological Consultant (LaCas Incorporated - LCI). Reports prepared by the foregoing professionals are attached to this Council Report as Appendices C through Q. These reports, together, form the complete design solution for this complex property.

History of Professional Analysis

McElhanney Consulting Services

The property is subject to potential flooding from Alta Creek (River of Golden Dreams), Nineteen Mile Creek, and Green Lake. The flood control level ("FCL") for this parcel was established at an elevation of 640.4 metres by McElhanney Consulting Services per the requirements of the Zoning Bylaw in a report dated November 2, 2016 (attached as Appendix "D"). This elevation is considerably higher than the existing lands. Topographic information indicates that the elevation of the proposed building sites on the lands is between approximately 633 metres and 637 metres (roughly three to seven metres below the FCL). This would result in placing the buildings on large amounts of fill to achieve the FCL.

The applicants are very interested in conserving the existing environment on the site and considered this solution as unacceptably unfriendly to the environment, and the community of Whistler (it would be highly visible). Therefore, the applicants chose to pursue a Flood Proofing Exemption pursuant to Section 524 of the *Local Government Act*. To that end, the owners engaged LaCas Consultants to create a solution that would satisfy flood proofing requirements while providing an environmentally acceptable solution.

LaCas Consultants (LCI)

LCI conducted an extensive review of potential flooding issues associated with the property including but not limited to: two and three dimensional modeling, transfer of risk (none), climate change considerations, and the 200 year flood event. LCI confirmed that the FCL could be reduced to 637.2 metres (3.2 metres below the original FCL established by McElhanney) provided a training berm directing potential flood waters associated with Nineteen Mile Creek was developed on the south side of the creek. This berm would redirect flood waters from the subject property to Green Lake. LCI's finalized Flood Construction Level Report, dated October 11, 2017 is attached to this Council Report as Appendix "E".

Together with the Flood Control Level Report, LCI prepared a Nineteen Mile Creek Training Berm Design Report. This Report establishes the design elevations for the proposed training berm and is attached to this Council Report as Appendix "F".

Transfer of Risk

At the March 20, 2018 Meeting, Council asked about transfer of risk to third party properties, particularly the high school property. LCI addresses transfer of risk in both the FCL report (please see Section 7 “Transfer of Risk”, pages 9 – 11 of Appendix “E”) and the Training Berm Design Report (please see Section 8 “Transfer of Flood and Erosion Risk”, page 10 of Appendix “F”). Specifically, LCI states:

“Transfer of Risk is defined as the scenario where changes are made at one location on a watercourse and/ or floodplain that results in a measurable increase in flood or erosion risk elsewhere during the design flood. The transfer of risk of flood with and without the Nineteen Mile Creek Training Berm is limited to its existing floodplain within the property therefore there is no transfer of flood risk or erosion from the proposed Nineteen Mile Creek Training Berm to third party properties.” (LCI Training Berm Design Report – Appendix “F”), and

“In reference to risk to third party properties related to the Nineteen Mile Creek Training Berm (which includes the Whistler High School) is addressed in Section 8, Page 10 of the LCI report: White Glacier Nineteen-Mile Creek Training Berm 8030 Alpine Way, Whistler, BC”, (LCI FCL Report – Appendix “E”).

Creus Engineering

Creus developed the proposed flood control training berm design based on LCI's data. As noted the proposed berm is contained entirely within the disturbed corridor of the existing road allowance. The berm begins at grade near the west property line of Wedge Park and gradually climbs to a height of approximately 1.5 m above the existing grade. The diagrams for the proposed training berm are attached to this Council Report as Appendix “C”.

Cascade Environmental Resource Group (CERG)

The lands are subject to the provincial Riparian Area Regulations (RAR). The applicants engaged CERG (qualified environmental professionals) to review the RAR on site. CERG provided five RAR reports during the period 2015 – 2018. The multiple reports reflected minor changes to the proposed project design. CERG established riparian areas in the original report dated 2015-09-09. This report identified potential building locations on less sensitive lands.

CERG's most recent RAR report, 3725E, dated 2016-11-10, accepted by the Provincial Government, is attached to this Council Report as Appendix “G”. Page 37 of this report provides mapping indicating riparian areas, streamside protection areas, zones of sensitivity, and potential building sites.

Cascade further provided two memos addressing Development Permit Area No. 13 Guidelines for the Wedge Park property. These are attached to this Council Report as Appendices “H” and “I”. These reports confirm that the proposed berm is located within the disturbed corridor of the existing road allowance and will not negatively affect the natural watercourse, wetlands, fish and wildlife habitat and/ or movement.

In response to concerns expressed by Council at their March 20th Regular Meeting, CERG provided a supplemental memo, dated March 22, 2018 and attached to this Council Report as Appendix “J”. This memo confirms that the proposed solution is the most environmentally sensitive approach. Specifically, the memo states:

“As part of the flood protection analysis, a number of configurations and alignments of berms were considered. Solutions to locate a flood protection berm entirely within the property would have negatively impacted SPEAs on the property and would therefore be non-compliant with RAR. A berm located along the West Property line was deemed as a possible alternative measure to protect the property but would have encroached into the SPEA and would require removal of mature forest and infilling wetlands. The adverse environmental effects would be unjustifiable. The proposed design represents the most environmentally responsive and RAR compliant configuration. The only alternative flood protection measure available involved raising the buildings above the flood elevation. The resulting fill necessary to achieve that elevation and the angle of repose, would result in intrusions into the SPEA, rendering the development non-compliant with the RAR; as such, it was not viable....After reviewing the various opportunities, Cascade determined the proposed berm to be the least impactful and therefore the most environmentally friendly design option.”

EXP Geotechnical

In conjunction with CERG's establishment of environmentally responsible building sites, EXP performed geotechnical analysis to confirm the viability of the building sites. A separate report was prepared for each site. EXP evaluated the sites for surficial geology, seismic considerations, moisture content, consolidation, spreading, and settlement, subsoil conditions, groundwater and liquefaction, and further provided recommendations for site preparation, excavation, foundation design, drainage, backfilling, and preloading. These reports are attached to this Administrative Report as Appendices “K”, “L”, and “M”.

Lamoureux Architect Inc. (LAI)

LAI has been acting as the agent for this property. LAI has prepared a development concept that conforms to the requirements of the RR1 zone and satisfies the requirements identified in the riparian reports, the geotechnical reports, and the hydrological reports. The concept is for five new buildings on three development sites (as identified by CERG and EXP) plus a pavilion developed on existing foundations on the peninsula. Staff note that there is an opportunity to develop the dwelling on the peninsula; however, the applicants have chosen a less visible scheme where the dwelling is further inland.

In response to Council's comments at their March 20, 2018 Meeting, LAI developed site sections for each of the three building sites demonstrating the challenge of meeting the FCL without a flood control berm. These sections (attached to this Council Report as Appendix “P”) indicate that the proposed buildings would need to be elevated between 5.18 metres and 6.7 metres above the adjacent grade to achieve the FCL required in the Zoning Bylaw. LAI has provided a volumetric analysis of the amount of fill required to achieve the FCL as shown in the accompanying table:

Volume of Fill

Location	With Flood Control Berm	Without Flood Control Berm	Difference
Site 1	8,731 cubic metres	22,849 cubic metres	14,118 cubic metres
Site 2	816 cubic metres	2,913 cubic metres	2,097 cubic metres
Site 3	980 cubic metres	4,922 cubic metres	3,962 cubic metres

Total Fill	10,527 cubic metres	30,684 cubic metres	20,177 cubic metres
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The table indicates that the amount of fill required is reduced nearly three-fold in the preferred (training berm) scenario.

The following table indicates the required height above adjacent grade for both scenarios:

Location	With Flood Control Berm	Without Flood Control Berm	Difference
Site 1	2.9 m	6.4 m	3.5 m
Site 2	2.4 m	5.2 m	2.8 m
Site 3	2.2 m	6.7 m	4.5 m

Staff note that the preferred (training berm) scenario places the buildings closer to grade thereby rendering them less visible from other areas of the valley. Staff do not consider the alternate scenario, with the buildings elevated more than two storeys above grade to be a less favourable outcome.

LAI further provided a written design rationale that is attached to this Council Report as Appendix “Q”.

Water Table

In response to Council’s inquiry regarding effects on the water table, the applicants provided three reports (CERG, EXP, TETRA) confirming that the water table is not affected by this proposal. These reports are attached as Appendices “J” (CERG), “N” (EXP), and “O” (TETRA). Groundwater was also addressed in EXP’s Geotechnical report for Site 1 (dated May 12, 2016) attached as Appendix “K”.

WHISTLER 2020 ANALYSIS

An analysis of the project with respect to Whistler 2020 was provided in the March 20, 2018 Council Report No. 18-031.

OTHER POLICY CONSIDERATIONS

SEC0018

Zoning and Parking Bylaw No. 303, 2015

The property is zoned Rural Resource One (RR1) Zone. This zone permits a wide range of uses including a detached dwelling, as well as indoor and outdoor recreation, school, church, storage and works yard, and auxiliary buildings and uses. The maximum floor area for a detached dwelling is 465 square metres, and other uses are permitted with buildings up to 2,000 square metres of gross floor area (GFA). There are no site coverage regulations for the zone.

The proposed development is for a detached dwelling with a GFA of 465 square metres, three principal buildings for private indoor recreation use of 295, 338 and 336 square metres, a 93 square metres indoor swimming pool building, retention of an existing open air shed, and a pavilion of 56 square metres. The proposed uses and densities conform to the regulations for the RR1 zone.

Apart from the flood proofing exemptions addressed in this Report, the proposed development conforms to all other requirements of “Zoning and Parking Bylaw 303, 2015”.

The specific exemptions are noted in the following table:

Zoning Bylaw Section	Requirement	Comment
5.4 (2) (a)	No building shall be constructed within 30 metres of the high water mark of Nineteen Mile Creek.	The applicants’ consultants, LCI (Flood Proofing) and Creus (Servicing), have provided a coordinated design solution incorporating a training berm and associated revisions to the flood construction levels for each building. The reports for the berm and the flood proofing exemption meet the requirements of Section 524 of the LGA.
5.4 (2) (a)	No building shall be constructed within 30 metres of the high water mark of Alta Creek.	
5.4 (2) (a)	No building shall be constructed within 7.5 metres of a lake.	
5.4 (2) (e)(v)	No building shall be constructed with the underside of a wooden floor system or top of concrete slab of any area used by habitation, business, or storage of goods damageable by floodwaters which is lower than 3 metres above the high water mark of Nineteen Mile Creek.	
5.4(2)(e)(vi)	No building shall be constructed with the underside of a wooden floor system or top of concrete slab of any area used by habitation, business, or storage of goods damageable by floodwaters which is lower than 1.5 metres above the high water mark of a lake, swamp, or pond.	

DP1541

Wedge Park is located in Development Permit Area No. 13. The lands are designated for:

1. Protection of the natural environment
2. Protection of development from hazardous conditions

DP Area 13 provides guidelines for development as outlined in the accompanying table:

Guideline	Comment
17.4.1 (a)	<p>The Municipality may require that site planning and works be constructed to preserve or enhance the natural water courses.</p> <p>All site planning for this proposal was done with consideration of the natural water courses. The applicants’ environmental consultant has provided an RAR review that has been accepted by the Province.</p> <p>Environmental monitoring will be required.</p>
17.4.1 (b)	<p>The area contains important wetlands and fish and wildlife habitats, which the Municipality may require to be protected from development. The Municipality may require that natural</p> <p>The applicants’ environmental consultant has identified potential areas for development.</p>

	water courses be preserved and dedicated. The Municipality may require, where the Minister of Environment, Lands, and Parks has requested it, that vegetation or trees be planted or retained to protect banks or fisheries.	<p>All proposed work would be completed per the Riparian Areas Regulation and assessment accepted by the Province thereby ensuring adequate protection of sensitive ecosystems associated with the creeks and lake.</p> <p>All work will be within the disturbed corridor of the existing road allowance.</p> <p>Staff require that the sloping sides of the training berm are naturalized with native planting and hydro seeding. A landscape estimate is pending. Bonding, in the amount of 135 per cent of the landscape estimate, per Council Policy G-09, will be required as a condition of issuance of DP1541.</p> <p>Environmental monitoring will be required.</p>
17.4.1 (c)	In order to ensure adequate protection from seasonal flooding and the high water table, the Municipality may require land to remain free of development, and may require landscaping where the Minister of Environment, Lands, and Parks has requested it, to control erosion or protect banks.	<p>The applicants' consultants have identified potential areas for development.</p> <p>All proposed work would be completed per the Riparian Areas Regulation and assessment accepted by the Province thereby ensuring adequate protection of sensitive ecosystems associated with the creeks and lake.</p> <p>Environmental monitoring will be required.</p>

Legal Encumbrances

An easement would need to be granted for the works in the road allowance within Wedge Park. This easement would address access to, and servicing of the adjacent lands, along with the berm itself. There is a value that is associated with granting this easement. Staff are in receipt of legal advice confirming that easement values typically range between 25 per cent and 50 per cent of assessed value of the land. In the case of the Wedge Park easement, the applicant has agreed to 50 per cent of assessed value which represents the upper range and is estimated at \$38,784. RMOW solicitors have confirmed that is an acceptable approach.

Given the sensitive nature of the lands and the proximity to riparian environments, staff recommend registration of an environmental monitoring covenant to ensure that the recommendations of the applicants' Qualified Environmental Professional (Cascade Environmental Resource Group) are implemented.

In addition, a covenant restricting development to that proposed under SEC0018, along with potential for an additional 200 square metres subject any further approval requirements. Staff note

that this is a major concession on the part of the applicant as the RR1 zone does not contain overall limits on floor space ratio ("FSR") or site coverage.

BUDGET CONSIDERATIONS

The municipality's direct costs of processing and reviewing this application are covered through application fees. As noted, staff recommend that the cost of granting an easement through the Wedge Park road allowance should be based on 50 per cent of the assessed land value. This totals \$38,784.

COMMUNITY ENGAGEMENT AND CONSULTATION

The required sign describing Development Permit DP1541 is posted on the property. No comments have been received. A notice of disposition of land will be required to be advertised prior to entering into the easement.

SUMMARY

This Report seeks Council's approval of the issuance of Development Permit DP1562, an application to develop a flood proofing training berm through Wedge Park. This Report further seeks Council's consideration to grant a flood proofing exemption for development at 8030 Alpine Way as described in this Report.

Respectfully submitted,

Roman Licko
PLANNING ANALYST
for
Jan Jansen
GENERAL MANAGER OF RESORT EXPERIENCE

CLIENT:

WHITE GLACIER INTERNATIONAL

PROJECT:

WHITE GLACIER
WHISTLER, BC

CONTRACT:

SITE SERVICING

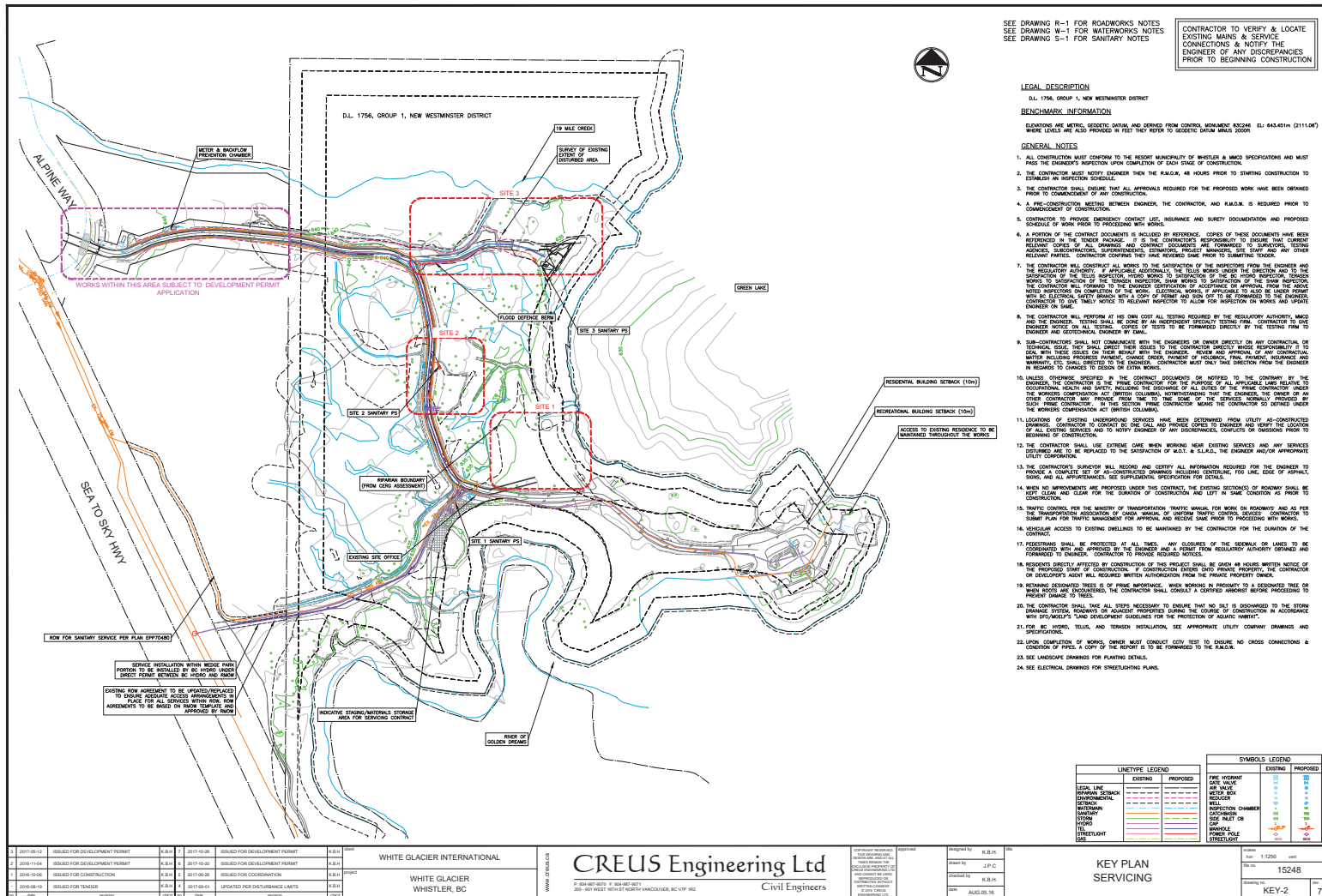
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Erosion & Sediment Control Plan	ESC-1
Erosion & Sediment Control Plan	ESC-2
Erosion & Sediment Control Plan	ESC-3
Erosion & Sediment Control Details	ESC-DET-1
Roadworks - Driveway Plan & Profile (STA. 0+100-0+300)	R-1
Waterworks - Plan & Profile (STA. 0+100-0+400)	W-1
Roadworks - Driveway Cross Sections (STA 0+100-0+300)	XS-1
Detail Sheet	Det-4

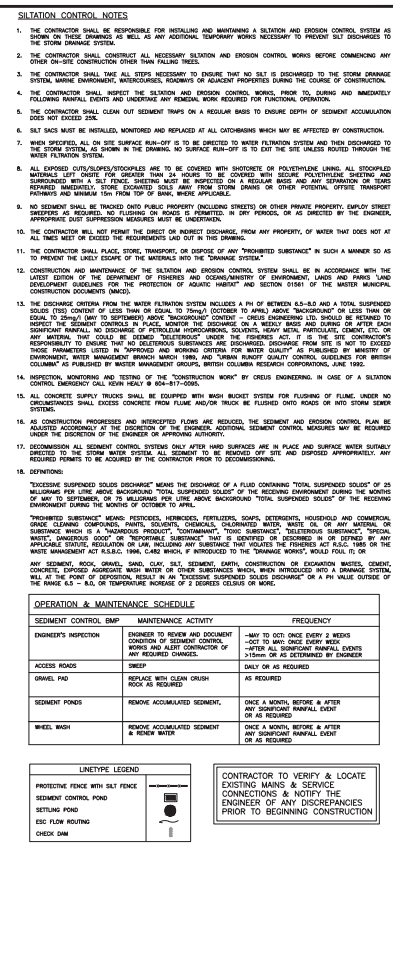


CREUS Engineering Ltd.

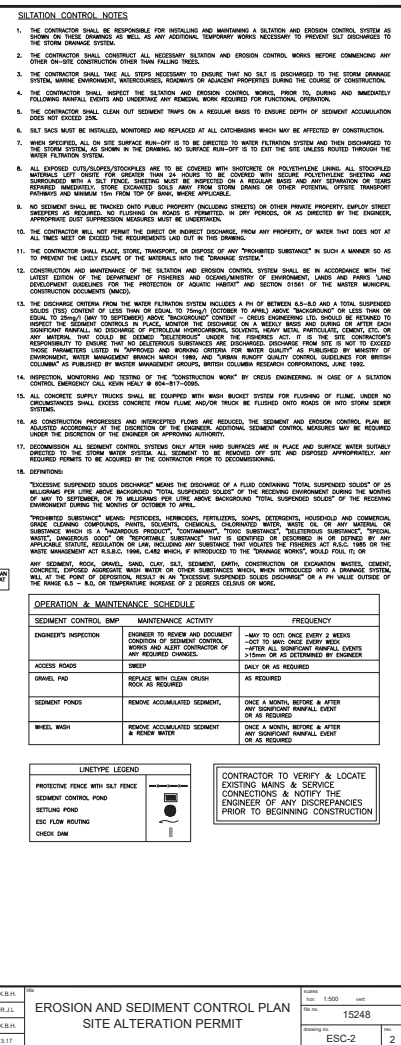
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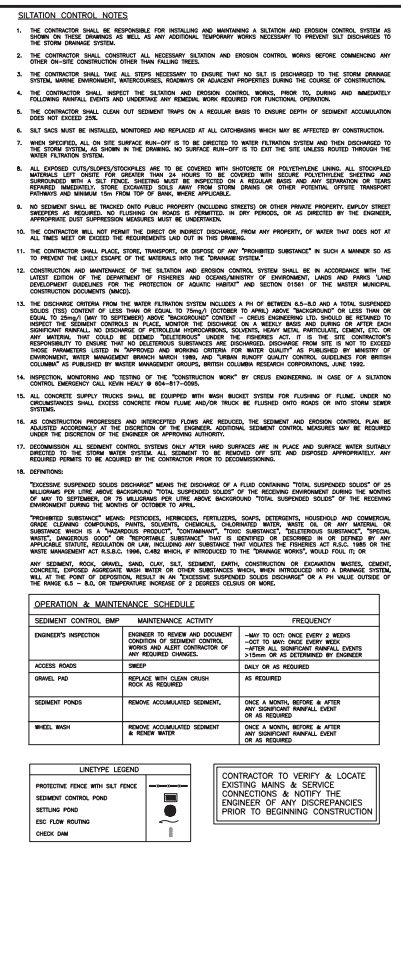
2017-10-26





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3.16				2

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R.J.L.		file no. <div style="text-align: center; font-size: 1.2em;">15248</div>	
C.B.H.		drawing no. <div style="text-align: center; font-size: 1.2em;">ESC-3</div>	rev. <div style="text-align: center; font-size: 1.2em;">2</div>
3.17			

RUNOFF FROM DEMOLITION AREA TO BE DIRECTED TO SEDIMENT POND. SEE DETAIL BELOW. TREATED WATER TO BE PIPED OR PUMPED TO THE EXISTING STORM SYSTEM ON SITE. LOCATION OF SEDIMENT POND TO BE DETERMINED BY ENGINEER ON SITE. INITIAL TREATMENT POND SIZE TO BE 3.0m X 3.0m. POND TO BE UP-SIZED AS REQUIRED BY ENGINEER AND ULTIMATELY REPLACED WITH STORM WATER MANAGEMENT SYSTEM AT LATER STAGE IN DEVELOPMENT.

- NOTES
1. PROTECTIVE FENCING MATERIAL SHALL BE "DUPONT VEXAR 1-70" PLASTIC SAFETY FENCING OR EQUAL (COLOR ORANGE).
 2. FENCING POSTS AND ANCHOR POSTS SHALL BE STANDARD MILD STEEL PAINTED "T" POSTS.
 3. TENSION WIRE AND GUY WIRE SHALL BE 9 GAUGE GALVANIZED STEEL WIRE.
 4. BINDING WIRE SHALL BE 9 GAUGE ALUMINUM WIRE.
 5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

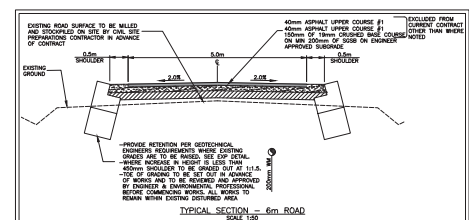
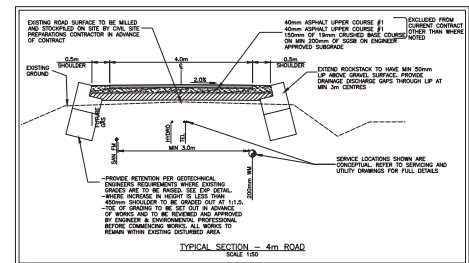
PROTECTIVE FENCE DETAILS

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CONTRACTOR TO VERIFY & LOCATE
EXISTING MAINS & SERVICE
CONNECTIONS & NOTIFY THE
ENGINEER OF ANY DISCREPANCIES
PRIOR TO BEGINNING CONSTRUCTION

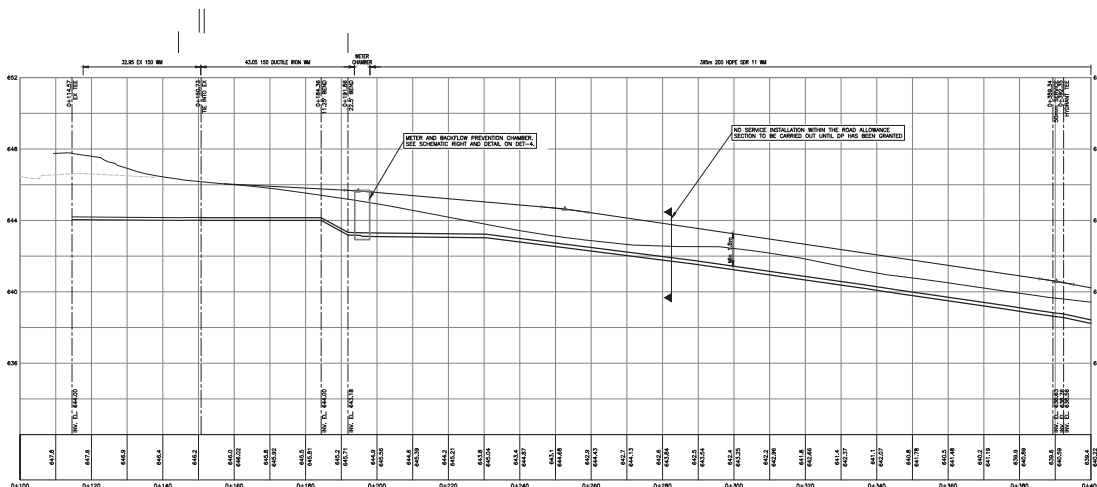


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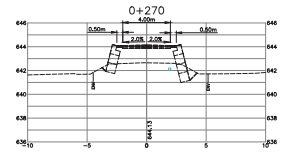
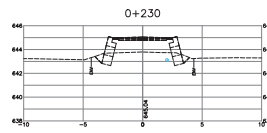
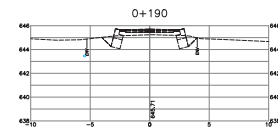
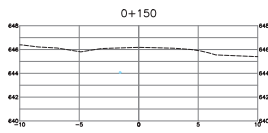
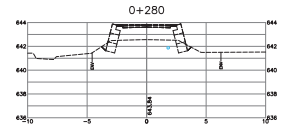
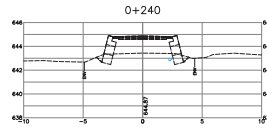
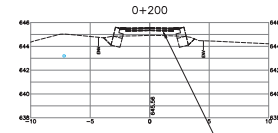
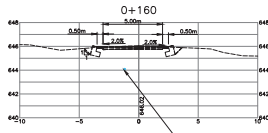
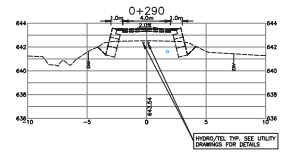
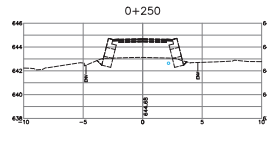
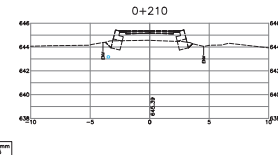
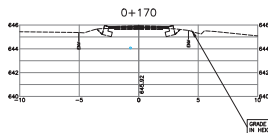
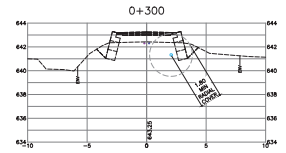
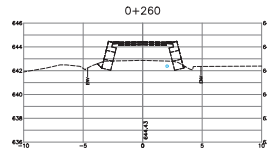
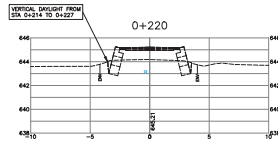
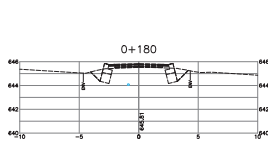
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SEE DRAWING KEY-2 FOR GENERAL NOTES
SEE DRAWING R-1 FOR ROADWORKS NOTES
SEE DRAWING S-1 FOR SANITARY NOTES

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WORKS DEPICTED ON THIS DRAWING TO BE CONSTRUCTED BY THE CONTRACTOR AWARDED THE WHITE GLACIER CIVIL SERVING PHASE 1 CONTRACT. DRAWING IS INCLUDED FOR REFERENCE ONLY WHERE PROVIDED WITHIN DRAWING SETS FOR OTHER CONTRACTS

CONTRACTOR TO VERIFY & LOCATE EXISTING MAINS & SERVICE CONNECTIONS & NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO BEGINNING CONSTRUCTION



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2	2018-11-09	ISSUED FOR DEVELOPMENT PERMIT	K.B.P.	2	2017-08-10	ISSUED FOR DEVELOPMENT PERMIT	K.B.P.
3	2018-12-01	ISSUED FOR DP - PL MARKERS ADDED	K.B.P.	3	2017-08-10	ISSUED FOR DEVELOPMENT PERMIT	K.B.P.
4	2018-11-04	ISSUED FOR DEVELOPMENT PERMIT	K.B.P.	4	2017-08-10	ISSUED FOR DEVELOPMENT PERMIT	K.B.P.

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November 2, 2016

Our File: 2113-03128-00

Lamoureux Architect Incorporated,
3392 Marine Drive,
West Vancouver, BC
V7V 1M9

Attention: Brad Lamoureux
Principal

Dear Brad,

Re: Flood Construction Level on District Lot 1756 Group 1 New Westminster District, Except Portions in Plans 12579 and 13114 - Civic address - 8020 Alpine Way, Whistler, BC

The flood construction level based Resort Municipality of Whistler Building Bylaw No. 303 was determined by establishing the elevations of Nineteen Mile Creek, Alta Creek and Green Lake. For both Nineteen Mile and Alta Creeks this was done by taking the average elevation of the present natural boundary as the creeks entered the property and where they met Green Lake. The critical elevations belong to Nineteen Mile Creek as the bylaw specifies "*no lower than 3 metres above the natural boundary of the Green River, Cheakamus River, Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek or Twenty-one Mile Creek*". I determined the average elevation of Nineteen Mile Creek to be 637.7 metres, therefore the Flood Construction Level is 640.7 metres or 2,102.0 feet.

If you have any questions, please contact the writer.

Sincerely,

McElhanney Consulting Services Ltd.



Brian O. Brown, BCLS
Project Land Surveyor

[illegible]

APPENDIX A	LOCATION MAP AND SITE PLAN
APPENDIX B	HYDROLOGICAL/HYDRAULIC DESIGN INFORMATION
APPENDIX C	2-D FLOODPLAIN MAPPING FOR 20-YEAR PEAK FLOOD
APPENDIX D	TRANSFER OF RISK ASSESSMENT
APPENDIX E	SECTION 524 EXEMPTION TABLE
APPENDIX F	CASCADE ENVIRONMENTAL MEMORANDUM
APPENDIX G	McELHANNEY MEMORANDUM
APPENDIX H	PLANNING AN ENTRY IN A FLOODPROOFED HOME
APPENDIX I	EXP SERVICES LATERAL LOADINGS
APPENDIX J	RMOW ZONING AND PARKING BY-LAW NO. 303, 2015

1. INTRODUCTION

This report was prepared by LaCas Consultants Inc. (LCI) for Lamoureux Architect Incorporated (LAI) acting on behalf of Teck Yuen Lee, of White Glacier International Inc.; herein below referred to as "the Client" relating to: District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114, located at 8030 Alpine Way, Whistler, BC (the Property). See Appendix A1 - Location Map. This Issued for Use Report dated October 11, 2017 supersedes all previous Flood Construction Level Reports for the Property.

The Property is 15.6 ha in area and currently includes a tourist lodge located at the southeast corner of the Property, near Green Lake and at the mouth of the River of Golden Dreams.

The report is based on re-developing the Property as a private residence with private recreational facilities (Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017).

The Property is subject to flooding from the River of Golden Dreams (Alta Creek), Green Lake and Nineteen-Mile Creek. This report describes the hydrological analysis and hydraulic modeling carried out to determine the respective flood levels for various return periods and to determine the transfer of risk. Climate change was applied to the 200-year flood analysis for both the River of Golden Dreams and Nineteen-Mile Creek.

The purpose of this report is to provide Flood Construction Levels and flood control recommendations relating to the River of Golden Dreams (Alta Creek), Green Lake and Nineteen-Mile Creek. The Property is located to some extent on both the River of Golden Dreams and Nineteen-Mile Creek floodplains as well as portions prone to flooding from high Green Lake Levels. In addition, the Property is located on the alluvial fan of Nineteen-Mile Creek.

2. DOCUMENTS REVIEWED OR REFERENCED

- Northwest Hydraulics Consultants Ltd., Assessment of Backwater from BC Rail Bridges over Alta Creek, August 1990;
- Ministry of Environment, Lands and Parks, Water Management Division, A Design Brief on the Floodplain Mapping Study, Whistler Area, June 1992;
- Tetra Tech EBA, Fitzsimmons Creek Flood Protection Maintenance Hydraulic Model Report, June 2014;
- Sigma Engineering Ltd., Proposed Subdivision of DL 1756 (Garrand Holding Ltd.) Flood Protection from Nineteen-Mile Creek, Green Lake and River of Golden Dreams (Alta Creek), June 1996;

- ASigma Engineering Ltd., Burrard International, CRC Developments, Nicklaus North Golf Course, River of Golden Dreams Training Berm, Construction Completion Report, December 1995.
- ASigma Engineering Ltd., Resort Municipality of Whistler, River of Golden Dreams Training Berm at Nicklaus North Operation & Maintenance Manual, February 1997.
- AFlood Hazard Management Section Environmental Protection Division Province of British Columbia, Ministry of Water, Land and Air Protection, Dike Design Guidelines – Best Management Practices for British Columbia, July 2003;
- ALaCas Consultants Inc, White Glacier Nineteen-Mile Creek Training Berm 8030 Alpine Way, Whistler, BC, Final Report, Issued for Use, December 19, 2016;
- ASimons, Li & Associates, Inc., Design Manual for Engineering Analysis of Fluvial Systems, Prepared for Arizona Department of Water Resources, 1985;
- APemberton, E.L, and Lara, J.M., Computing Degradation and Local Scour, prepared for the U.S. Department of the Interior, Bureau of Reclamation, Publication Number 7-2090, 1984;
- AWest Consultants Inc., Predicting Bed Scour for Toe Protection Design in Bank Stabilization Projects, 2003;
- AMinistry of Sustainable Resource Management, Streamflow in the Lower Mainland and Vancouver Island, April 2003;
- AMinistry of Environment, Water Management Branch, Whistler Area Peak Flows, September 1989.

3. SCOPE OF WORK

The following is the scope of work for this report:

- Site visit to the Property to obtain site information such as existing channel conditions and watershed characteristics;
- Provide instructions to Doug Bush Survey Services Ltd. (DBSS) for the channel cross section survey along the River of Golden Dreams, along Nineteen-Mile Creek and at Green Lake;
- Compilation of all available information obtained from site visit (notes/maps/photos);
- Search and collect relevant mapping information for hydrological analysis;
- Determination of required catchment areas for the study;
- Hydrological analysis to determine design flood flows for the River of Golden Dreams and Nineteen-Mile Creek;
- Hydraulic model development for the River of Golden Dreams and Nineteen-Mile Creek based on topographic data provided by DBSS, dated 2015 and 2016 and by LAI dated September 28, 2017;
- Sensitivity analysis of the hydraulic models and preparation of result summary;
- Carry out 1-D hydraulic water surface profile modeling of both Nineteen-Mile Creek and the River of Golden Dreams in order to determine the water surface profiles of the 2, 5, 10, 20, 50, 100 and 200-year floods and the interaction with the 200-year Green Lake level;
- Applying climate change factors to the River of Golden Dreams and Nineteen-Mile Creek hydrological analysis and hydraulic modeling;
- Carry out 2-D modeling to prepare a Floodplain Inundation Map illustrating flood depths/velocities for egress from the Property;
- Carry out a flood/erosion transfer of risk assessment;
- Review of Section 524 exemptions;
- Determination of Flood Construction Levels and flood control recommendations for any area used for habitation on the Property; and
- Prepare a Flood Construction Level report for the Property.

4. HYDROLOGICAL ANALYSIS

Watershed Characteristics

The Property is located within the watershed of Green Lake, which receives flows from Alta Creek (locally referred to as the River of Golden Dreams) immediately south of the Property, from Nineteen-Mile Creek about 300 m north of the Property and from Fitzsimmons Creek across the lake to the east of the Property.

The River of Golden Dreams originates from Alta Lake located approximately 5 km upstream and receives additional flows from Twenty-One Mile Creek and Crabapple Creek approximately 700 m downstream of the outlet of Alta Lake.

The catchment area at the mouth of the River of Golden Dreams is approximately 49 km², and it has maximum and minimum watershed elevations of 1,600 m and 740 m, respectively. The watershed of Nineteen-Mile Creek is located immediately north of that for the River of Golden Dreams. Nineteen-Mile Creek has a total catchment area of about 15 km². The elevation of the watershed ranges from 2,260 m to 740 m. The total main channel length of Nineteen-Mile Creek is about 7 km.

Hydrometric Data

The regional hydrometric stations used in this study are listed in Table 1.

Table 1: Regional Hydrometric Stations

STATION ID	STATION NAME	DRAINAGE AREA (KM ²)
08GA023	RUBBLE CREEK NEAR GARIBALDI	74.1
08GA024	CHEAKAMUS RIVER NEAR MONS	287
08GA054	MAMQUAM RIVER ABOVE MASHITER CREEK	334
08GA056	SENTINEL CREEK ABOVE GARIBALDI LAKE	5.7
08GA057	MASHITER CREEK NEAR SQUAMISH	38.9
08GA064	STAWAMUS RIVER BELOW RAY CREEK	40.4
08GA071	ELAHO RIVER NEAR THE MOUTH	1200
08GA072	CHEAKAMUS RIVER ABOVE MILLAR CREEK	297
08GA075	MAMQUAM RIVER ABOVE RING CREEK	284
08MG003	GREEN RIVER NEAR PEMBERTON	855
08MG004	GREEN RIVER NEAR RAINBOW	195
08MG006	RUTHERFORD CREEK NEAR PEMBERTON	179
08MG007	SOO RIVER NEAR PEMBERTON	283
08MG021	TWENTYONE MILE CREEK AT 670 M CONTOUR	28.2
08MG026	FITZSIMMONS CREEK BELOW BLACKCOMB CR	89.7

There is no long-term historical streamflow record available on the River of Golden Dreams and on Nineteen-Mile Creek. Historical hydrometric data was obtained from the Water Survey of Canada to characterize the hydrology of the study area. A total of 15 stations were selected in the study in view of their proximity to site, relatively long period of record and comparable range of drainage area size. In general, floods in the vicinity of the River of Golden Dreams may occur in autumn (October and November) due to intense rainstorms or in the summer (usually July) due to snowmelt.

Design Flood Flow Estimation

A regional analysis was performed to determine the design flood flows for the River of Golden Dreams and Nineteen-Mile Creek. The regional analysis involves frequency analyses of regional hydrometric data and determination of the relationship between the unit peak discharge and the size of drainage area. (Appendix B – Hydrological/Hydraulic Design Information)

The regional analysis in this case involves the application of an index flood method. Flood frequency analyses were conducted for the selected regional hydrometric stations using HYFRAN. To make use of all available peak flow data, the maximum instantaneous flow records were extended by applying an average maximum instantaneous to maximum daily flows for the three largest floods at the stations. The distributions providing the best fit to the extended data records were selected in estimating the floods for various return periods at the stations. Results of the frequency analyses were then used in the index flood method, which determines a relationship between the unit mean annual discharge, usually with a return period of 2.33 years, and drainage area. An envelope curve was then drawn to determine the unit mean annual discharge at site. The median ratios of floods for various return periods to the mean annual flood were calculated from the regional flood frequency analysis.

In addition to the regional analysis using the maximum instantaneous flow records, a similar regional analysis was carried out using the maximum daily flow records, followed by a general conversion to the maximum instantaneous flows. A station frequency analysis was also applied particularly for the Twenty-One-Mile Creek flow records and transposed to property site. These results were further compared to values determined in earlier studies within the region such as the 1992 Whistler Area Floodplain Mapping study and the 2003 Streamflow in the Lower Mainland and Vancouver Island study, both conducted by the Ministry of Environment.

Based on the results of the hydrological analysis, the 200-year maximum instantaneous flood flow of the River of Golden Dreams was determined to be 197 m³/s without climate change factors.

In view of the likelihood of a debris flood on Nineteen-Mile Creek, a bulking factor of 2 was applied to the estimated 200-year maximum instantaneous flood flow of Nineteen-Mile Creek, resulting in a recommended 200-year design flood flow of 148 m³/s without climate change factors. The peak flood estimates for various return periods in the vicinity of the Property are tabulated in Table 2.

Table 2: Regional Analysis Peak Flood Estimates (m³/s)

RETURN PERIOD (YEARS)	RIVER OF GOLDEN DREAMS	NINETEEN-MILE CREEK
2	81	57
5	111	78
10	128	91
20	137	102
50	165	116
100	181	128
200	197	148

*A bulking factor of 2 was applied to take into account debris floods on Nineteen-Mile Creek.

5. HYDRAULIC MODEL

Hydraulic Model Development

The HEC-RAS water surface profile model, Version 4.1.0, developed by the Hydrologic Engineering Center was used for the hydraulic analysis of the River of Golden Dreams and Nineteen-Mile Creek.

River of Golden Dreams

A total of six channel cross sections were surveyed and provided by DBSS dated June 2015. This survey information was used as the basis for the hydraulic model. The total length of the study reach is approximately 285 m, with the most upstream cross section located about 230 m upstream of the Property and the most downstream cross section located near Green Lake (about 50 m downstream of the center of the Property). The upstream boundary condition was defined as the normal depth associated with the channel slope.

The downstream boundary condition was specified as the 200-year water level in Green Lake of El. 635.6 m. This lake level was applied in the Fitzsimmons Creek Flood Protection Maintenance since 2010. Based on site observations, available references and results of a sensitivity analysis, a main channel roughness of 0.035 was applied in this case while a roughness of 0.1 was applied for the vegetated floodplain area.

Two model scenarios were analyzed for the River of Golden Dreams:

- Existing conditions; and
- Proposed conditions (including fill for flood control purposes and buildings).

Nineteen-Mile Creek

A total of 15 channel cross sections were surveyed and provided by DBSS dated June 2015. This survey information included bridge deck elevations at three locations: Valley Trail Bridge, Highway Bridge and High School Bridge. The total length of the study reach is approximately 640 m, with the most upstream cross section located about 465 m upstream of the Property and the most downstream cross section located at Green Lake.

The upstream boundary condition was defined as the normal depth associated with the channel slope. Similar to the River of Golden Dreams hydraulic model, the downstream boundary condition was specified as the 200-year water level in Green Lake of El. 635.6 m. Based on site observations, available references and results of a sensitivity analysis, a main channel roughness of 0.045 was applied in this case while a roughness of 0.14 was applied for the forested floodplain area. Five model scenarios were analyzed for Nineteen-Mile Creek:

- Existing Conditions;
- Proposed river training berm along the Nineteen-Mile Creek and extended to Green Lake (30 m setback);
- Avulsion occurred downstream of Alpine Way;
- 50% blockage at the High School Bridge; and
- 50% blockage at the Highway Bridge.

Results and Discussion

When fill is placed on the Property for flood control purposes, the Property will be subject to a 200-year overland flow velocity of 0.6 m/s. It should be noted that a 200-year overland flow velocity of 3.7 m/s was determined in the case of channel avulsion on Nineteen-Mile Creek.

Summaries of the hydraulic model results at the Property are provided in Tables 3 and 4.

Table 3: Results of Hydraulic Analysis for River of Golden Dreams (197 m³/s)

SCENARIO	DESCRIPTION	200-YR WATER LEVEL (M)	200-YR OVERLAND FLOW VELOCITY (M/S)
1	Existing Conditions	635.6	0.4
2	Proposed Conditions with Fill Placement at the Property	635.7	0.6

Table 4: Results of Hydraulic Analysis for Nineteen-Mile Creek (148 m³/s)

SCENARIO	DESCRIPTION	200-YR WATER LEVEL EL. (M)	200-YR OVERLAND FLOW VELOCITY (M/S)
1	Existing Conditions	639.6	1.4
2	Proposed River Training Berm along Alpine Way & Driveway and Extended to Green Lake	639.8	0.5
3	Avulsion Occurred Downstream of Alpine Way & Driveway	639.6	3.7
4	50% Blockage at High School Bridge	639.6	1.4
5	50% Blockage at Highway Bridge	639.6	1.4

6.20-YEAR FLOODPLAIN MAPPING

In order to prepare a flood inundation map, a two-dimensional hydraulic model of the Property was developed. The River2D program, a two-dimensional depth averaged model of river and hydrodynamics developed by the University of Alberta, was used in the current 2-D modelling for the River of Golden Dreams. The major data requirements for the model include bed topography, channel geometry, upstream and downstream boundary conditions, and bed roughness, etc.

Available topographic information between Nineteen-Mile Creek and the north bank of the River of Golden Dreams were obtained from DBSS dated June 2016. The channel cross sections used in the HEC-RAS model of the River of Golden Dreams were included in the development of the overall bed topography. Additional survey points in the channel and for the area between the south bank of the River of Golden Dreams and the Nicklaus North River Training Berm were later collected by DBSS in November 2016. Once the data points were imported to River2D and breaklines were added, a mesh was created to represent the study area in the model. To balance between model accuracy and computational time, a mesh with grid size of 10 m was selected.

The upstream boundary of the model is near the west edge of the property, and the downstream boundary of the model is along the shoreline in the east. The 200-year Green Lake water level was applied as the outflow water surface elevation. The bed roughness in the form of the bed roughness height, k_s , was determined based on consideration of the Manning's n values used in the HEC-RAS model, and average water depth in general. A bed roughness height of 0.25 was selected for the channel portion of the model, and a bed roughness height of 5.7 m was selected for the floodplain areas.

A bed roughness height of 0.5 was originally used for the channel portion of the model using the roughness height converter available in River2D. A sensitivity analysis of the roughness height for the channel was conducted based on the 20-year flood flow. Results of the sensitivity analysis indicate that a roughness height of 0.25 would provide water levels calculated in River2D being similar to the water levels calculated in HEC-RAS. However, it should be noted that the River2D and the HEC-RAS models are not directly comparable due to the fact that the River2D model contains greater extents of survey information. Also, water levels are assumed to be constant across the channel cross section in the HEC-RAS model since it is a 1-D hydraulic model while water levels would vary across the main channel in the River2D model since it is a 2-D hydraulic model.

Two model scenarios were developed and analyzed: the existing conditions and the proposed conditions based on the updated September 28, 2017 site plan provided by LAI (Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017). In this case, the proposed buildings/fill pads were simulated in the model as internal boundaries.

For the current study, the 20-year flood of 137 m³/s was used to generate the corresponding water surface elevations and velocity vectors within the study area. This inundation map shows the extents of the 20-year flood when combined with the 200-year Green Lake water level. The flood inundation maps for both the existing conditions and proposed conditions at the project site can be found in Appendix C – 2-D Floodplain Mapping for 20-Year Peak Flood.

The Property owner shall take sole responsibility and make proper provision for safe egress of all persons to be evacuated from any occupied building which has flood depths of 0.3 m or above surrounding the occupied building.

Furthermore, the Property owner shall be made aware of frequent flood risks through the review of the 20-Year Flood Floodplain Inundation Map found in Appendix C illustrating flood depths/velocities on the Property. The Property owner should also be made aware that the occurrence of at least one 20-Year Flood in the next 5 years is 23%.

7. ~~A~~ TRANSFER OF RISK

The “transfer of risk” is defined as the scenario when changes are made at one location on a watercourse and/or floodplain that results in a measurable increase in flooding/erosion elsewhere during the design flood. The transfer of risk of flooding is limited to the existing Nicklaus North River of Golden Dreams Dike along the right overbank (south bank) of the River of Golden Dreams.

The 2-D hydraulic model of the River of Golden Dreams developed for the preparation of inundation map was used to determine if there would be any transfer of risk.

The two model scenarios developed for the 20-year inundation mapping remained the same in this case: the existing conditions and the proposed conditions with the proposed buildings in place. The proposed buildings/fill pads were simulated in the model as internal boundaries and updated landscape contours were incorporated in the model based on a site plan provided by LAI (Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017).

For the current analysis, the 200-year flood of 197 m³/s was used to generate the corresponding water surface elevations and velocity vectors within the study area. The flood inundation maps for both the existing conditions and proposed conditions during the 200-year flood can be found in Appendix D. Table 5 below shows a summary of the water level comparison at selected points along the centerline of Nicklaus North River of Golden Dreams Dike.

Table 5: Water Level Comparison along Nicklaus North Dike

Dike Centerline			Water Surface Elevation (m)		Dike Crest vs. Existing Conditions WSE (m)	Dike Crest vs. Proposed Conditions WSE (m)	Proposed vs. Existing Conditions WSE (m)
Survey Station (m)	*Original Design Crest Elev. (m)	Crest Elev. from Survey (m)	**Existing Conditions	Proposed Conditions			
27	636.40	636.37	635.988	636.003	0.382	0.367	0.015
70	636.34	636.29	635.977	635.991	0.313	0.299	0.014
108	636.25	636.22	635.842	635.855	0.378	0.365	0.013
138	636.16	636.16	635.654	635.673	0.506	0.487	0.019
167	636.15	636.26	635.634	635.650	0.626	0.610	0.016
201	636.11	635.96	635.619	635.632	0.341	0.328	0.013
239	636.00	635.91	635.613	635.622	0.297	0.288	0.009
281	636.00	636.34	635.595	635.595	0.745	0.745	0.000

*As-constructed crest of berm (prior to final settlement and grading)

**Existing conditions as determined by LCI for the purposes of this report

Based on the results from the 2-D hydraulic modeling, the potential transfer of risk of relatively higher floodwaters due to the proposed White Glacier Project at 8030 Alpine Way ranges from zero to 1.9 cm with an average of 1 cm over the 300 m length of the Nicklaus North River of Golden Dreams Dike. The increase in flood level represents about a maximum 4% decrease and an average of 3% decrease in the available existing dike freeboard. Comparing bank velocities from the 2-D model for pre-development and post-development along the dike, the greatest increase in bank velocity along the dike is 0.02 m/s, while the average is 0.01 m/s which represents a very minor potential transfer of risk of erosion.

In reference to potential transfer of risk to third party properties related to the Nineteen-Mile Creek Training Berm (which includes the Whistler High School) is addressed in the Section 8, page 10 of the LCI Report: White Glacier Nineteen-Mile Creek Training Berm 8030 Alpine Way, Whistler, BC,

Final Report, Issued for Use, December 19, 2016. According to this report, *"there is no transfer of flood risk or erosion from the proposed Nineteen-Mile Creek Training Berm to third party properties."* Furthermore, since all of the proposed development is to be located on the land side of the berm there will be no transfer of flood or erosion risk to the Whistler High School.

8. FLOOD CONSTRUCTION LEVELS

The Flood Construction Levels including the proposed any area used for habitation shown in Table 6 and (Appendix A2 – Site Plan, LBU-1.01R1, by LAI, September 28, 2017) are based on the provision of a properly designed river training berm along the right overbank of Nineteen-Mile Creek (Table 6). Without the construction of the river training berm, there would be a potentially dangerous risk of high average channel velocity (approximately 3.7 m/s), potentially avulsing from the Nineteen-Mile Creek main channel and flowing through the development. Consequently, LCI would not recommend any habitable development without the Nineteen-Mile Creek Berm properly constructed. Therefore, no Flood Construction Levels were established for the development without the Nineteen-Mile Creek Berm constructed. It should be noted that according to McElhanney (Appendix G – McElhanney Memorandum) applying Whistler Building Bylaw No. 303 and without the construction of the Nineteen-Mile Creek Berm, "the Flood Construction Level is 640.7 metres...".

Table 6: Flood Construction Levels

PROPOSED HABITABLE AREAS	FLOOD CONSTRUCTION LEVEL*	OTHER FLOOD CONTROL REQUIREMENTS**
Residence 1_RES	El. 637.2 m	1 m above finished grade surrounding the building whichever is the greater.
Pool Changing Electrical/Mechanical (2_POOL)	El. 637.2 m	1 m above finished grade surrounding the building whichever is the greater.
3_Multi-Use Space (3_MULTI)	El. 637.2 m	1 m above finished grade surrounding the building whichever is the greater.
Studio (4_STUD)	El. 637.2 m	0.3 m above Nineteen-Mile Creek Berm crest elevation. Stormwater should drain away from building.
Reception (5_RECEP)	El. 637.2 m	1 m above finished grade surrounding the building whichever is the greater.
Pavilion (7_PAV)	El. 637.0 m	1 m above finished grade surrounding the building whichever is the greater.

* Including 1.5 m above design flood levels (0.6 m standard freeboard + 0.5 m for waves + 0.3 m for debris + 0.1 m for climate change) with the exception of the Studio and Pavilion where a 1.4 m freeboard was used, since they are governed by Nineteen-Mile Creek and Green Lake flood levels. Flood Construction Levels are based on the Nineteen-Mile Creek Training Berm being properly constructed and properly maintained in accordance with the Nineteen-Mile Creek Training Berm Operation & Maintenance Manual.

** Alluvial fan requirement or drainage requirements.

9. CONCLUSIONS AND RECOMMENDATIONS

1. The recommended Flood Construction Levels for District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114) for the any area used for habitation are shown in Table 6 and in Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017.
2. No area used for habitation shall be located within any building, mobile home or unit, or modular home or structure at an elevation such that either:
 - a) the underside of a wooden floor system, or
 - b) the top of concrete floor slab, or
 - c) the top of a wooden floor system where a continuous concrete perimeter foundation is provided to a level equal to or above the floor is less than the Flood Construction Level. The “area used for habitation” means any room or space within a building or structure which is or may be used for human occupancy, commercial sales, business or storage of goods but does not include an entrance foyer or parking facility. In the case of a mobile home or unit, the ground level or top of concrete or asphalt pad on which it is located shall be no lower than the Flood Construction Level.
3. The Flood Construction Level may be achieved by structural elevation of the area used for habitation by adequate compacted landfill on which any building, mobile home or unit, or modular home or structure is to be constructed or mobile home or unit located or by a combination of both structural elevation and compacted fill.
4. No area used for habitation below the Flood Construction Level shall be used for the installation of heating, ventilating and air conditioning devices, mechanical equipment, electrical switches/plugs, major electrical switchgear or, other fixed equipment susceptible to damage by floodwaters unless the space below the Flood Construction Level is protected by properly engineered flood control door(s) or tanked up to the Flood Construction Level, with continuous floodproofed concrete walls and slab designed by a qualified Professional Engineer to withstand, among others, the hydrostatic forces that would result from flooding of the area up to the Flood Construction Level (Appendix I – EXP Services Lateral Loadings).
5. A qualified Professional Engineer shall certify that there are no openings or vents allowing floodwaters to enter electrical/mechanical rooms or storage areas, below the Flood Construction Level and that all cracks, ducts and pipes have been adequately sealed with no-shrink grout and that all walls and ceilings (below Flood Construction Level) are protected by the installation of an impermeable waterproof barrier. Non-shrink grout is a hydraulic cement grout that when hardened is typically greater than or equal to the original installed volume thereby sealing cracks and gaps. Concrete walls and floors below the Flood Construction Level could also be treated with an applied surface coating in order to waterproof the concrete.

6. All floor drains in the building shall have a backwater preventer or valve installed to prevent backflow into any area used for habitation during flood events and/or elevated groundwater conditions.
7. For entrance doors below the Flood Construction Level (not including doors in entries as noted in the Appendix H – Planning an Entry in a Floodproofed Home), a specialized watertight door for pedestrian use that also acts as a flood protection door (including a waterproofed door frame) when the door is closed could be deemed acceptable based on a review by a qualified Professional Engineer. Windows (not including windows in entries as noted in the Appendix H – Planning an Entry in a Floodproofed Home) shall not be permitted below the Flood Construction Level.
8. All rainfall and snowmelt generated stormwater drainage should be directed away from any area used for habitation and proper roof/awnings above doors should be installed to prevent direct rainfall/snowfall and runoff entering the any area used for habitation.
9. The building foundations for any area used for habitation should be protected from potential erosion and scour due to floodwaters by a method or methods approved by a qualified Professional Engineer.
10. This report assumes that a properly designed river training berm will be constructed along the south bank (right bank looking downstream) of Nineteen-Mile Creek along with raising a portion of the entrance road. The river training berm, Alpine Way, and the driveway including a portion of Alpine Way in the Wedge Park access easement, will require erosion and scour protection along the riverside of the berm/road. The river engineering design of the training berm and road raising is detailed in a separate engineering design report by LCI, Nineteen-Mile Creek Training Berm Final Design Report dated December 19, 2016 (Sealed Final Issued for Use Report). If the river training berm is not constructed as per the LCI's report: Nineteen-Mile Creek Training Berm Final Design Report, dated December 19, 2016 (Sealed Final Issued for Use Report), there would be a potentially dangerous risk of high average channel flow velocity of approximately 3.7 m/s, potentially avulsing from the Nineteen-Mile Creek main channel and flowing through the development. Consequently, LCI would not recommend any habitable development without the Nineteen-Mile Creek Berm properly constructed; therefore, no Flood Construction Levels were established for the development without the Nineteen Mile Creek Berm constructed. The Nineteen-Mile Creek Training Berm shall be maintained in accordance with the Nineteen-Mile Creek Training Berm Operation & Maintenance Manual approved by a qualified Professional Engineer.
11. The transfer of risk of flooding is limited to the existing Nicklaus North River of Golden Dreams Dike along the right overbank (south bank) of the River of Golden Dreams. For the current analysis, the 200-year flood of 197 m³/s was used to generate the corresponding water surface elevations within the study area for the existing conditions and the proposed conditions based on the updated site plan by LAI (Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017).

The flood inundation maps for both the existing conditions and proposed conditions at the project site can be found in Appendix D – Transfer of Risk Assessment. Table 5 shows a summary of the water level comparison at selected points along the centerline of Nicklaus North River of Golden Dreams Dike. A 2-D hydraulic model of the River of Golden Dreams was carried out based on detailed land/creek survey in the vicinity of River of Golden Dreams to determine any transfer of risk from the proposed development. Based on the results from the 2-D hydraulic modeling, the potential transfer of risk of relatively higher floodwaters due to the proposed White Glacier Project at 8030 Alpine Way ranges from zero to 1.9 cm with an average of 1 cm over the 300 m length of the Nicklaus North River of Golden Dreams Dike. The increase in flood level represents about a maximum 4% decrease and an average of 3% decrease in the available existing dike freeboard. Comparing bank velocities from the 2-D model for pre-development and post-development along the dike, the greatest increase in bank velocity along the dike is 0.02 m/s, while the average is 0.01 m/s which represents a very minor potential transfer of risk of erosion.

12. ~~The~~ The Property owner shall take sole responsibility and make proper provision for safe egress of all persons to be evacuated from any occupied building which has flood depths of 0.3 m or above surrounding the occupied building. Furthermore, the Property owner shall be made aware of frequent flood risks through the review of the 20-Year Flood Floodplain Inundation Map found in Appendix C – 2-D Floodplain Mapping for 20-Year Peak Flood illustrating flood depths/velocities on the Property. The Property owner should also be made aware that the occurrence of at least one 20-Year Flood in the next 5 years is 23%.
13. ~~This~~ This report has been prepared with respect to the Local Government Act, Section 524 (7) (b) (i) Requirements in relation to flood plain areas.
14. ~~Refer~~ Refer to Appendix E - 524 Exemption Table and Appendix J - RMOW Zoning & Parking By-Law No. 303, 2015. The following exemptions from: RMOW Zoning & Parking By-Law No. 303, 2015 are required:
 - RMOW Zoning & Parking By-Law No. 303, 2015, Part 5, General Regulations**
 - Section 4: Floodproofing Requirements (Bylaw No. 380)**
 - (2) Notwithstanding any other provisions of this Bylaw, no building or any part thereof shall be constructed, reconstructed, moved or extended nor shall any mobile home or unit, modular home or structure be located: (Bylaw No. 916).*
 - (a) 7.5 metres of the high water mark of a lake, swamp or pond, nor within 30 metres of the high water mark or Green River, Cheakamus River, Alta Creek (which is also known as the River of Golden Dreams), Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek, Twenty-one Mile Creek (Bylaw No. 2071).*
 - (e) with the underside of a wooden floor system or top of concrete slab of any area used by habitation, business, or storage of goods damageable by floodwaters, or in the case of mobile home or unit the ground level or top of concrete or asphalt pad on which it is located, lower than:*
 - (v) 3 metres above the high water mark of the Green River, Cheakamus River, Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek or Twenty-One Mile Creek;*

(4) The required elevation may be achieved by structural elevation of the said habitable, business or storage area by adequately compacted landfill on which any building is to be constructed or mobile home or unit located, or by the combination of both structural elevation and landfill. No area below the required elevation shall be used for the installation of furnaces or other fixed equipment susceptible to damage by floodwater.

15. ~~A~~n reference to potential transfer of risk to third party properties related to the Nineteen-Mile Creek Training Berm (which includes the Whistler High School) is addressed in the Section 8, page 10 of the LCI Report: White Glacier Nineteen-Mile Creek Training Berm 8030 Alpine Way, Whistler, BC, Final Report, Issued for Use, December 19, 2016. According to this report, *"there is no transfer of flood risk or erosion from the proposed Nineteen-Mile Creek Training Berm to third party properties."* Furthermore, since all of the proposed development is to be located on the land side of the berm there will be no transfer of flood or erosion risk to the Whistler High School.
16. ~~A~~ny future site grading alterations, placement of fill, buildings or any obstructions affecting flood levels and velocities impacting the Property shall not be permitted unless the revised grading plan is certified by a qualified Professional Engineer.
17. ~~A~~the report is based on the existing topographic conditions for the River of Golden Dreams, Nineteen-Mile Creek and Green Lake provided by DBSS and proposed development conditions based on design information received from LAI including Appendix A2 – Site Plan, LBU-1.01R1, LAI, September 28, 2017.
18. ~~A~~Upon completion of construction a qualified Professional Engineer shall carry out a construction review of the flood control for the site and provide a letter of assurance to government agencies prior to occupancy or partial occupancy of any area used for habitation.
19. ~~A~~During construction, an Environmental Monitor is required to ensure adherence to all environmental standards and preventing deleterious substances from entering 19-Mile Creek, Green Lake or The River of Golden Dreams (Alta Creek). In addition, a sediment management plan shall be provided and accepted by the Resort Municipality of Whistler. Reference should be made to Cascade Environmental Resource Group memorandum dated August 2, 2017 (Appendix F - Cascade Environmental Memorandum).

All elevations are metres above sea level, based on the Geodetic NAD83 derived from Monument No. 95HA141 located on NW Highway Bridge abutment over the River of Golden Dreams (Alta Creek) (Elevation = 636.339 m).

10. CLOSURE & LIMITATIONS

The proposed development on the Property is "*safe for the use intended*" with respect to the 200-year flood on Nineteen-Mile Creek, Green Lake and Alta Creek (which is also known as the River of Golden Dreams), provided there is strict adherence to the recommendations found in this report.

Prepared by:



Brian LaCas, P.Eng, Sr. Hydrotechnical Engineer
LaCas Consultants Inc.

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APPENDIX A – LOCATION MAP AND SITE PLAN

APPENDIX A1-LOCATION MAP

APPENDIX A2- SITE PLAN, LBU-1.01R1, LAI, SEPTEMBER 28, 2017

APPENDIX A1-LOCATION MAP



**FIGURE 1
LOCATION MAP**

APPENDIX A2- SITE PLAN, LBU-1.01R1, LAI, SEPTEMBER 28, 2017



APPENDIX B – HYDROLOGICAL/HYDRAULIC DESIGN INFORMATION

B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 1)

B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

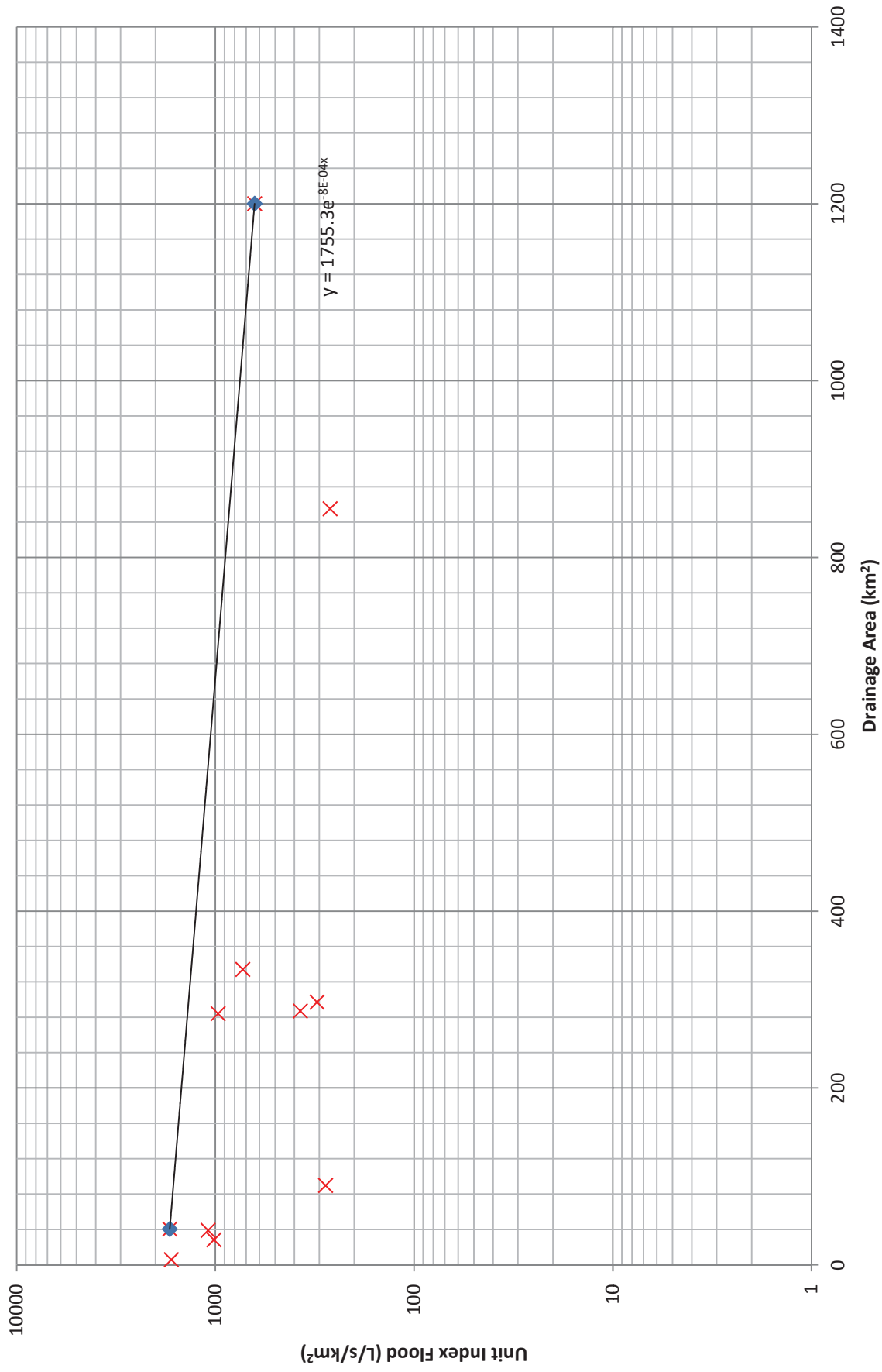
B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT

B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

B6 - SURVEY PLANS BY DBSS

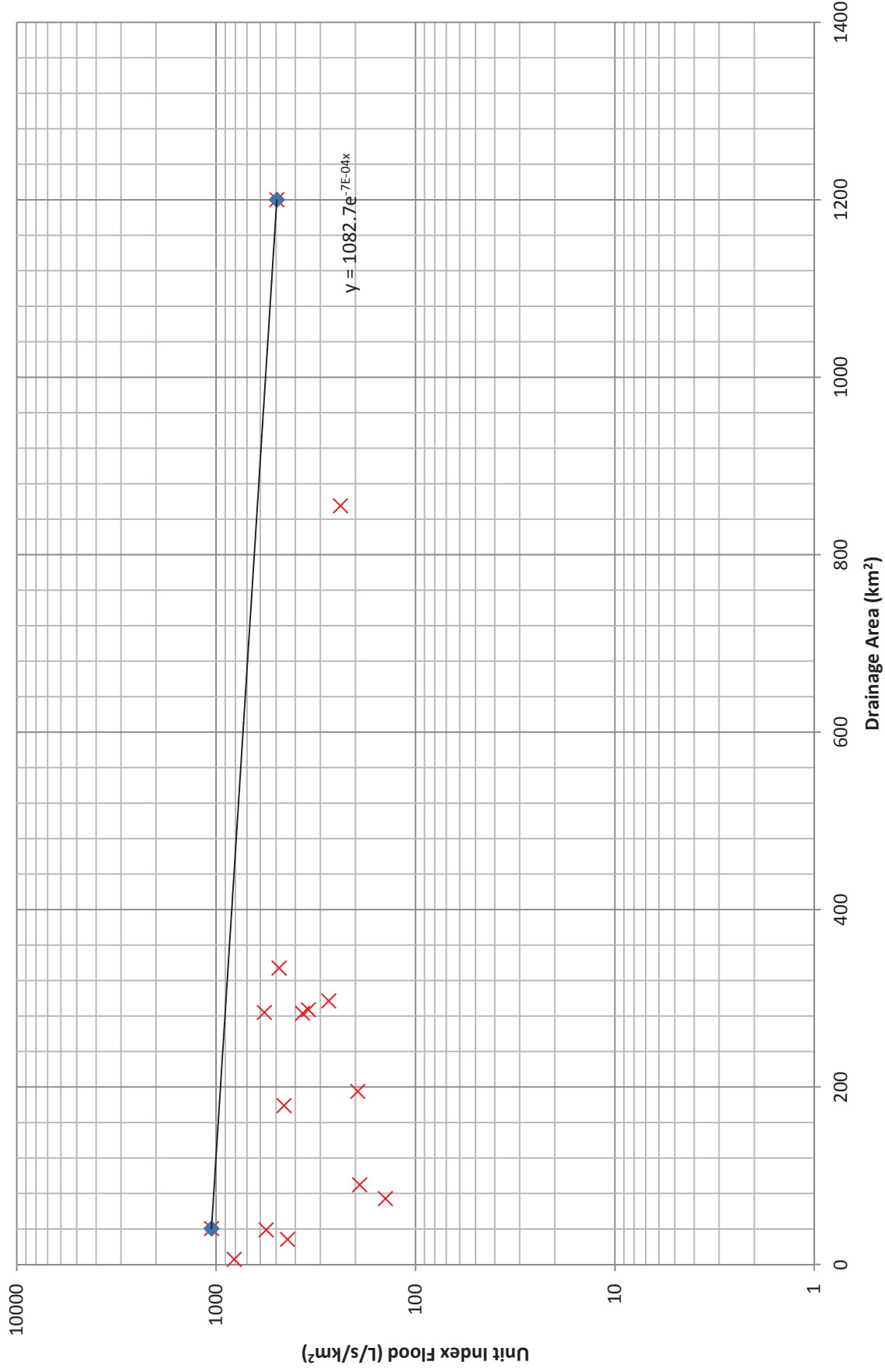
B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 1)

Unit Index Flood vs. Drainage Area (Envelope Curve 1 Using Maximum Instantaneous Flow Data)



B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

Unit Index Flood vs. Drainage Area (Envelope Curve 2 Using Maximum Daily Flow Data)



B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

PEAK FLOW IN THE LOWER MAINLAND REGION 10-Year Peak Flow Curves

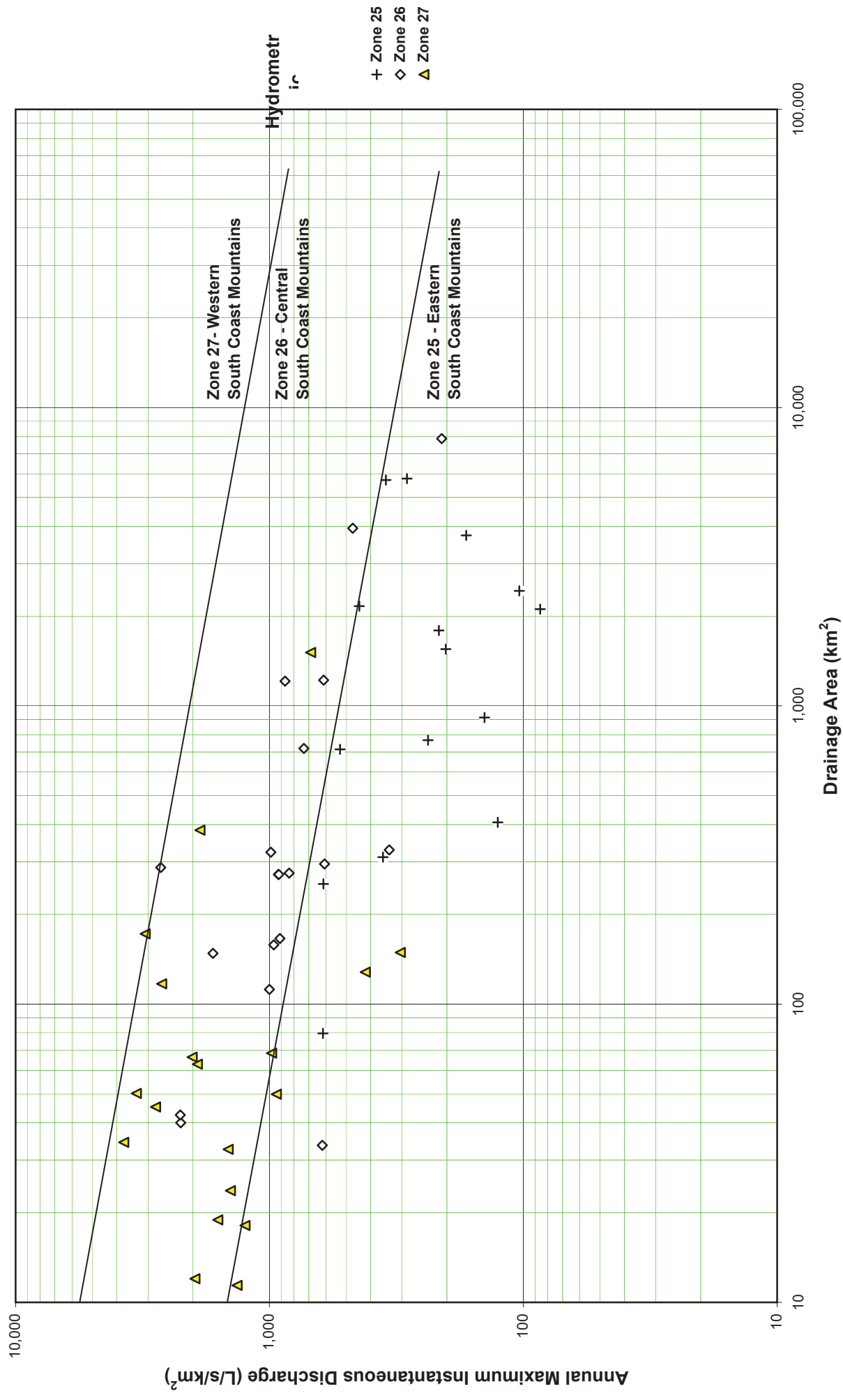
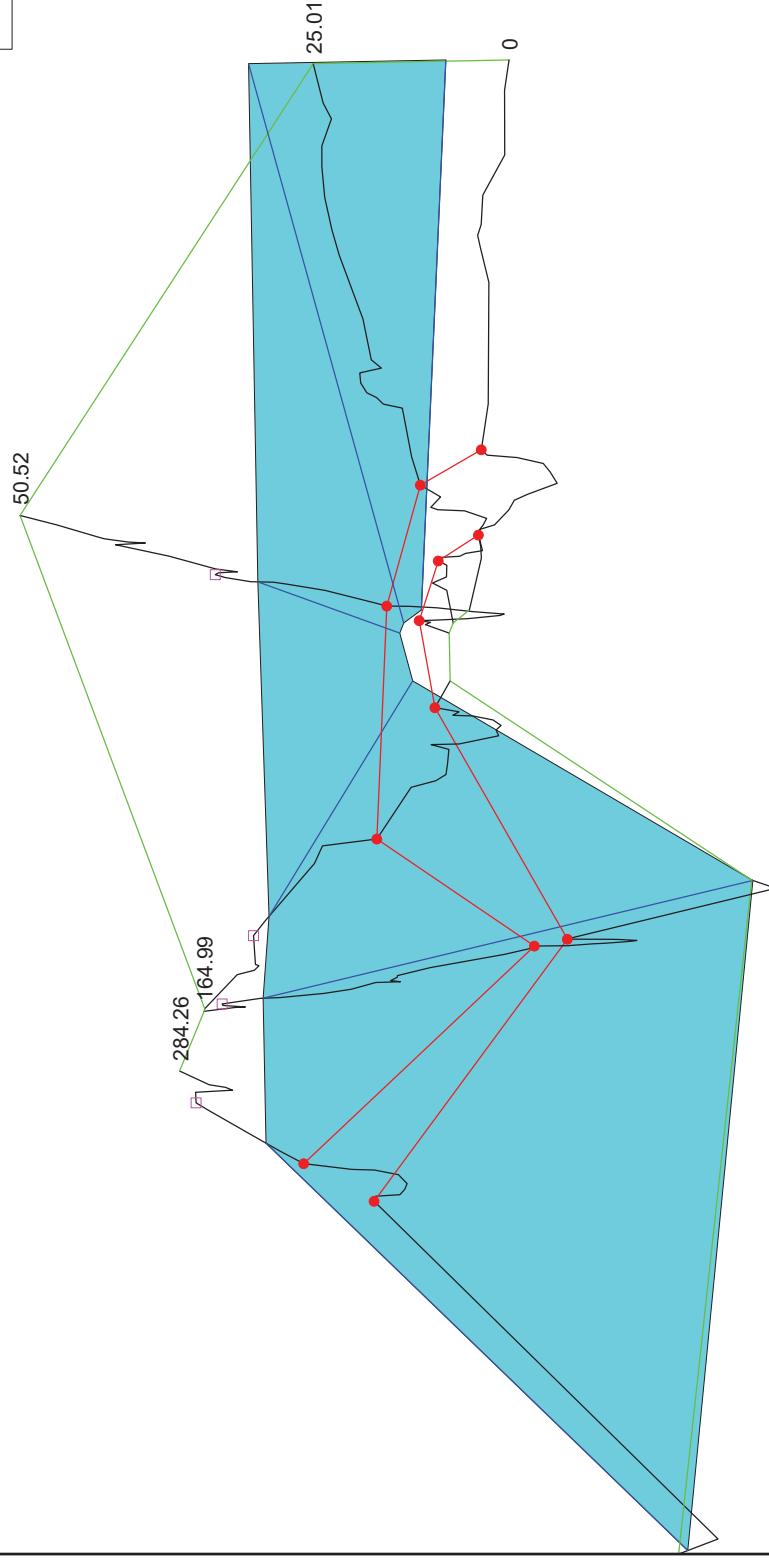
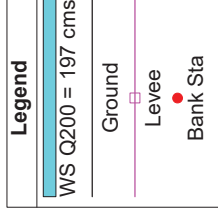
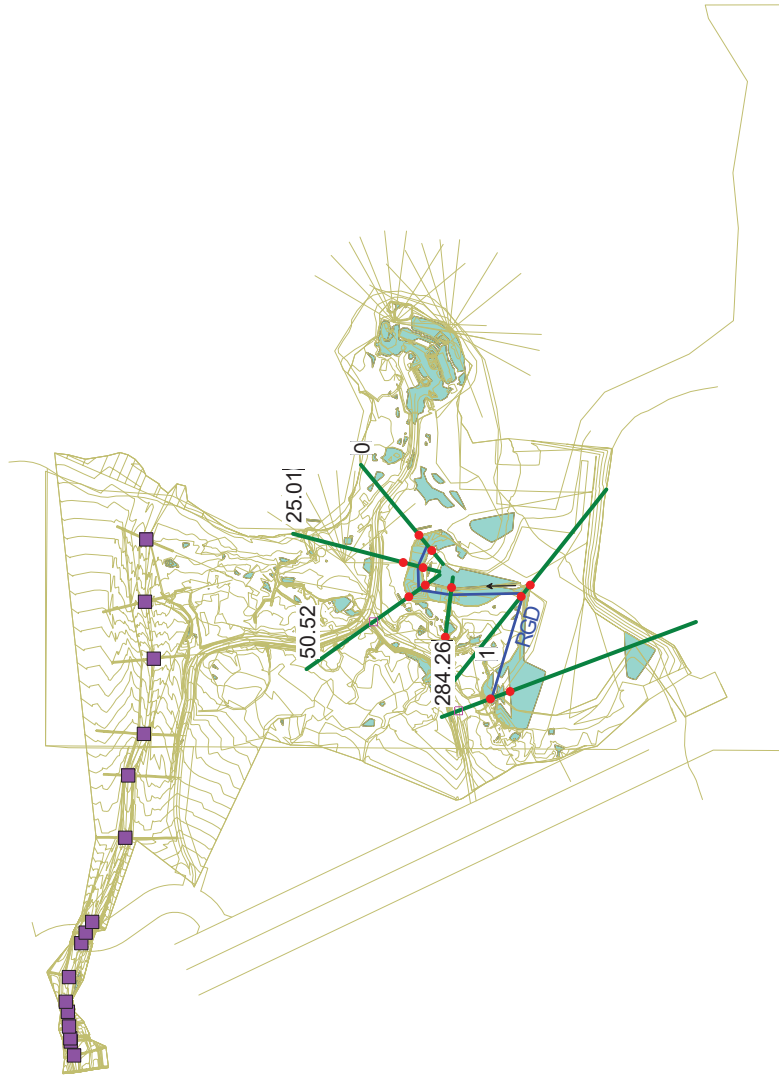
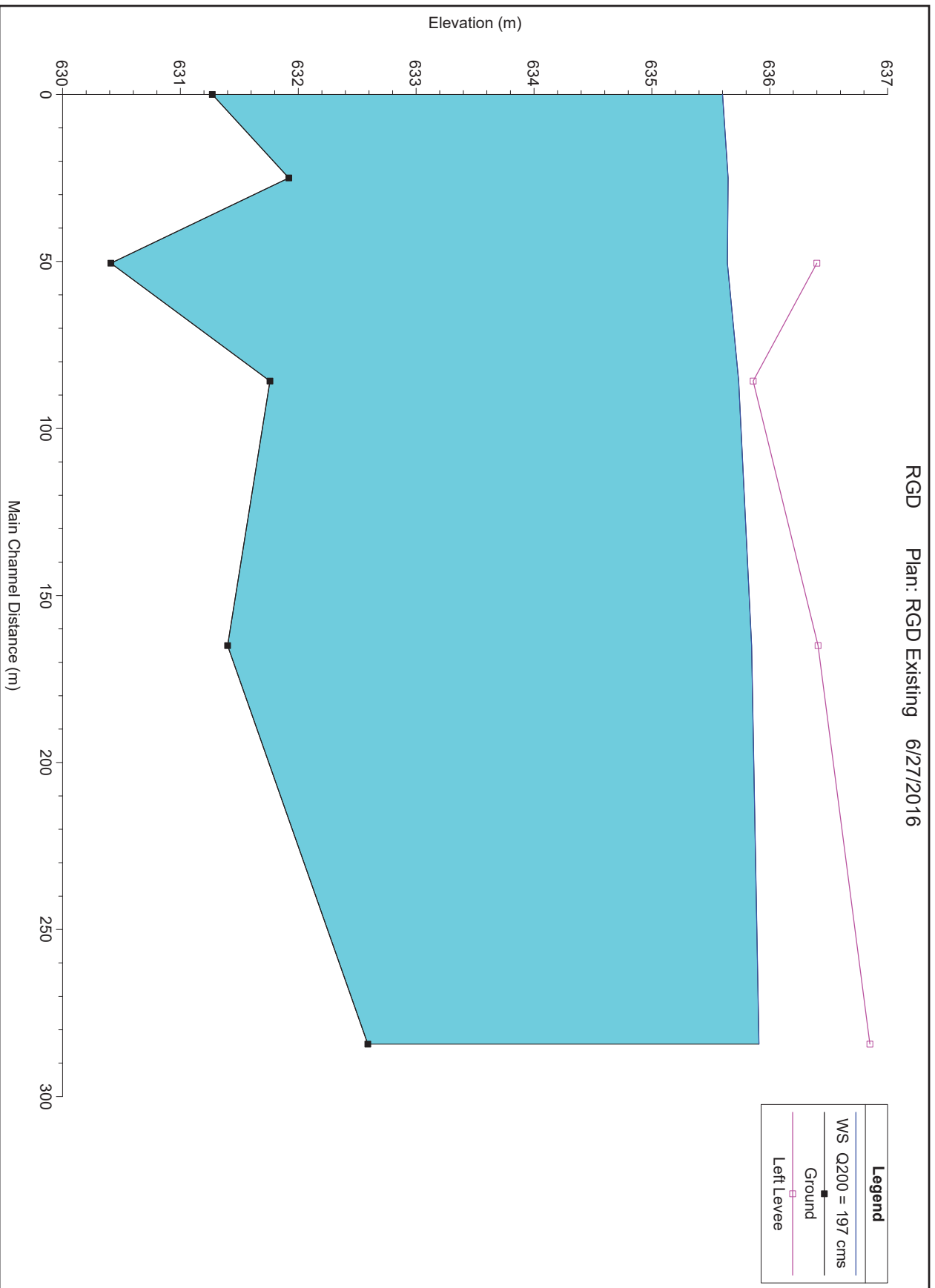


Figure 3 Watershed Peak Flow (page 1 of 2)

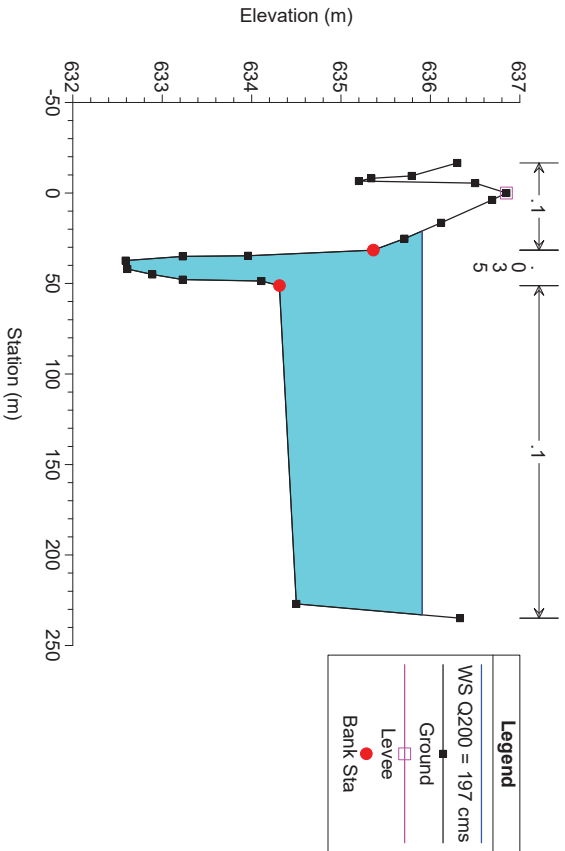
B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT



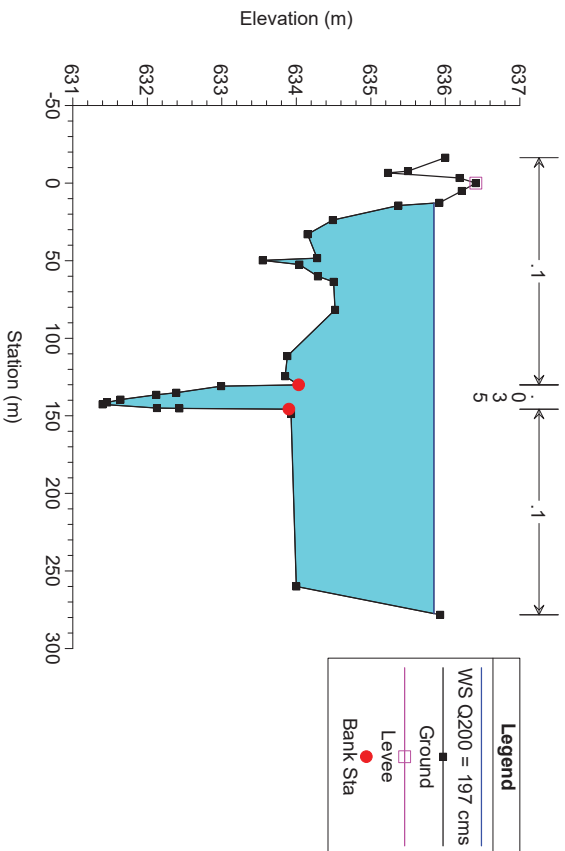




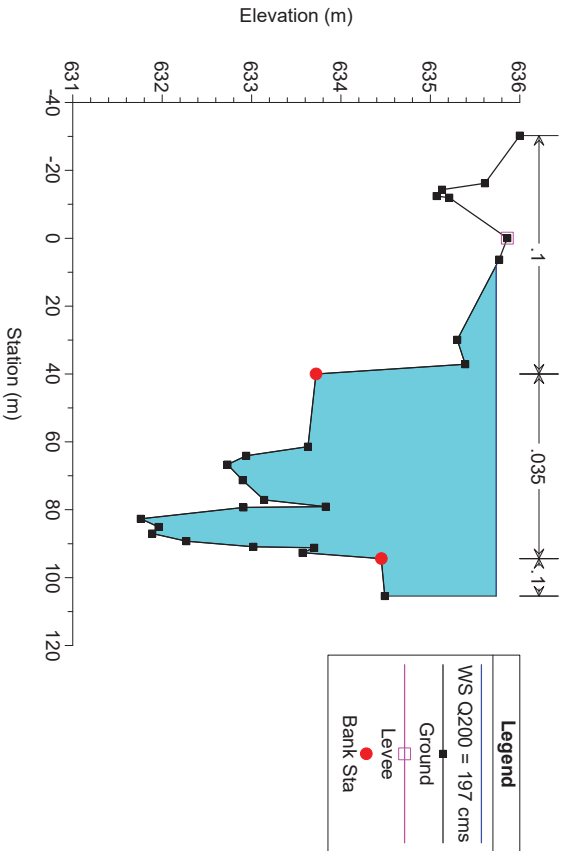
RGD Plan: RGD Existing 6/27/2016
XS 6



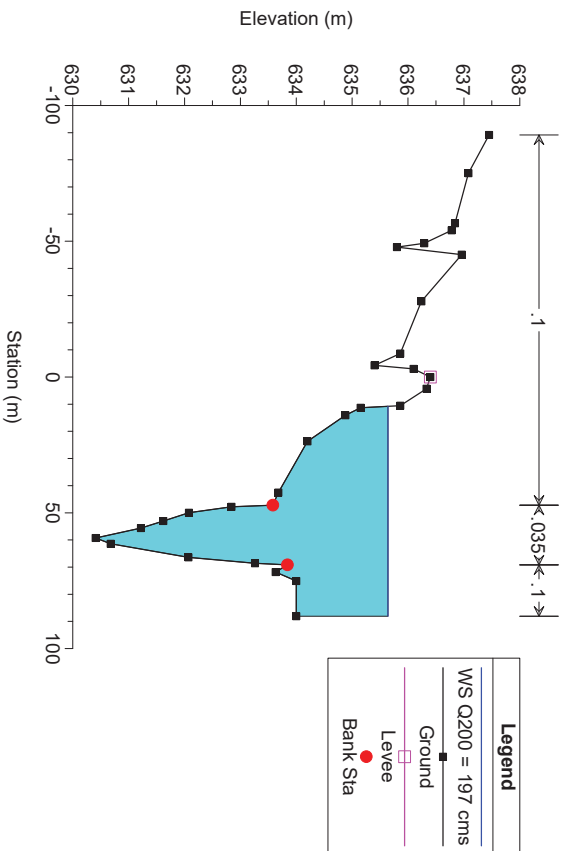
RGD Plan: RGD Existing 6/27/2016
XS 5

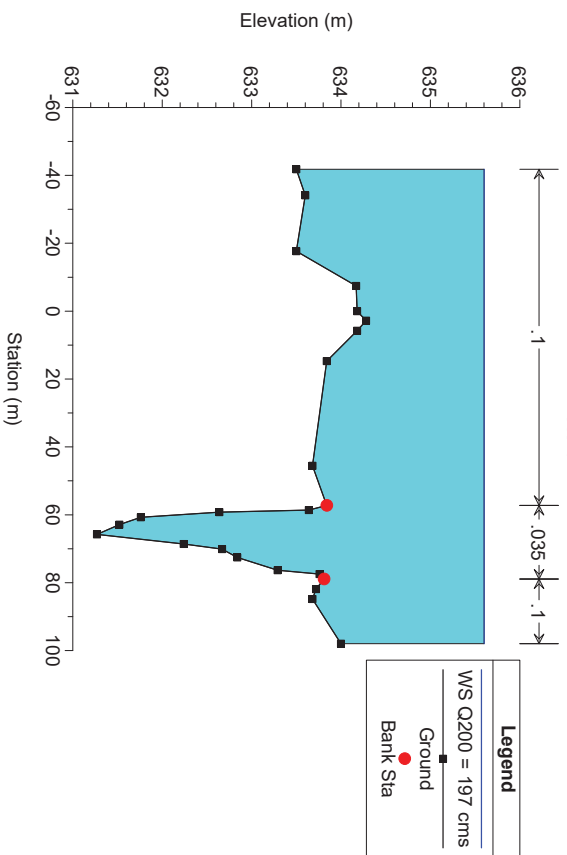
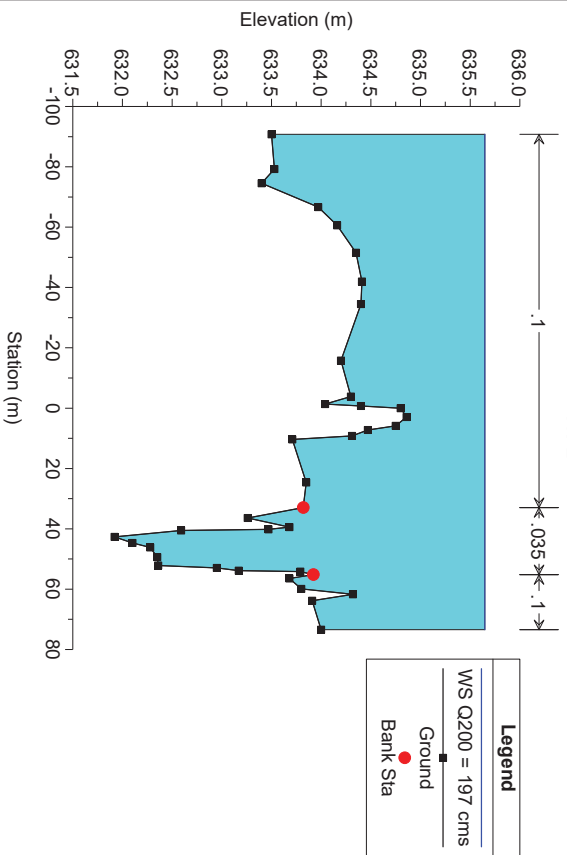


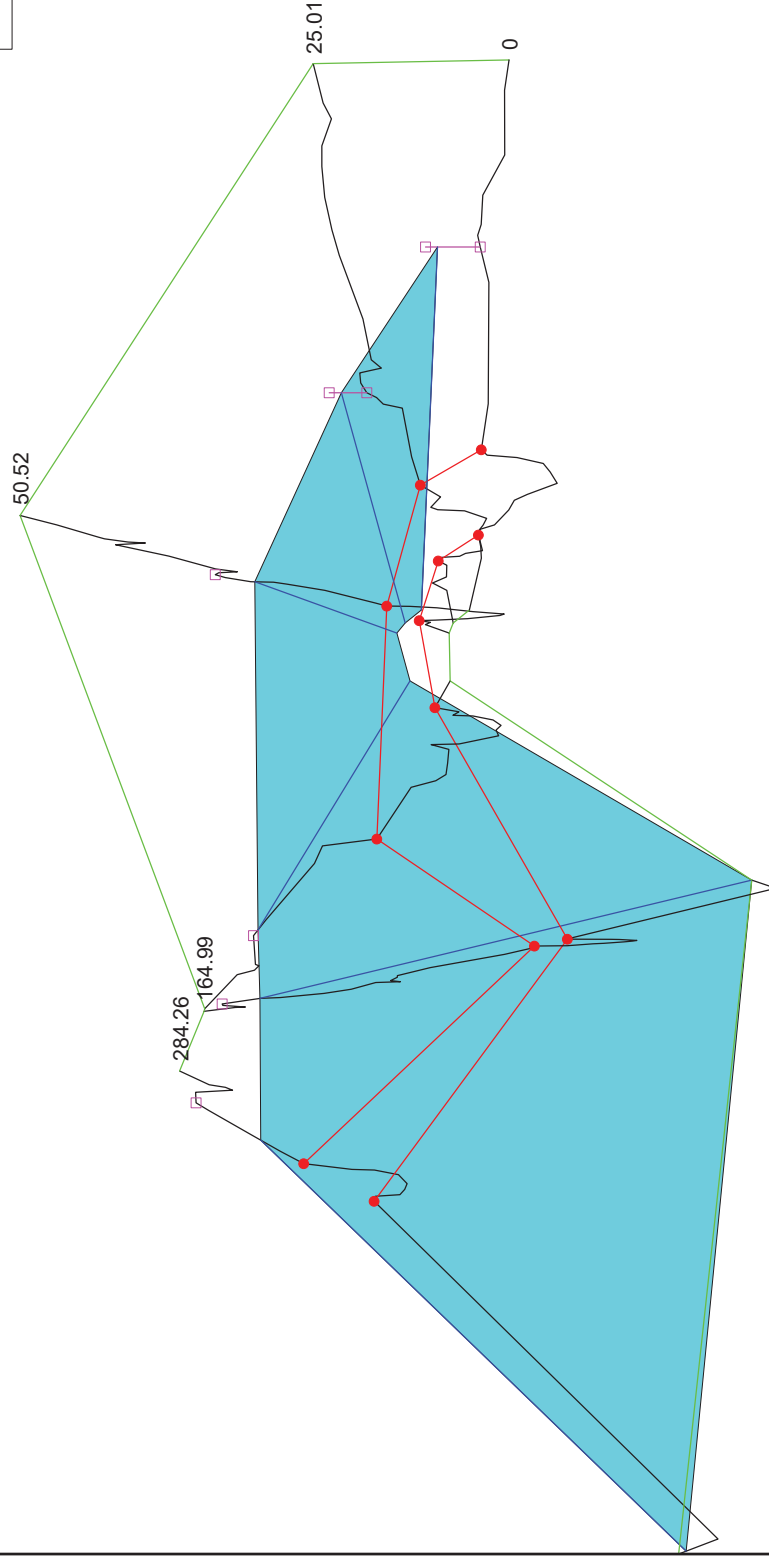
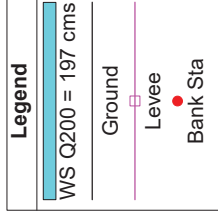
RGD Plan: RGD Existing 6/27/2016
XS 4

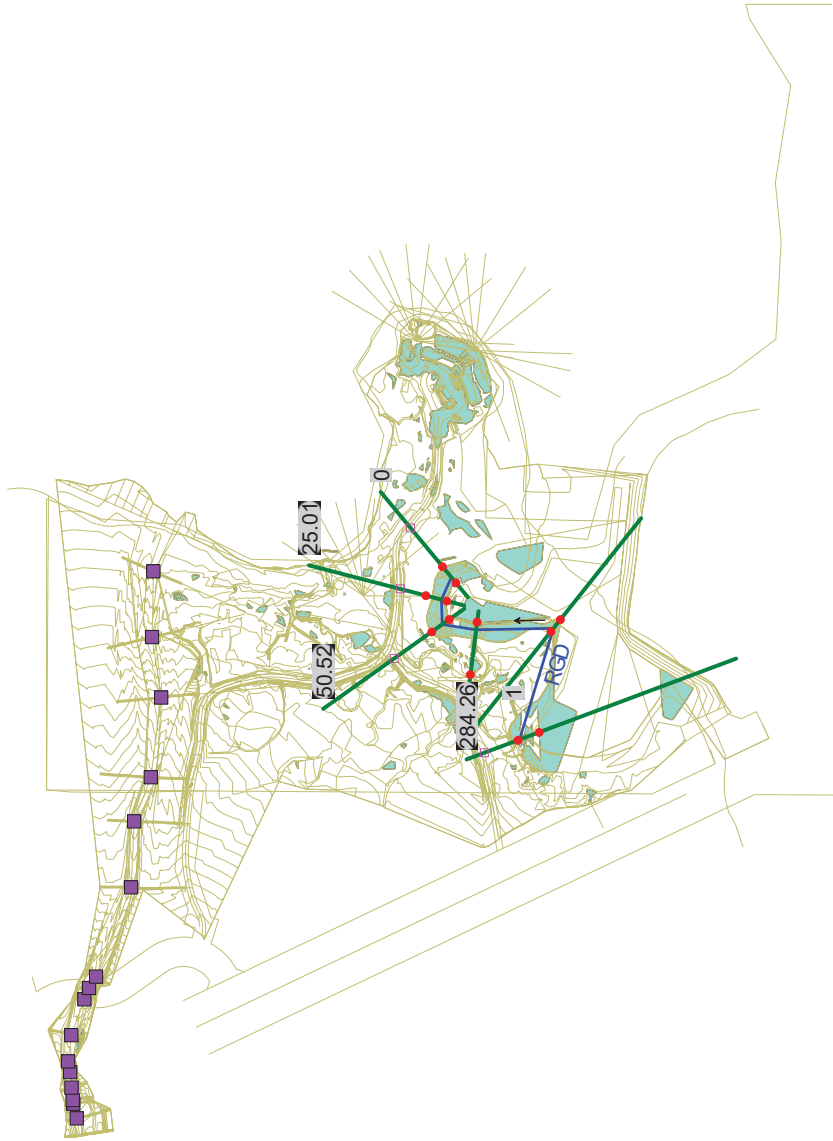


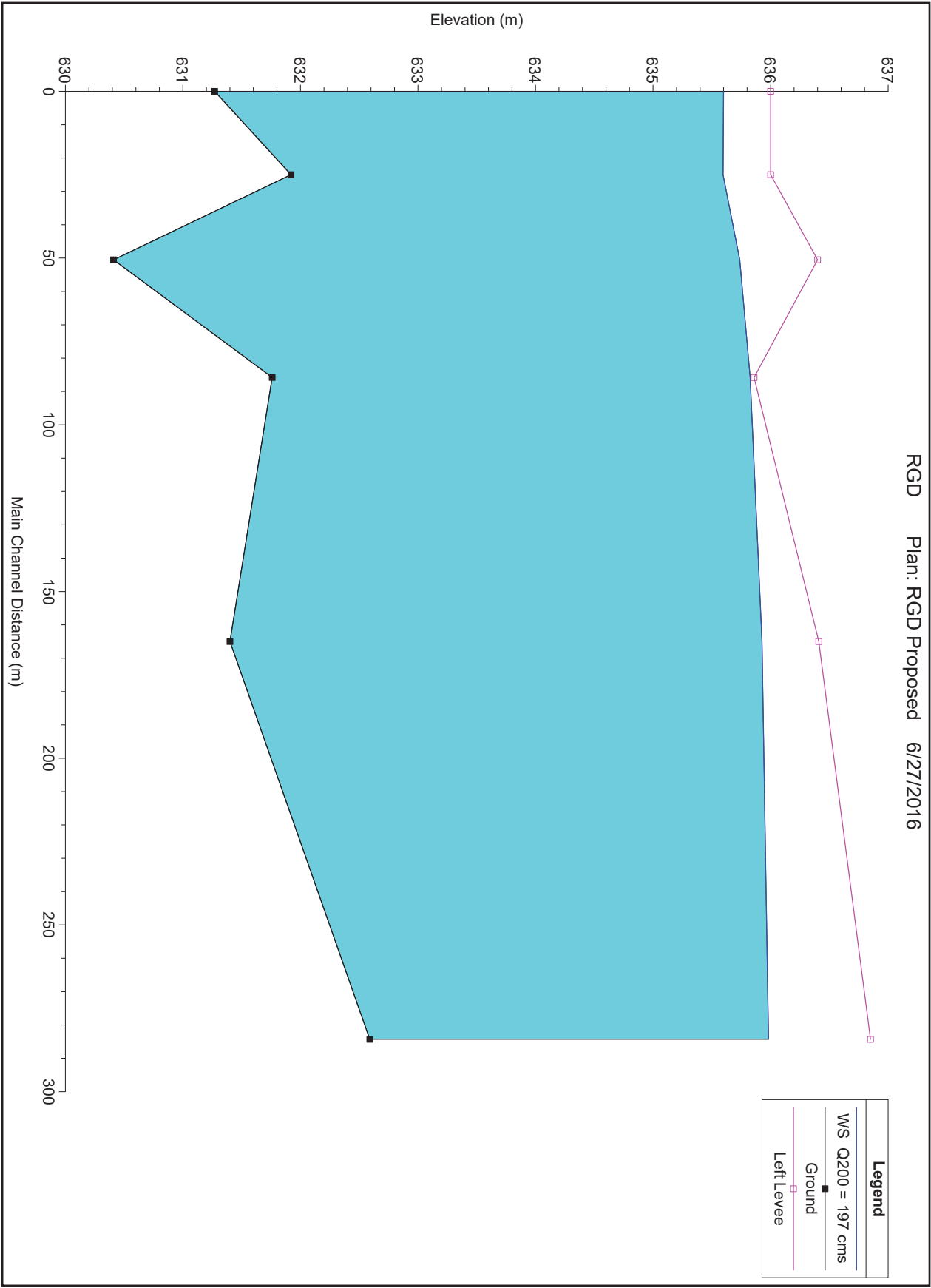
RGD Plan: RGD Existing 6/27/2016
XS 3



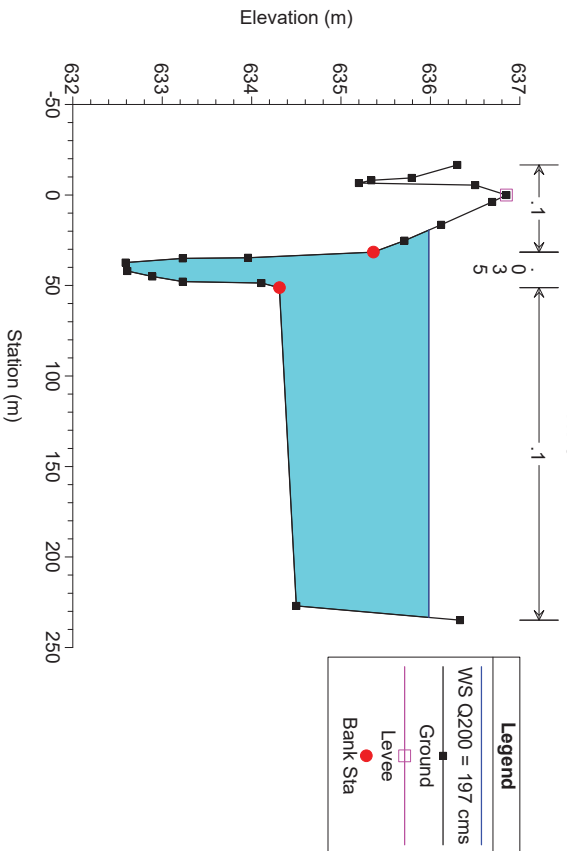




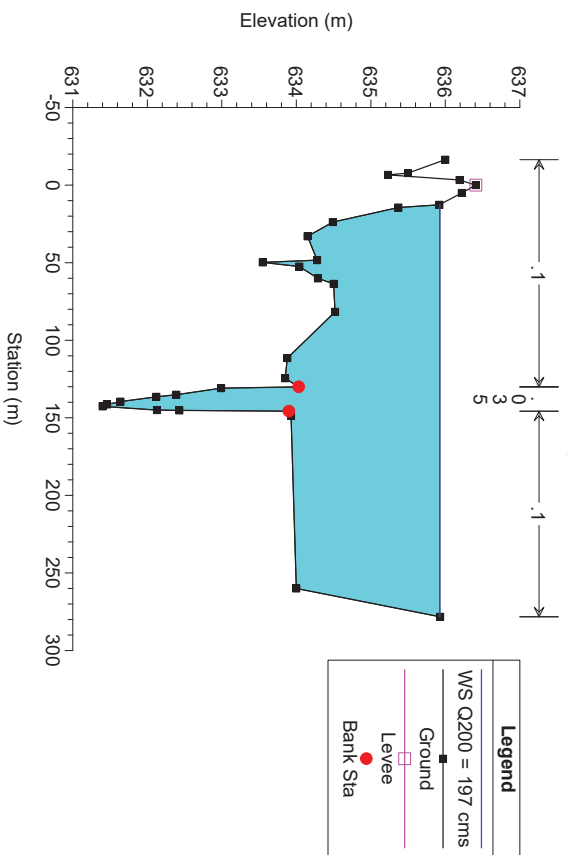




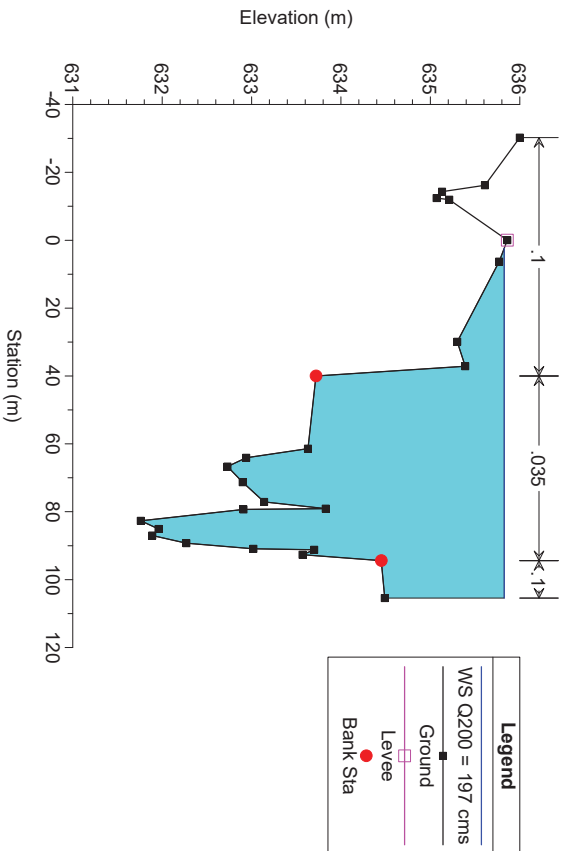
RGD Plan: RGD Proposed 6/27/2016
XS 6



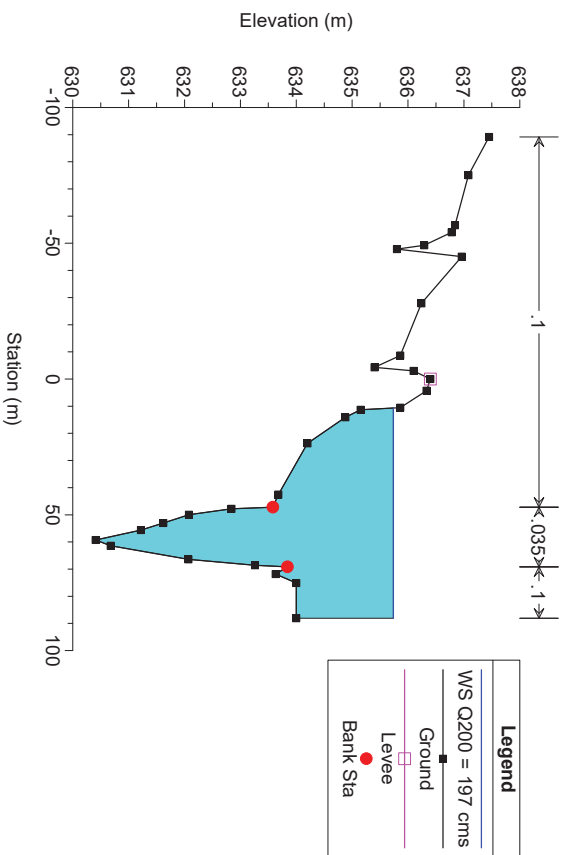
RGD Plan: RGD Proposed 6/27/2016
XS 5

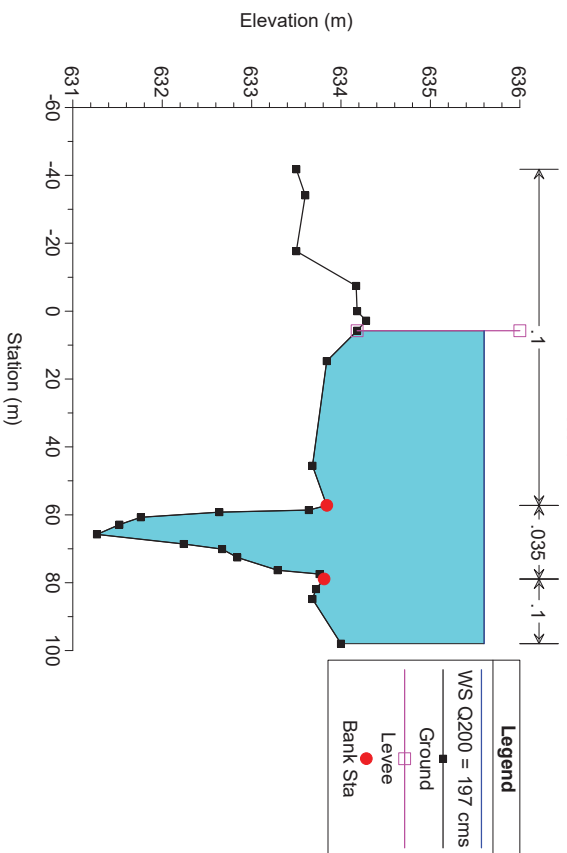
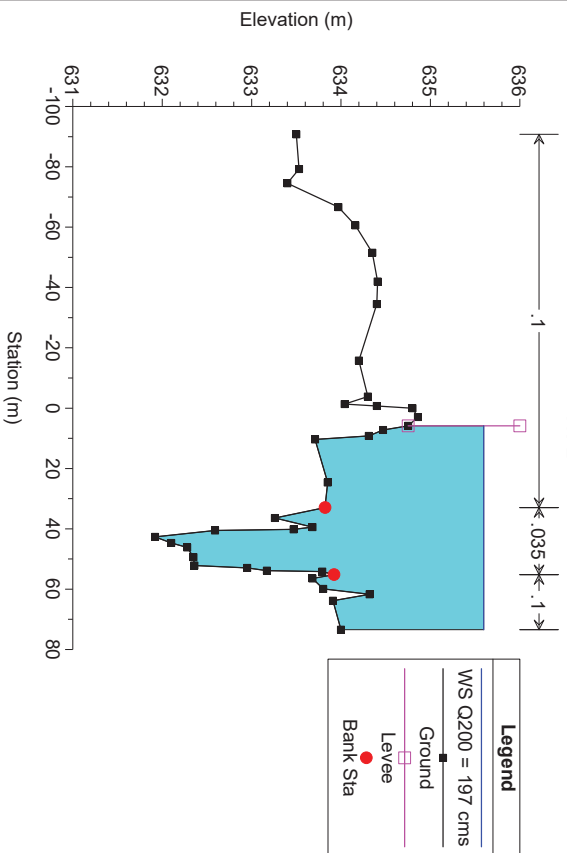


RGD Plan: RGD Proposed 6/27/2016
XS 4



RGD Plan: RGD Proposed 6/27/2016
XS 3





B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

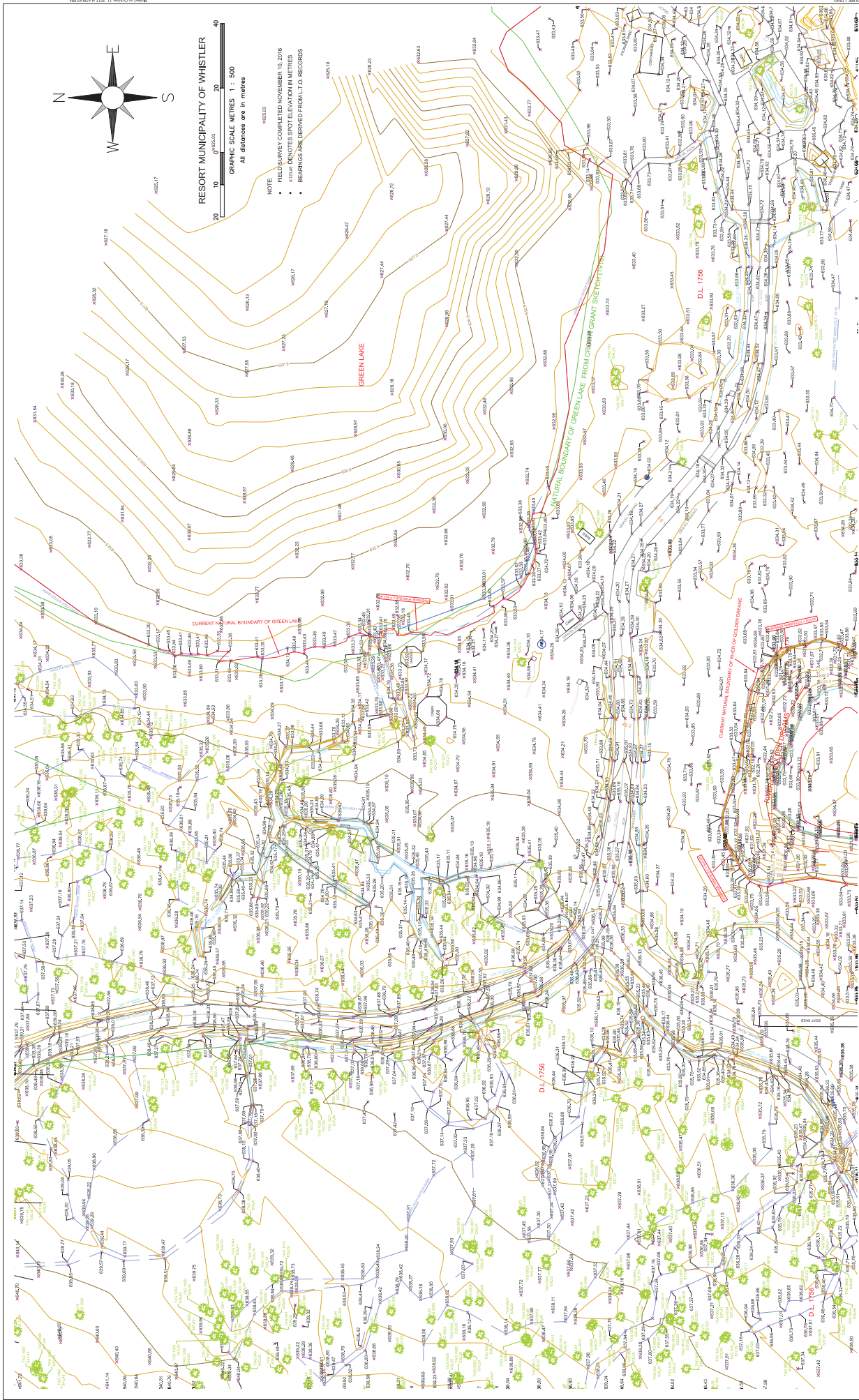
HEC-RAS Plan: RGD Exist River: RGD Reach: 1 Profile: Q200 = 197 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 197 cms	197.00	631.27	635.60	634.48	635.68	0.000791	1.65	279.69	139.79	0.30
1	25.01	Q200 = 197 cms	197.00	631.92	635.65		635.73	0.000929	1.68	287.94	164.18	0.32
1	50.52	Q200 = 197 cms	197.00	630.41	635.64	633.63	635.79	0.000734	1.88	174.69	77.32	0.30
1	85.77	Q200 = 197 cms	197.00	631.76	635.74	634.25	635.83	0.000673	1.36	165.61	97.44	0.27
1	164.99	Q200 = 197 cms	197.00	631.40	635.85	634.70	635.88	0.000433	1.31	472.62	264.57	0.22
1	284.26	Q200 = 197 cms	197.00	632.59	635.91	635.12	635.97	0.001037	1.66	322.31	212.12	0.33

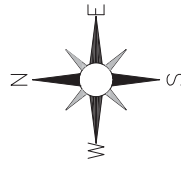
HEC-RAS Plan: RGD Proposed River: RGD Reach: 1 Profile: Q200 = 197 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 197 cms	197.00	631.27	635.60	634.53	635.74	0.001179	2.01	193.69	92.25	0.36
1	25.01	Q200 = 197 cms	197.00	631.92	635.60	634.74	635.83	0.001996	2.43	138.49	67.57	0.46
1	50.52	Q200 = 197 cms	197.00	630.41	635.74	633.63	635.88	0.000666	1.82	182.18	77.43	0.29
1	85.77	Q200 = 197 cms	197.00	631.76	635.83	634.25	635.91	0.000597	1.31	174.57	103.05	0.26
1	164.99	Q200 = 197 cms	197.00	631.40	635.93	634.70	635.96	0.000384	1.25	494.04	265.74	0.21
1	284.26	Q200 = 197 cms	197.00	632.59	635.98	635.12	636.04	0.000909	1.59	337.88	213.99	0.31

B6 - SURVEY PLANS BY DBSS



DOUG BUSH SURVEY SERVICES LTD. Douglas J. Bush, ASCT, RSIS Applied Science Technologies (Geomatics) Unit 18, 18700 Highway 101, Whistler, BC V8E 2Z3 Phone 932-3314 / Fax 932-3099 E-mail doug@bss.ca / http://bss.ca	LCI Water Resources Group Leica Geomatics Inc., Since 1981 10000, 102, Avenue 102, 102 E-mail: leica@leica-geomatics.com Web: www.leica-geomatics.com	Notes: <ul style="list-style-type: none">ELEVATIONS ARE GEODETIC (NAD83) DERIVED FROM MONUMENT NO. 59414 LOCATED ON HWY HIGHWAY BRIDGE ABUTMENTELEVATION USED = 630.339 METRES (2087.73 ft)	Client: Project:	WHITE GLACIER INTERNATIONAL EDGEWATER RESORT	Date: October 11, 2017	Scale: 1:500	Job No: J17014	DWG: FIGURE 1
					Files: 1501.DWG			



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GRAPHIC SCALE METRES 1 : 500
All distances are in metres

- NOTE:
- FIELD SURVEY COMPLETED NOVEMBER 10, 2016
 - * 1545 DENOTES SPOT ELEVATION IN METRES
 - BEARINGS ARE DERIVED FROM L.T.O. RECORDS

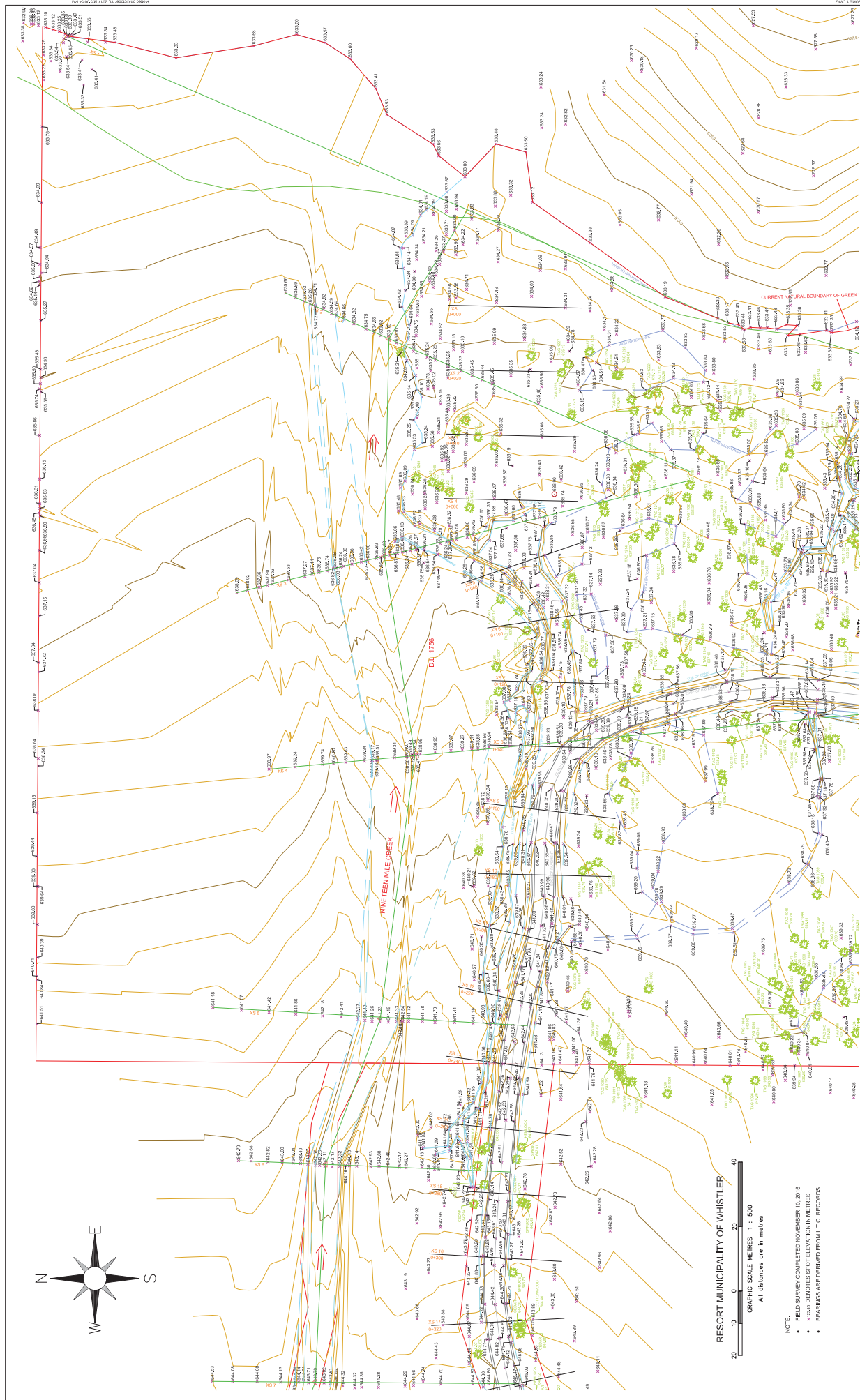
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Douglas J. Bush, ASCT, RSIS
Applied Sciences Technologies (Geomatics)
Unit 18, 15750 Highway 10, Whistler, BC V8E 2C3
Phone 532-3314 / Fax 532-3059 E-mail
doug@dbss.ca / http://dbss.ca

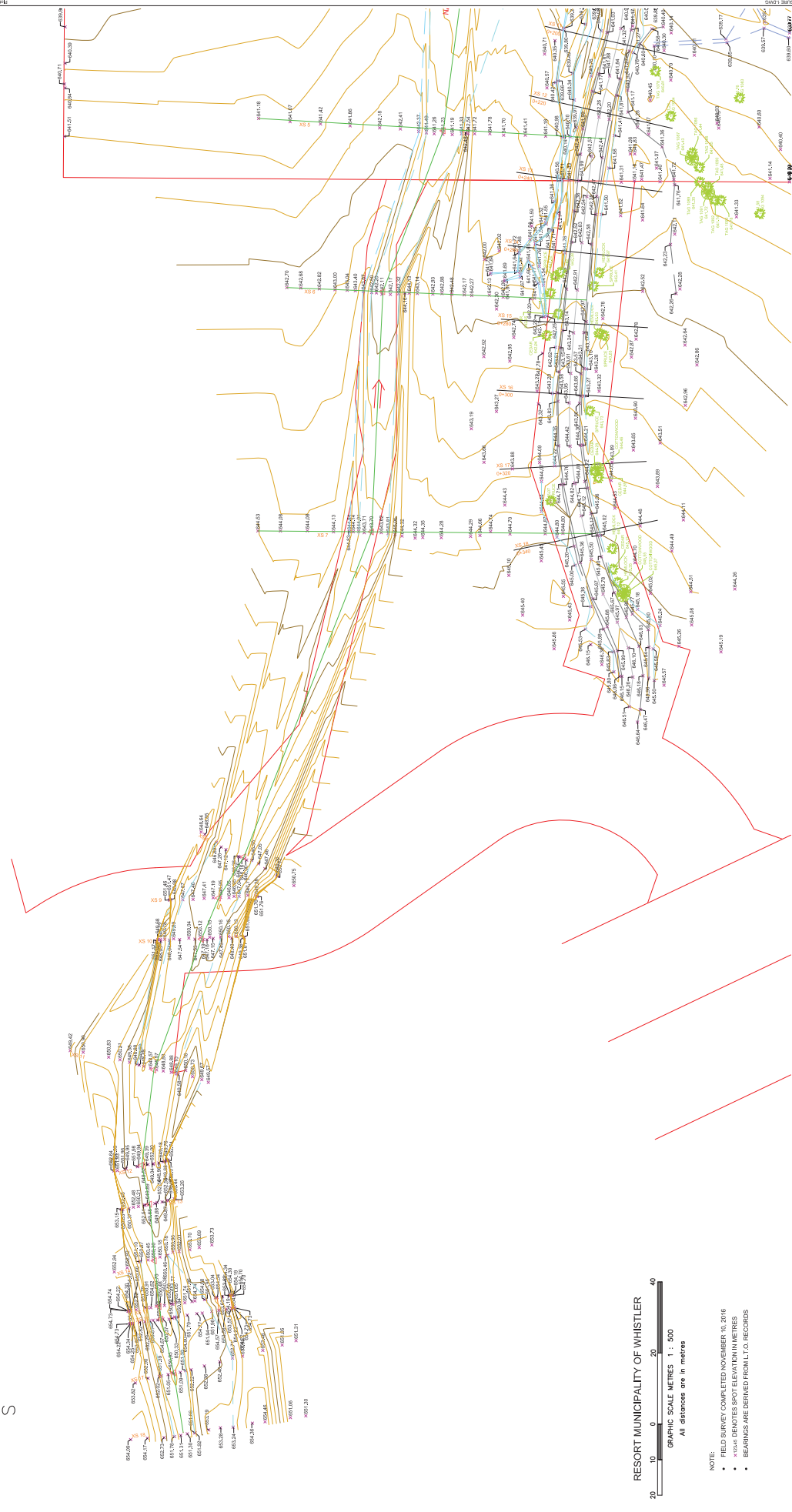
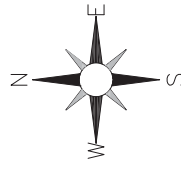
LCI Water Resources Group
LeCais Consultants Inc., Since 1991
1000 West 102nd Avenue, Suite 100
Edmonton, Alberta T6A 4K3
E-mail: info@lecais.com Web: www.lecais.com

- Notes:
- ELEVATIONS ARE GEODETIC NAVD83 DERIVED FROM MONUMENT
NS 59414 LOCATED ON HWY HIGHWAY BRIDGE BUTMENT
ELEVATION USED = 638.39 METRES (2097.73 ft)

Client: WHITE GLACIER INTERNATIONAL
Project: EDGEWATER RESORT

Date: October 11, 2017
Scale: 1:500
Job NO: J17014
Files: 1507.DWG
DWG: FIGURE 1
Sheet: 3





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- NOTE:
- FIELD SURVEY COMPLETED NOVEMBER 10, 2016
 - 'X' DENOTES SPOT ELEVATION IN METRES
 - BEARINGS ARE DERIVED FROM L.T.O. RECORDS

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Douglas J. Bush, ASCT, RSIS
Applied Sciences Technologies (Geomatics)
Unit 18, 4550 Highway 10 West, Whistler, BC V8E 2Z3
Phone 532-3314 / Fax 532-3059 E-mail
doug@dbss.ca / http://dbss.ca

LCI Water Resources Group
LeCais Consultants Inc., Since 1991
1000 West 10th Avenue, Suite 100, Whitehorse, YT X1A 2S2
E-mail: info@lciwaterresources.com Web: www.lciwaterresources.com

Notes:

- ELEVATIONS ARE GEOMETRIC MOBS DERIVED FROM MONUMENT NO. 59414 LOCATED ON NW HWYWAY BRIDGE ABUTMENT (ELEVATION USED = 638.39 METRES (2097.73 ft))

Client:

Project:

WHITE GLACIER INTERNATIONAL

EDGEWATER RESORT

Date:

October 11, 2017

Scale:

1:500

Job No:

J17014

DWG:

FIGURE 1

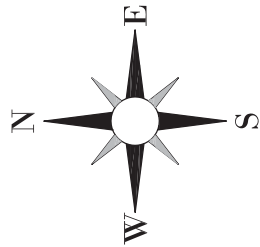
Sheet 4

APPENDIX C – 2-D FLOODPLAIN MAPPING FOR 20-YEAR PEAK FLOOD

C1 - 20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY (EXISTING)

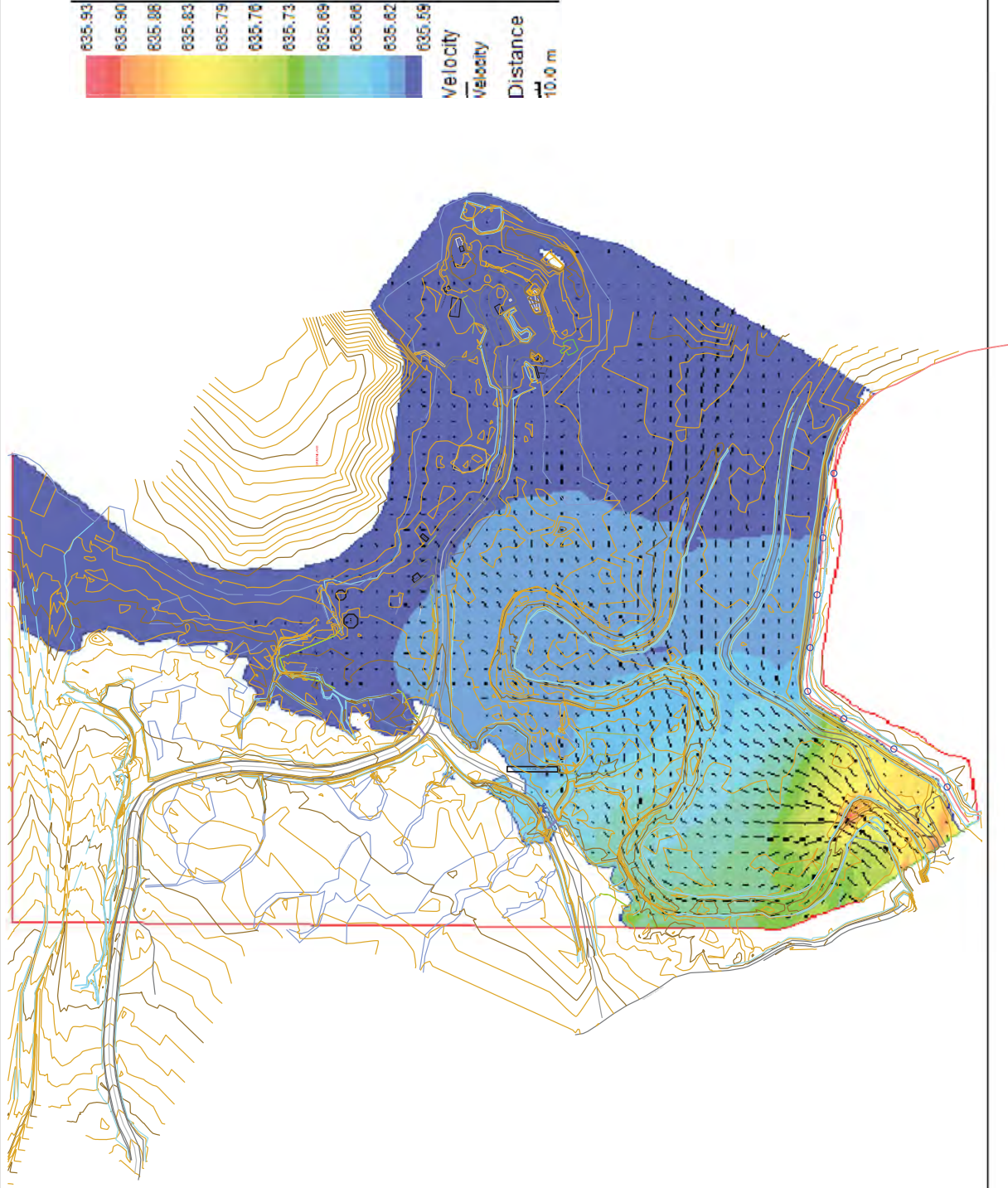
C2 - 20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY (PROPOSED)

C1 - 20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY (EXISTING)



NOTE:
• FIELD SURVEY COMPLETED SEPTEMBER 1, 2015
• SURFACE SPOT ELEVATION IN METRES
• BEANINGS ARE DERIVED FROM L.T.O. RECORDS

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Douglas J. Bush, ASCT, RSIS
Applied Science Technologist (Geomatics)
Unit 16, 1370 Alpha Lake Road, Whistler, B.C., V0N 1B1
Phone: 604-939-2222 Fax: 604-939-2222
dough@dbss.ca / http://dbss.ca

LCI Water Resources Group
LeCas Consultants Inc., Since 1991
Suite 800 - 627 West Hastings Street
Vancouver, B.C. V6C 1A1
Tel: (604) 682-2222 Fax: (604) 682-2222
E-mail: info@lciwater.com / www.lciwater.com

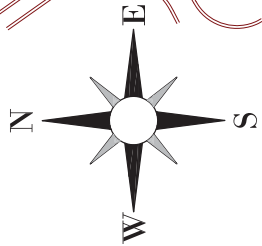
Notes:
• ELEVATIONS ARE GEODETIC, BASED ON MONUMENT
NO. 5984141 LOCATED ON HWY HIGHWAY BRIDGE ABUTMENT
ON THE WEST SIDE OF GOLDEN DREAMS
ELEVATION BASED ON GOLDEN DREAMS (2007.73 m)

Client: WHITE GLACIER INTERNATIONAL
Project: RIVER OF GOLDEN DREAMS
20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY VECTORS (EXISTING)

Date: Oct 11, 2017
File:
Scale:
Job No.:
DWG.: FIGURE C1

SHEET

C2 - 20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY (PROPOSED)



NOTE:
• FIELD SURVEY COMPLETED SEPTEMBER 1, 2015
• SPOTS DENOTES SPOT ELEVATION IN METRES
• BOUNDARIES ARE DERIVED FROM LTO RECORDS

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DOUG BUSH SURVEY SERVICES LTD.
Douglas J. Bush, ASCT, RSIS
Applied Science Technologist (Geomatics)
Unit 16, 1370 Alpha Lake Road, Whistler, B.C., V0N 1B1
Phone: 604-939-3333 Cell: 604-939-3333
Fax: 604-939-3333 Email: dought@dsass.ca / http://dsass.ca

LCI Water Resources Group
LeCas Consultants Inc. Since 1991
Sales: 800-1-877-4444
Fax: 604-939-3333
E-mail: info@lciwater.com

Notes:
• ELEVATIONS ARE GEODETIC VALUES DERIVED FROM MONUMENT
NO. 598414 LOCATED ON HWY HIGHWAY BRIDGE ABUTMENT
OVER THE RIVER OF GOLDEN DREAMS
ELEVATION VALUES: 635.83 METRES (1987.73 Mm)

Client: WHITE GLACIER INTERNATIONAL
Project: RIVER OF GOLDEN DREAMS
20-YEAR WATER SURFACE ELEVATIONS AND VELOCITY VECTORS (PROPOSED)

Date: Oct 11, 2017
File: FIGURE C2

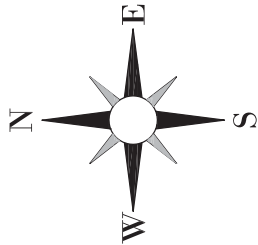
SCALE:
JOB NO.:
DWG.: FIGURE C2
SHEET:

APPENDIX D –TRANSFER OF RISK ASSESSMENT

D1 – 200-YEAR WATER SURFACE ELEVATION VELOCITY VECTORS (EXISTING)

D2 – 200-YEAR WATER SURFACE ELEVATION VELOCITY VECTORS (PROPOSED)

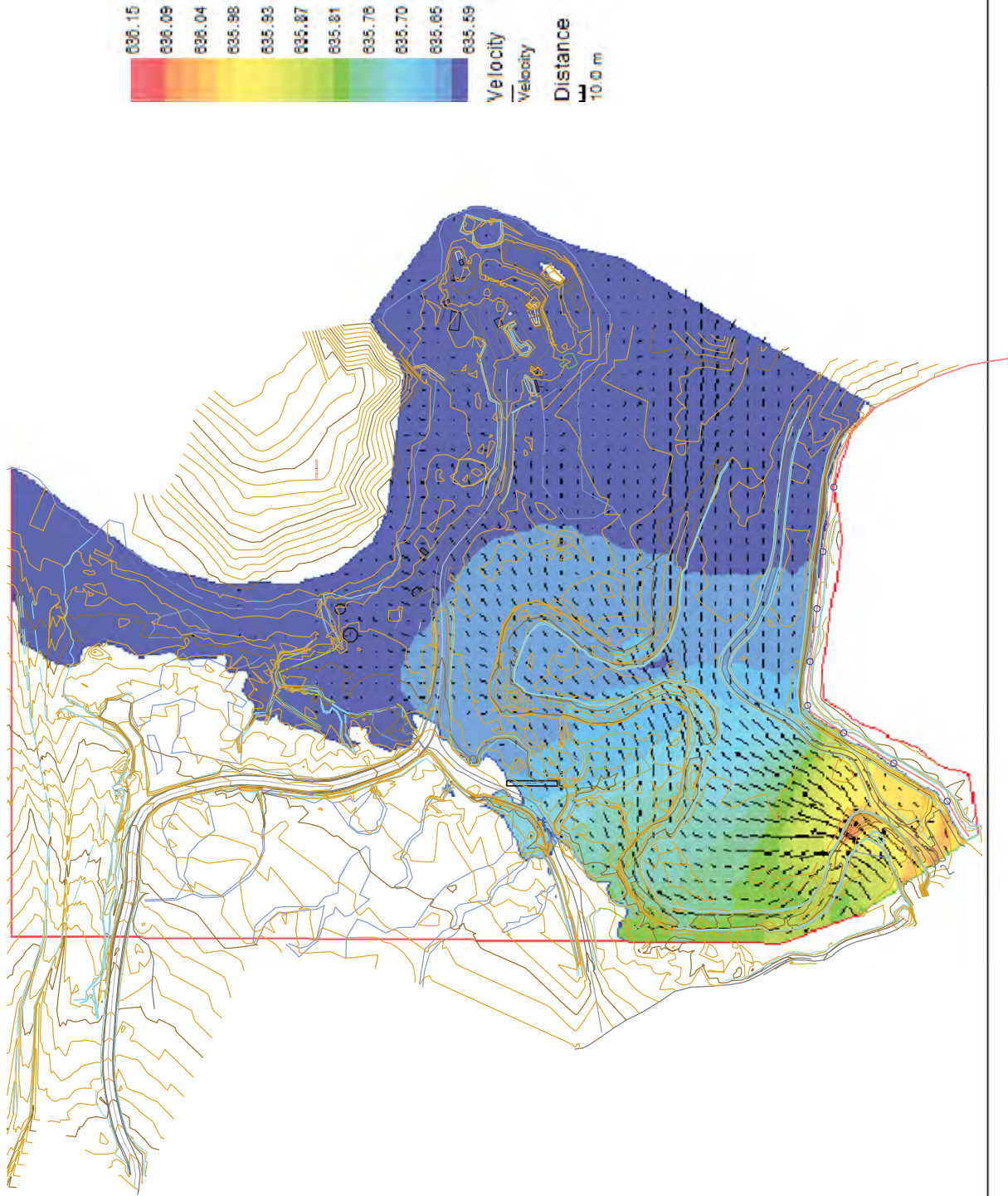
D1 – 200-YEAR WATER SURFACE ELEVATION VELOCITY VECTORS (EXISTING)



NOTE:

- FIELD SURVEY COMPLETED SEPTEMBER 1, 2016
- ELEVATIONS ARE GEODETIC ELEVATIONS DERIVED FROM MONUMENT
- ELEVATIONS ARE SPOT ELEVATIONS IN METRES
- BEARINGS ARE DERIVED FROM L.T.O. RECORDS

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DOUG BUSH SURVEY SERVICES LTD.
Douglas J. Bush, ASCT, RSIS
Applied Science Technologist (Geomatics)
Unit 16, 1370 Alpha Lake Road, Whistler, B.C., V0N 1B1
Phone: (604) 932-3333 Fax: (604) 932-3335
E-mail: doug@dbss.ca / http://dbss.ca

LCI Water Resources Group
LeCas Consultants Inc., Since 1991
Suite 800 - 102 West Hwy 103 West
Whistler, B.C. V0N 1B1
Tel: (604) 932-3333 Fax: (604) 932-3335
E-mail: info@lciwater.com / www.lciwater.com

Notes:

- ELEVATIONS ARE GEODETIC ELEVATIONS DERIVED FROM MONUMENT
- LOC. 854141 LOCATED ON HWY HIGHWAY BRIDGE ABUTMENT
- OVER THE RIVER OF GOLDEN DREAMS
- ELEVATION VALUES ARE IN METRES (2007.73 M)

Client: WHITE GLACIER INTERNATIONAL
Project: RIVER OF GOLDEN DREAMS
200-YEAR WATER SURFACE ELEVATIONS AND VELOCITY VECTORS (EXISTING)

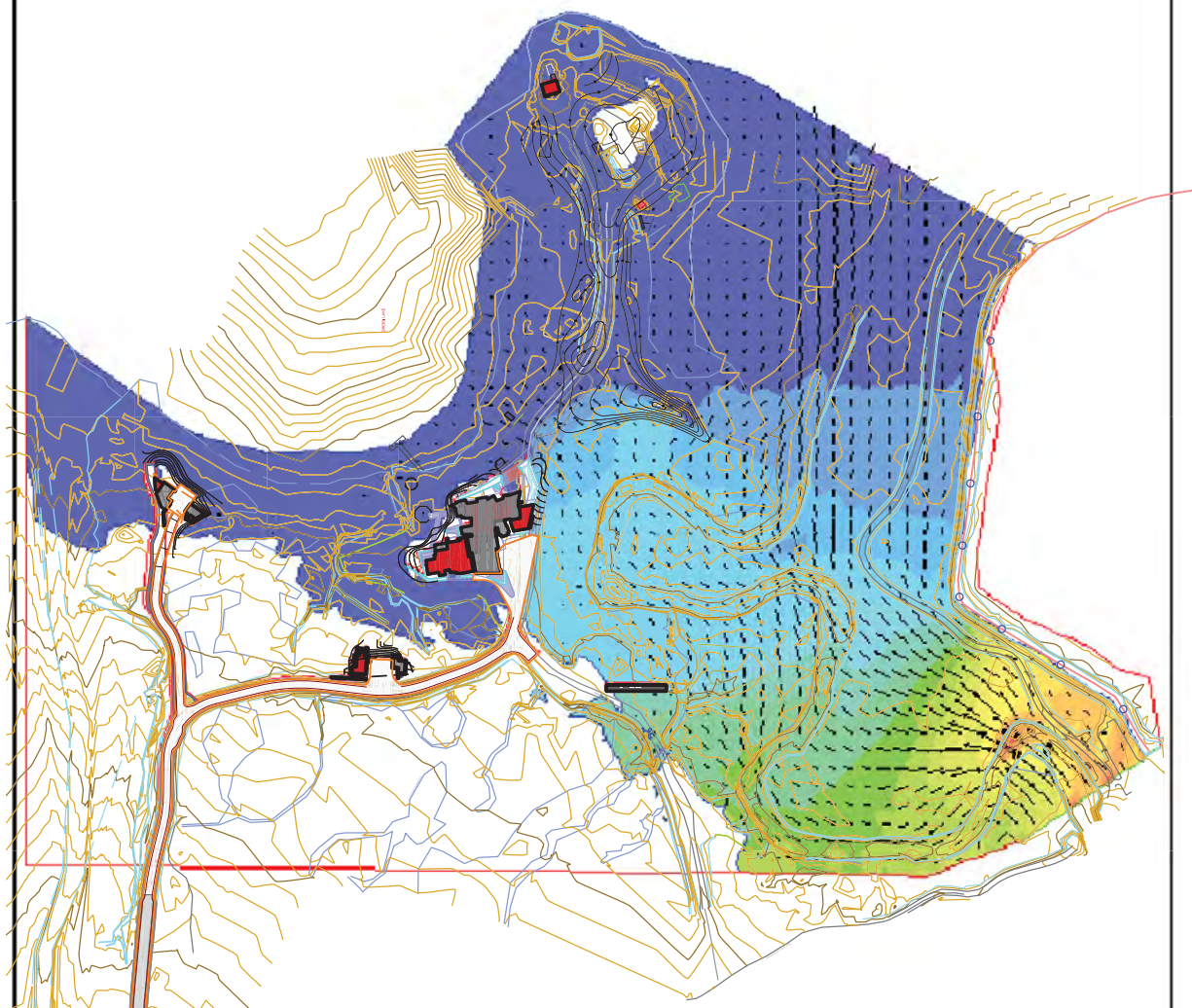
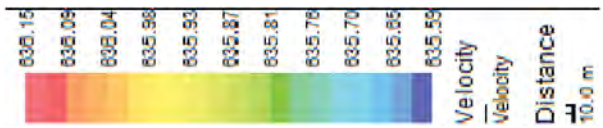
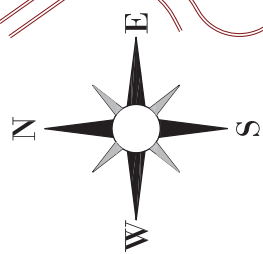
Date: Oct 11, 2017

File: FIGURE D1

Scale: 1:10,000

Job No.: DWG.: FIGURE D1

D2 – 200-YEAR WATER SURFACE ELEVATION VELOCITY VECTORS (PROPOSED)



NOTE:
• FIELD SURVEY COMPLETED SEPTEMBER 1, 2015
• SPOTS DERIVED FROM ELEVATION IN METRES
• SPOTS ARE DERIVED FROM LTO RECORDS

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DOUG BUSH SURVEY SERVICES LTD.
Douglas J. Bush, ASCT, RSIS
Applied Science Technologist (Geomatics)
Unit 16, 1370 Alpha Lake Road, Coquitlam, B.C., V3K 1B1
Phone: 604-526-3333 Fax: 604-526-3333
dough@dbss.ca / http://dbss.ca

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LeCas Consultants Inc. Since 1991
Sales: 800-122-0888
Fax: 604-526-3333
E-mail: info@lci.ca / www.lci.ca

Notes:
• ELEVATIONS ARE GEODETIC VALUES DERIVED FROM MONUMENT
• NO. 594141 LOCATED ON HWY HIGHWAY BRIDGE ABUTMENT
• OVER THE RIVER OF GOLDEN DREAMS
• ELEVATION VALUES: 635.16 TO 635.59 (2007-73 m)

Client: WHITE GLACIER INTERNATIONAL
Project: RIVER OF GOLDEN DREAMS
200-YEAR WATER SURFACE ELEVATIONS AND VELOCITY VECTORS (PROPOSED)

Date: Oct 11, 2017
File: FIGURE D2
SCALE:
JOB NO.:
DWG.: FIGURE D2
SHEET:

APPENDIX E – SECTION 524 EXEMPTION TABLE

WHITE GLACIER

SECTION 534 EXEMPTION APPLICATION ZONING BYLAW CHART 11 OCTOBER 2017

ZONING BYLAW		COMMENTS						
SECTION	REQUIREMENT	Building 1 - Residence	Building 2 - Pool Changing	Building 3 - Multi-Use	Building 4 - Studio	Building 5 - Reception	Building 6 - Greenhouse	Building 7 - Pavilion
Subsection 4(2)(b) of Part 5:	No building shall be constructed within 7.5 meters of the high water mark of a lake, swamp or pond or any other body of water, including the River of Golden Dreams, Nineteen Mile Creek.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	This structure has been eliminated from proposal	The proposed building is an existing structure and is not subject to the requirements of this Bylaw. The applicant has provided a Flood Control Report, dated 11 October 2017, prepared by L&C Consultants (Hydrotechnical Engineering Consultants) in support of this location.
Subsection 4(2)(b) of Part 5:	No building shall be constructed within 10 meters of the high water mark of any other nearby water course.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b)(ii) of Part 5:	No building shall be constructed with the underside of a wooden floor system or top of foundation below the required minimum finished grade surrounding the building.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b)(iv) of Part 5:	No building shall be constructed with the underside of a wooden floor system or top of foundation below the required minimum finished grade surrounding the building.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b)(v) of Part 5:	No building shall be constructed with the underside of a wooden floor system or top of foundation below the required minimum finished grade surrounding the building.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b)(vi) of Part 5:	No building shall be constructed with the underside of a wooden floor system or top of foundation below the required minimum finished grade surrounding the building.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b)(vii) of Part 5:	No building shall be constructed with the underside of a wooden floor system or top of foundation below the required minimum finished grade surrounding the building.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b) of Part 5:	Subparagraph (2)(b)(i) through (vii) shall not apply to that portion of a building or structure that will be used for parking.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		The proposed building conforms to these requirements.
Subsection 4(2)(b) of Part 5:	The required elevation may be achieved by: structural elevation... or by adequately compacted landfill, or both	The required elevation is achieved by: structural elevation...	The required elevation is achieved by: structural elevation...	The required elevation is achieved by: structural elevation...	The required elevation is achieved by: both structural elevation and adequately compacted landfill	The required elevation is achieved by: both structural elevation and adequately compacted landfill		The required elevation is achieved by: structural elevation...
Subsection 4(2)(b) of Part 5:	No area below the required elevation shall be used for the installation of furnaces or other fixed equipment susceptible to damage by floodwater.	Area below required elevation:	Area below required elevation:	Area below required elevation:	Area below required elevation:	Area below required elevation:		Area below required elevation:
Subsection 4(3) of Part 5:	Where landfill is used to achieve required elevations stated in paragraph (2) (b), no portion of the landfill slope shall be closer than 1.5 meters to the high water mark, and the toe of the landfill slope shall be adequately protected against erosion from floodwaters.	Does Not Apply: The required elevation is achieved by structural elevation.	Does Not Apply: The required elevation is achieved by structural elevation.	Does Not Apply: The required elevation is achieved by structural elevation.	The proposed building conforms to these requirements.	The proposed building conforms to these requirements.		Does Not Apply: The required elevation is achieved by structural elevation.

APPENDIX F – CASCADE ENVIRONMENTAL MEMORANDUM



MEMORANDUM

DATE: August 2, 2017
TO: Resort Municipality of Whistler
FROM: Dave Williamson, B.E.S., A.Sc.T., QEP
Adrien Baudouin, M.Sc., R.P.Bio.
RE: RMOW Staff Comments- 8030 Alpine Way, Whistler, BC.
FILE #: 619-01-03

Cascade Environmental Resource Group Ltd. (Cascade) was retained by White Glacier International Ltd., to provide environmental services during the development of the property located at 8030 Alpine Way, Whistler, BC. This memo addresses item 6, 7 and 9 of the section "Some further comments/ questions from staff" in the letter titled "Section 524_RMOW Staff comments" written by Roman Licko dated August 1, 2017.

6. Please minimize tree disturbance and removal

Cascade is involved in the planning process of the development and will ensure that tree disturbance and removal will be minimized. Tree removal will only occur where required by the proposed development.

7. Maintain RAR setbacks

The RAR requires that construction fencing is erected on the boundary of the RAR setbacks, to discourage intrusion into the setbacks during development. Cascade will ensure that fencing is erected and maintained, and that no intrusion into the setbacks will occur, with the exception of the section of the RAR setback along 19 mile Creek where the training berm will be upgraded (see attached map).

The existing berm is "grand parented" with regards to the RAR, and the new training berm will follow the footprint of the existing disturbance. The south extent of the new berm will extend outside of the footprint of the existing disturbance by 1-3 m in some sections; however the upgrade design of the training berm was accepted by the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) during the submission of the RAR assessment. Measures to prevent further disturbance in the setback area (as requested by FLNRO) will include placement of silt fencing at the boundary of the worksite to ensure that no construction debris or sediment laden water enters the setback. In addition, Cascade will ensure that no permanent impact is incurred during the upgrade of the training berm, and that the areas of intrusion will be revegetated with native riparian vegetation once works are complete where possible.

9. Engage environmental monitor to ensure the project does not impact 19 Mile Creek during construction.

Cascade was retained as the environmental monitor for the construction phase of the development. Cascade will ensure that no impact on 19 Mile Creek occurs during construction. Silt fences along 19 Mile Creek will be installed to ensure that no sediment laden water enters the creek. In addition, Cascade will conduct regular water quality monitoring to ensure that water quality in 19 Mile Creek remains within the acceptable guidelines.



CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

If you have any questions regarding this file, please contact me at our Whistler office.

Sincerely,

Dave Williamson, Principal

Adrien Baudouin, Biologist

APPENDIX G – McELHANNEY MEMORANDUM

November 2, 2016

Our File: 2113-03128-00

Lamoureux Architect Incorporated,
3392 Marine Drive,
West Vancouver, BC
V7V 1M9

Attention: Brad Lamoureux
Principal

Dear Brad,

Re: Flood Construction Level on District Lot 1756 Group 1 New Westminster District, Except Portions in Plans 12579 and 13114 - Civic address - 8020 Alpine Way, Whistler, BC

The flood construction level based Resort Municipality of Whistler Building Bylaw No. 303 was determined by establishing the elevations of Nineteen Mile Creek, Alta Creek and Green Lake. For both Nineteen Mile and Alta Creeks this was done by taking the average elevation of the present natural boundary as the creeks entered the property and where they met Green Lake. The critical elevations belong to Nineteen Mile Creek as the bylaw specifies "*no lower than 3 metres above the natural boundary of the Green River, Cheakamus River, Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek or Twenty-one Mile Creek*". I determined the average elevation of Nineteen Mile Creek to be 637.7 metres, therefore the Flood Construction Level is 640.7 metres or 2,102.0 feet.

If you have any questions, please contact the writer.

Sincerely,

McElhanney Consulting Services Ltd.



Brian O. Brown, BCLS
Project Land Surveyor

APPENDIX H- PLANNING AN ENTRY IN A FLOODPROOFED HOME

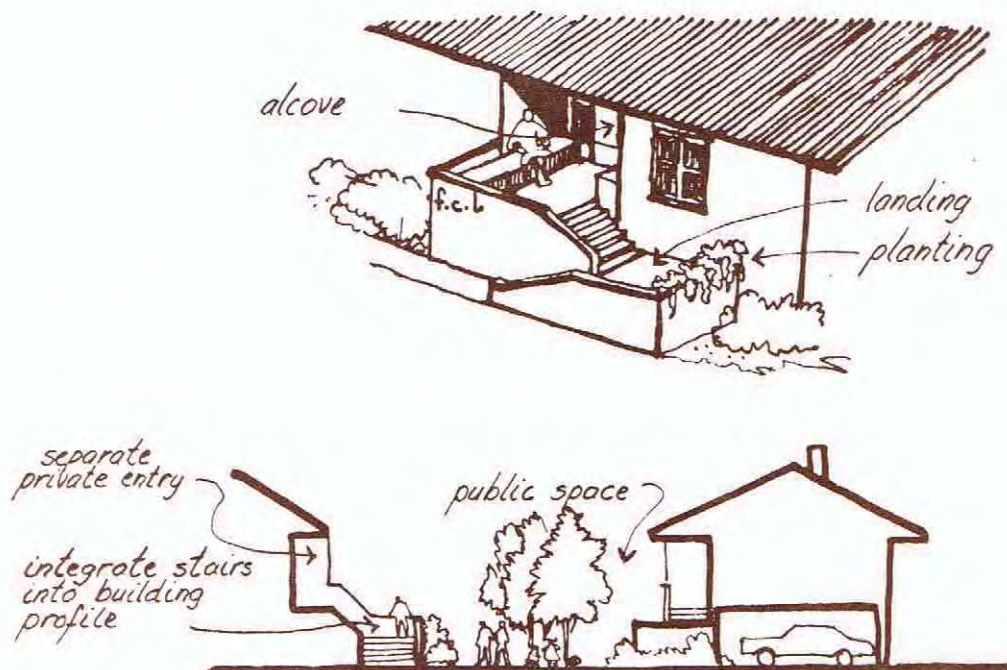
Planning an Entry into a Floodproofed Home

When a dwelling is raised above grade, entries take on greater significance as an area of transition from inside to outside the home. Entries may be situated above or below the Flood Construction Level; entries below the Flood Construction Level open into a non-floodproofed space, although they have the advantage of an indoor stair to areas above the FCL. Exterior stairs on the other hand, can add interest to the profile of the structure and help to integrate the building into the landscape.

1. Entries above FCL

Entries above the FCL require extra space outside the door to wait, park a stroller or shopping cart, put down parcels, etc. . . .

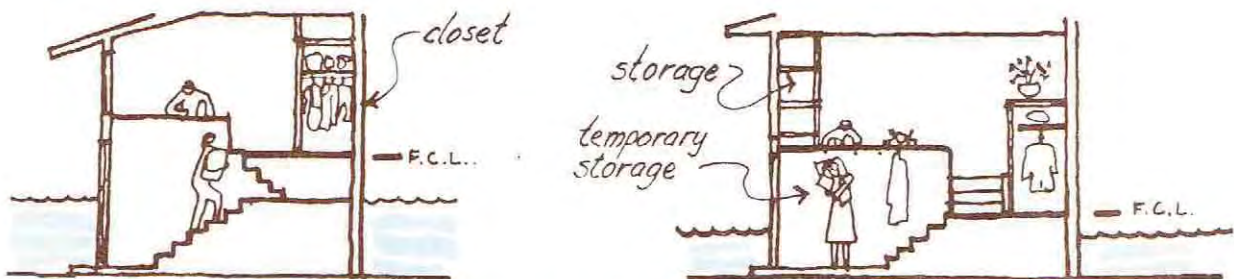
- situate entries as conveniently as possible to ease circulation from various parts of the home to outside
- provide an alcove or covered landing next to the entry door
- situate at least one entry close to parking
- ensure that functions such as mail delivery are accommodated as smoothly as possible
- an entry vestibule inside the house allows extra room for greeting, storage, etc.



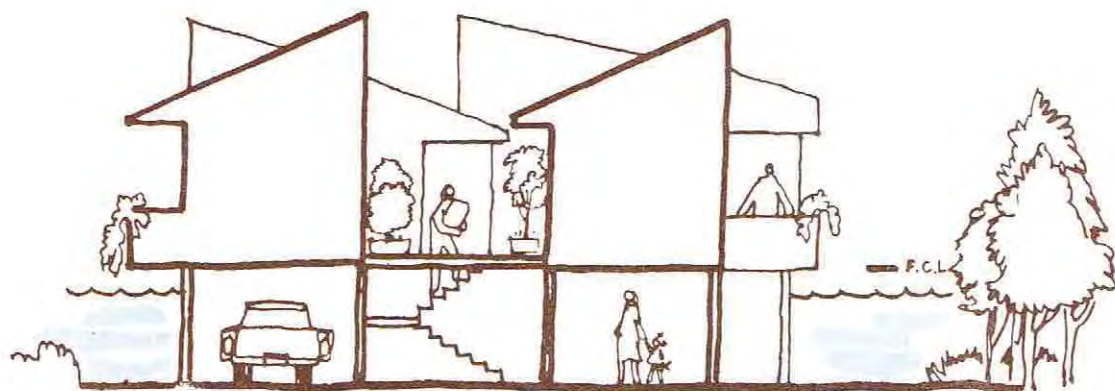
2. Entries below FCL

Depending on the height of the FCL an entry may be situated at the edge of the dwelling or underneath it (FCL's over 2 metres). Since this space is subject to flooding, permanent storage must be kept above the FCL.

- use flood resistant materials up to the FCL
- since these entries cannot be used during large floods, another means of access to space above the FCL should be provided.



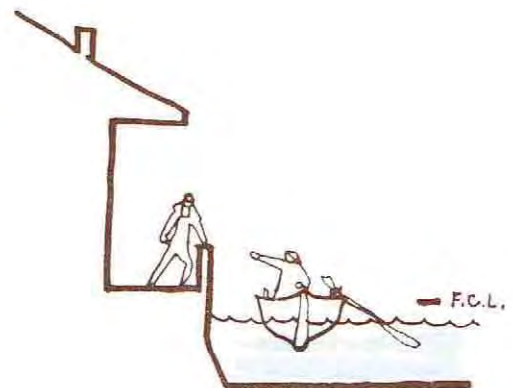
ENTRIES AT PERIMETER OF DWELLING



ENTRIES BENEATH DWELLING

3. Emergency Exit

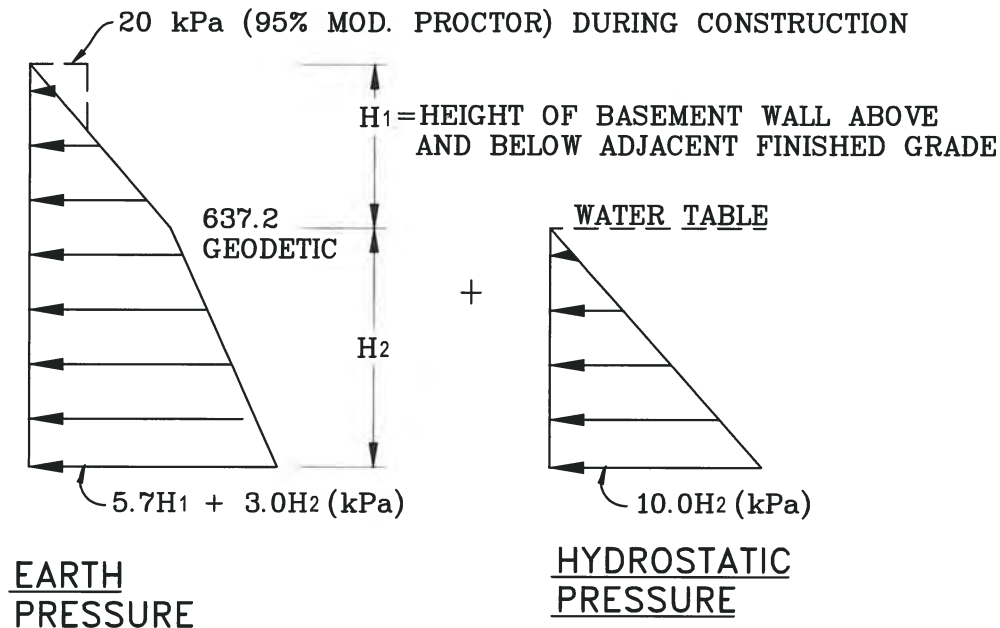
Where the site is subject to a rapid rise in flood depth, an emergency exit above the FCL should be provided.



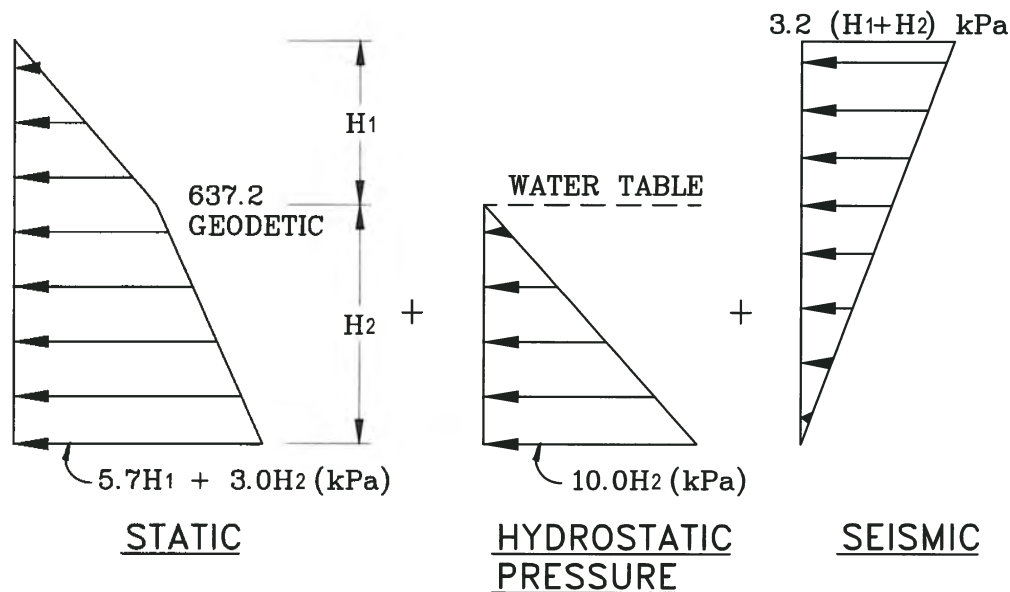
APPENDIX I – EXP SERVICES LATERAL LOADINGS

LATERAL LOADINGS ON FOUNDATION WALLS

CASE 1: STATIC CONDITIONS



CASE 2: STATIC + SEISMIC (WHERE APPLICABLE)



NOTE:
SURCHARGE
PRESSURE DUE
TO LIVE LOAD,
ADJOINING
STRUCTURES
ETC. TO BE
INCLUDED
WHERE
APPLICABLE

ASSUMPTIONS:

- TOP OF WALL FREE TO ROTATE 0.2% OF WALL HEIGHT
- LEVEL FREE DRAINING BACKFILL MATERIAL
- HORIZONTAL GROUND ACCELERATION = 0.29g
- BACKFILL UNIT WEIGHT = 20 kN/m³

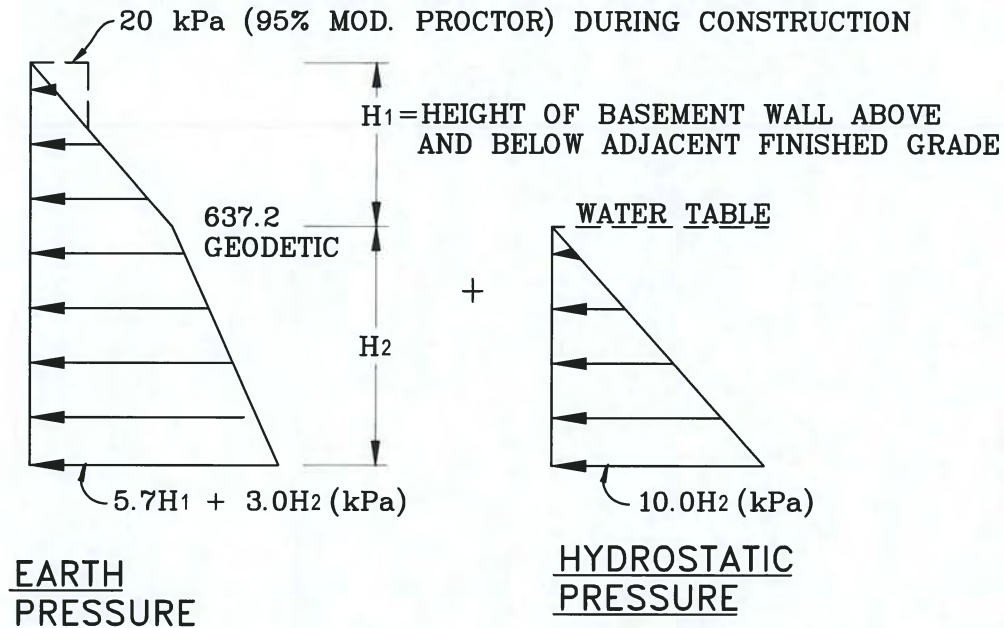
NOTE: ALL LOADS ARE UNFACTORED.



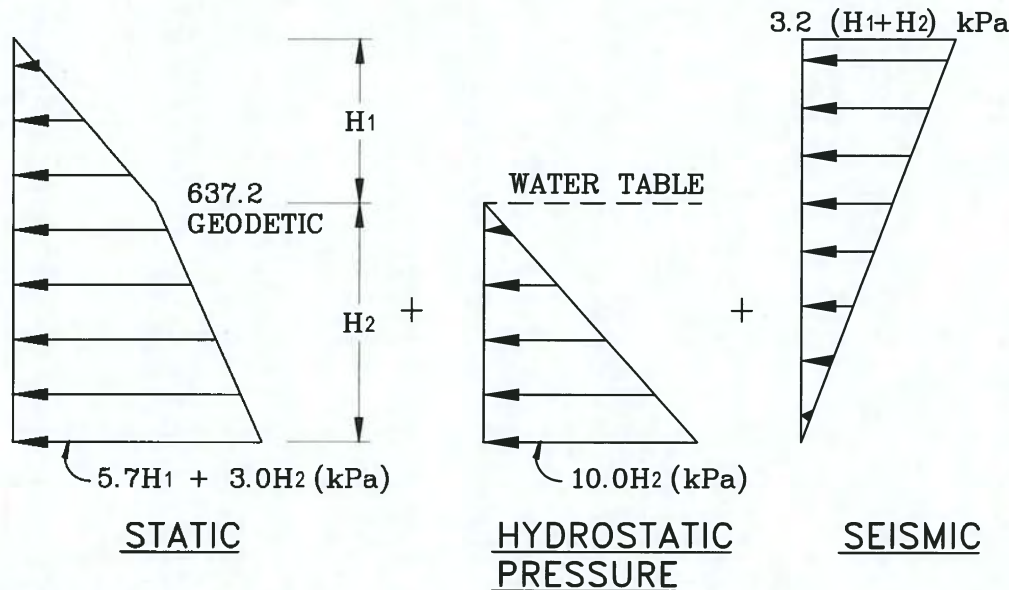
CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE BASEMENT WALL DESIGN			
PROJECT WHITE GLACIER - RESIDENCE WHISLTER, B.C.							
PROJECT NO. VAN-00226703-A0		DFTR. MG	DSGN. EGS	CHK. UC	DATE 2017-10-04	SCALE: NTS	DWG NO. FIGURE 1

LATERAL LOADINGS ON FOUNDATION WALLS

CASE 1: STATIC CONDITIONS



CASE 2: STATIC + SEISMIC (WHERE APPLICABLE)



NOTE:
SURCHARGE
PRESSURE DUE
TO LIVE LOAD,
ADJOINING
STRUCTURES
ETC. TO BE
INCLUDED
WHERE
APPLICABLE

ASSUMPTIONS:

- TOP OF WALL FREE TO ROTATE 0.2% OF WALL HEIGHT
- LEVEL FREE DRAINING BACKFILL MATERIAL
- HORIZONTAL GROUND ACCELERATION = 0.29g
- BACKFILL UNIT WEIGHT = 20 kN/m³

NOTE: ALL LOADS ARE UNFACTORED.



CLIENT				TITLE:			
TECK YUEN LEE				LATERAL EARTH PRESSURE BASEMENT WALL DESIGN			
PROJECT WHITE GLACIER - RECEPTION WHISLER, B.C.							
PROJECT NO.		DFT.	DSGN.	CHK.	DATE	SCALE:	DWG NO.
VAN-00226703-A0		MG	EGS	UC	2017-10-04	NTS	FIGURE 3

APPENDIX J – RMOW ZONING AND PARKING BY-LAW NO. 303, 2015

PART 5 General Regulations

1. Application

- (1) Except as otherwise specified in this Bylaw, the following regulations in this Part apply to all zones.

2. Intent Statements

- (1) The commentaries entitled "Intent" throughout this Bylaw do not constitute part of this Bylaw and are of no legal force or effect whatsoever. (Bylaw No. 380)

3. Auxiliary Buildings

- (1) The maximum permitted floor area for an auxiliary building per principal dwelling unit is as follows:
- (a) 70 square metres for detached dwelling or bed and breakfast use in the RS, RT, RTA and TB zones except as otherwise specified in this Bylaw; (Bylaw No. 464; Bylaw No. 905; Bylaw No. 916; Bylaw No. 1233; Bylaw No. 1435)
 - (b) 50 square metres for duplex dwellings in the RT and RTA zones, except as otherwise specified in this Bylaw; (Bylaw No. 464; Bylaw No. 905; Bylaw No. 1435)
- (2) Notwithstanding paragraph (1) (a), the maximum permitted gross floor area for an auxiliary building containing an auxiliary residential dwelling unit in an RS1, RS2, RS3, RI1 or RSE1 zone is 90 square metres. (Bylaw No. 1621) (Bylaw No. 1914)
- (3) Except as otherwise specified in this Bylaw, the maximum permitted floor area for an auxiliary building is 56 square metres in Multiple Residential, Tourist Accommodation, Tourist Pension and Rural Resource zones provided that for the purpose of this subsection, lands within a strata plan or bare land strata plan shall be deemed to be a single parcel. (Bylaw No. 464)
- (4) The maximum permitted height of an auxiliary building is 5 metres.
- (5) Subject to section 4 an auxiliary building is permitted to be sited not less than 3 metres from a side or rear parcel line.
- (6) An uncovered swimming pool or hot tub must be sited not less than 3 metres from a rear or side parcel line, and not less than 7.6 metres from a front parcel line. (Bylaw No. 1552)
- ### **4. Floodproofing Requirements (Bylaw No. 380)**
- (1) The purpose of these requirements is to reduce the risk of injury, loss of life, and property damage due to flooding and erosion. However, the Resort Municipality of Whistler does not represent to the owner or any other person that any building constructed or mobile home or unit located in accordance with the following requirements will not be damaged by flooding or erosion.

-
- (2) Notwithstanding any other provisions of this Bylaw, no building or any part thereof shall be constructed, reconstructed, moved or extended nor shall any mobile home or unit, modular home or structure be located: (Bylaw No. 916)
- (a) within 7.5 metres of the high water mark of a lake, swamp or pond; nor within 30 metres of the high water mark of Green River, Cheakamus River, Alta Creek (which is also known as the River of Golden Dreams), Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek, Twenty-one Mile Creek; (Bylaw No. 2071)
 - (b) within 30 metres of the high water mark of Fitzsimmons Creek, except where the building, mobile home or unit, modular home or structure is proposed to be located within Areas "A" and "B" outlined on Schedule "C"; (Bylaw No. 2071)
 - (c) within 7.5 metres from the inboard toe of the dyke or dyke right-of-way adjacent Fitzsimmons Creek where the building, mobile home or unit, modular home or structure is proposed to be located within Area "A" outlined on Schedule "C";
 - (d) within 15 metres of the high water mark of any other nearby watercourse; or (Bylaw No. 2071)
 - (e) with the underside of a wooden floor system or top of concrete slab of any area used by habitation, business, or storage of goods damageable by floodwaters, or in the case of mobile home or unit the ground level or top of concrete or asphalt pad on which it is located, lower than:
 - (i) elevation 640.5 metres Geodetic Survey of Canada datum (NAD 83) for locations adjacent to Alta Lake;
 - (ii) the Flood Construction level for Fitzsimmons Creek where it has been determined to the satisfaction of the Ministry of Environment, or lower than 3 metres above the high water mark of Fitzsimmons Creek where the Flood Construction Level has not been determined, except where the building, mobile home or unit, modular home or structure is proposed to be located within Areas "A," "B" and "C" outlined on Schedule "C";
 - (iii) 1 metre above the finished grade surrounding the building, 0.6 metres above the elevation of Fitzsimmons Road or Toni Sailer Lane, whichever is closer, or 0.6 metres above the lowest crown elevation of Nancy Greene Drive, whichever is highest, on lands which lie within Area "A" outlined on Schedule "C";
 - (iv) 3 metres above the high water mark of Fitzsimmons Creek, 1 metre above the finished grade surrounding the building, or 0.6 metres above the adjacent road crown elevation, whichever is highest, on lands which lie within Area "C" outlined in Schedule "C"; (Bylaw No. 2071)

-
- (v) 3 metres above the high water mark of the Green River, Cheakamus River, Whistler Creek, Sixteen Mile Creek, Nineteen Mile Creek or Twenty-One Mile Creek;
 - (vi) 1.5 metres above the high water mark of a lake, swamp or pond;
(Bylaw No. 2071)
 - (vii) 1.5 metres above the high water mark of any other watercourse;
(Bylaw No. 2071)
 - (viii) for any alluvial fan area, 1 metre above the finished grade surrounding the building, or as in subparagraphs (e) (i) through (vii), whichever elevation is higher; or
 - (ix) for the area shown crosshatched in Schedule "B", an elevation of 636.6 metres Geodetic Survey of Canada datum (NAD 83) or 1 metre above the finished grade surrounding the building.
- (3) Subparagraphs (2) (e) (i) through (vii) shall not apply to:
- (a) a renovation of an existing building structure used as a residence that does not involve an addition thereto; or an addition to a building or structure for residential use that would increase the size of the building or structure by less than 25 percent of the floor area existing on September 24, 1976;
 - (b) that portion of a building or structure to be used as a carport or garage; or
 - (c) light or heavy industrial development which is required to floodproof to the Designated Flood Level as determined by the Ministry of Environment.
- (4) The required elevation may be achieved by structural elevation of the said habitable, business, or storage area or by adequately compacted landfill on which any building is to be constructed or mobile home or unit located, or by a combination of both structural elevation and landfill. No area below the required elevation shall be used for the installation of furnaces or other fixed equipment susceptible to damage by floodwater.
- (5) Where landfill is used to achieve required elevations stated in paragraph (2) (e), no portion of the landfill slope shall be closer than the distances in paragraphs (2) (a), (b) and (d) from the high water mark, and the face of the landfill slope shall be adequately protected against erosion from floodwaters. (Bylaw No. 2071)
- (6) DELETED (Bylaw No. 1656)

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NOTES TO THE READER

This Issued for Use Report dated December 19, 2016 supersedes all previous LaCas Consultants Inc. Nineteen-Mile Creek Training Berm Final Design Reports prepared for the White Glacier Project, 8030 Alpine Way, Whistler, BC. Once the "Issued for Use Report" has been released by LaCas Consultants Inc. then all the drafts hardcopies or electronic media shall all be destroyed or erased.



LCI Water Resources Group

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2. DOCUMENTS REVIEWED OR REFERENCED	2
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4. HYDROLOGICAL ANALYSIS	4
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9. CONCLUSIONS AND RECOMMENDATIONS	10
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LIST OF APPENDICES

Appendix A - Location Map

Appendix B - Design Information

Appendix C - LCI Final Design Berm Drawings

1. INTRODUCTION

This report was prepared by LaCas Consultants Inc. (LCI) for Lamoureux Architect Incorporated (LAI) acting on behalf of Mr. Teck Yuen Lee, of White Glacier International Ltd, Singapore; herein below referred to as “the Client” relating to: District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114, Whistler, BC (the Property). See Appendix A- Figure 1 Location Map.

The Property is subject to flooding from Nineteen-Mile Creek. This report describes the hydrological analysis and hydraulic modeling carried out for the proposed extension and raising of the existing road and berm referred to in this report as the Nineteen-Mile Creek Training Berm. The purpose of this report is to be a design brief for the Nineteen-Mile Creek Training Berm. Final design parameters including depth of scour and minimum berm crest elevations are discussed in Section 8, Conclusions and Recommendation of this report and shown in LCI Drawings found in Appendix C (15-10-000/001/002/003), dated December 19, 2016. This final design parameters report dated December 19, 2016, for the proposed Nineteen-Mile Creek Training Berm supersedes any previous training berm design reports by LaCas Consultants Inc. for the Property.

A “dike” is defined as an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land, therefore the Nineteen-Mile Creek Training Berm is a dike.

The Nineteen-Mile Training Berm is defined as a “private dike” which is a dike built on private property without public funds to protect only the Property (District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114) of a person owning the private dike. The Property is only 1 lot and it understood by LCI that there is no planned subdivision in the future.

The Nineteen-Mile Creek Training berm alignment is generally setback about 30 m from the main stem of Nineteen-Mile Creek along the right overbank floodplain (looking downstream). A small stream was identified that would flow adjacent to the proposed Nineteen-Mile Creek Training Berm, however, due to typical channel avulsion processes on the alluvial fan the main channel in the future could conceivably change flow paths and flow adjacent to the proposed Nineteen-Mile Creek Training Berm.

2. DOCUMENTS REVIEWED OR REFERENCED

- Ministry of Environment, Lands and Parks, Water Management Division, A Design Brief on the Floodplain Mapping Study, Whistler Area, June 1992;
- Sigma Engineering Ltd., Proposed Subdivision of DL 1756 (Garrand Holding Ltd.) Flood Protection from Nineteen-Mile Creek, Green Lake and River of Golden Dreams (Alta Creek), June 1996;
- Dike Design Guidelines – Best Management Practices for British Columbia, Flood Hazard Management Section Environmental Protection Division Province of British Columbia, Ministry of Water, Land and Air Protection, July 2003;
- Simons, Li & Associates, Inc., 1985. Design Manual for Engineering Analysis of Fluvial Systems, Prepared for Arizona Department of Water Resources;
- Pemberton, E.L, and Lara, J.M., 1984. Computing Degradation and Local Scour, prepared for the U.S. Department of the Interior, Bureau of Reclamation, Publication Number 7-2090;
- West Consultants Inc., 2003. Predicting Bed Scour for Toe Protection Design in Bank Stabilization Projects;
- Ministry of Sustainable Resource Management, Streamflow in the Lower Mainland and Vancouver Island, April 2003;
- Ministry of Environment, Land and Parks, Water Management Division, A Design Brief on the Floodplain Mapping Study, Whistler Area, June 1992; and
- Ministry of Environment, Water Management Branch, Whistler Area Peak Flows, September 1989.

3. SCOPE OF WORK

The following is the scope of work for this report:

- site visit to the Property to obtain site information such as existing channel conditions and watershed characteristics;
- provide instructions to Doug Bush Survey Services Ltd. (DBSS) for the channel cross section survey along Nineteen-Mile Creek;
- compilation of all available information obtained from site visit (notes/maps/photos);
- search and collect relevant mapping information for hydrological analysis;
- determination of required catchment areas for the study;
- hydrological analysis to determine design flood flows for Nineteen-Mile Creek;
- hydraulic model development for the study reach of Nineteen-Mile Creek based on survey data provided by DBSS, dated June 2015;
- sensitivity analysis of the hydraulic models and preparation of result summary;
- carry out 1-D hydraulic water surface profile modeling of Nineteen-Mile Creek in order to determine the water surface profiles of the 2, 5, 10, 20, 50, 100 and 200-year floods and the interaction with the 200-year Green Lake level;
- applying climate change factors to the Nineteen-Mile Creek hydrological analysis and hydraulic modeling;
- carry out a flood and erosion transfer of risk assessment;
- determination of minimum berm crest recommendations for the proposed Nineteen-Mile Creek Training berm;
- carry out reviews of berm alignment for Stream Protection Environmental Area and discussions with the project environmental consultant;
- carry out discussions with LAI, project team, RMOW, and the Province of British Columbia regarding the private dike issues and regulation;
- carry out review of sheetpile and lock-block revetment applications suggested by geotechnical engineer;
- carry out review of environmental concerns with respect to the tributary channel adjacent to the berm and alternative methods for providing erosion/scour protection;
- review of augerhole data provided by Exp Services Inc. and determination of scour elevation along the berm;
- discuss with RMOW the requirements for maintenance ROW setback for berm and operation and maintenance issues;
- preparation of LCI final design drawings for the Nineteen-Mile Creek Training;
- review of civil engineering road/berm construction drawings with respect to flood control;
- provide recommendations for the design and construction of the Nineteen-Mile Creek Training Berm; and
- provide a final berm design report sealed by a Professional Engineer qualified in flood control for the Client, project environmental consultant, and the Resort Municipality of Whistler.

4. HYDROLOGICAL ANALYSIS

Watershed Characteristics

The Property is located within the floodplain of Nineteen-Mile Creek, which flows along the northern boundary of the Property. Nineteen-Mile Creek has a total catchment area of about 15 km². The elevation of the watershed ranges from EL. 2,260 m to EL. 740 m. The total main channel length of Nineteen-Mile Creek is about 7 km.

Hydrometric Data

The regional hydrometric stations used in this study are listed in Table 1. There is no long-term historical streamflow record available on Nineteen-Mile Creek. Historical hydrometric data was obtained from the Water Survey of Canada to characterize the hydrology of the study area. A total of 15 stations were selected in the study in view of their proximity to site, relatively long period of record and comparable range of drainage area size. The floods on Nineteen-Mile Creek may occur in autumn (October and November) due to intense rainstorms (also rain-on-snow) or in the summer (usually July) due to snowmelt.

Table 1: Regional Hydrometric Stations

STATION ID	STATION NAME	DRAINAGE AREA (KM ²)
08GA023	RUBBLE CREEK NEAR GARIBALDI	74.1
08GA024	CHEAKAMUS RIVER NEAR MONS	287
08GA054	MAMQUAM RIVER ABOVE MASHITER CREEK	334
08GA056	SENTINEL CREEK ABOVE GARIBALDI LAKE	5.7
08GA057	MASHITER CREEK NEAR SQUAMISH	38.9
08GA064	STAWAMUS RIVER BELOW RAY CREEK	40.4
08GA071	ELAHO RIVER NEAR THE MOUTH	1200
08GA072	CHEAKAMUS RIVER ABOVE MILLAR CREEK	297
08GA075	MAMQUAM RIVER ABOVE RING CREEK	284
08MG003	GREEN RIVER NEAR PEMBERTON	855
08MG004	GREEN RIVER NEAR RAINBOW	195
08MG006	RUTHERFORD CREEK NEAR PEMBERTON	179
08MG007	SOO RIVER NEAR PEMBERTON	283
08MG021	TWENTYONE MILE CREEK AT 670 M CONTOUR	28.2
08MG026	FITZSIMMONS CREEK BELOW BLACKCOMB CREEK	89.7

Design Flood Flow Estimation

A regional analysis was performed to determine the design flood flows for Nineteen-Mile Creek. The regional analysis involves frequency analyses of regional hydrometric data and determination of the relationship between the unit peak discharge and the size of drainage area. The regional analysis in this case involves the application of an index flood method. Refer to Appendix B Design Information.

Flood frequency analyses were conducted for the selected regional hydrometric stations using HYFRAN. To make use of all available peak flow data, the maximum instantaneous flow records were extended by applying an average maximum instantaneous to maximum daily flows for the three largest floods at the stations. The distributions providing the best fit to the extended data records were selected in estimating the floods for various return periods at the stations. Results of the frequency analyses were then used in the index flood method, which determines a relationship between the unit mean annual discharge, usually with a return period of 2.33 years, and drainage area.

An envelope curve was then drawn to determine the unit mean annual discharge at site. In this case, one envelope curve was developed using maximum instantaneous data, and a second envelope curve was developed using maximum daily data. Both curves were considered in the determination of the flood flows. The median ratios of floods for various return periods to the mean annual flood were calculated from the regional flood frequency analysis. A regional maximum instantaneous to maximum daily flow ratio of 2 was applied to the flood flows estimated using the second envelope curve.

As part of the flood flow estimation, a station frequency analysis using the peak flow data at the Twenty-One Mile Creek station with 8 years of record and Fitzsimmons Creek station with 17 years of record was performed. These two stations are located relatively close to the project site. However, it should be noted that estimated flood flows from the Fitzsimmons Creek peak flow data were relatively low compared to other methods applied, likely due to the fact that the dataset is lack of data for years with larger floods. The Fitzsimmons Creek station was established in 1993, and it is a relatively new station compared to other regional stations. Large floods prior to 1993 and the 1997 flood event were not recorded. Therefore, results from the Fitzsimmons Creek station were not considered in the final peak flow estimation.

As an overall check of the flood flow estimates calculated from the above methods, two other references were used for comparison purposes: 2003 Streamflow in the Lower Mainland (for hydrologic zone 26/27) and Vancouver Island and 1989 Whistler Area Regional Study. The 2003 regional streamflow study was prepared by the Ministry of Sustainable Resource Management for the south coastal area of the Province (hydrologic

zones 25 to 29). In particular, the 10-year peak flow curves were derived in the form of a log-log graph with plots of unit annual peak discharge (L/s/km^2) versus drainage area (km^2).

The 1989 Whistler Area Regional Study carried out by the Ministry of Environment was used in the 1992 Floodplain Mapping Study for the Whistler Area prepared by the Water Management Division of the Ministry of Environment, Lands and Parks. Frequency analyses using regional streamflow data was performed as part of the 1989 study and the associated results are the 20-year and 200-year peak flows at various locations along Millar Creek and Alta Creek. Such peak flow estimates were transposed to the project site for comparison purposes.

Results of the flood flow estimation using the above methods were compared and analyzed. It was determined that Envelope Curve 1 and Envelope Curve 2 developed in the current study, station frequency analysis using the Twenty-One Mile Creek station, the 2003 streamflow analysis and the 1989 Whistler Area regional study should be considered in the development of the peak flows at the project site. Where applicable, the average of the estimated flood flows derived from these various methods were used as the recommended flood estimates for the current study.

In view of the likelihood of a debris flood on Nineteen-Mile Creek, a common bulking factor of 2 times was applied to the estimated 200-year maximum instantaneous flood flow of Nineteen-Mile Creek clear-water flood to account for a debris flood. Debris floods are characterized by a combination of bedload movement, suspended sediment load, and floating organic debris. The movement is part of the flood process in which the flow behaves as a water flood rather than a hill slope process such as a debris flow or/channelized landslide. Bulking factors could range from 2 to 5 times the clear-water flood, however a bulking factor of 2 is representative of the expected debris flood generated on Nineteen-Mile Creek.

The resulting recommended 200-year design flood flow is $148 \text{ m}^3/\text{s}$ (without climate change factors).

The peak flood estimates for various return periods in the vicinity of the Property are tabulated in Table 2. See Appendix B for detailed support information.

Table 2: Nineteen-Mile Creek Flood Return Periods

RETURN PERIOD (YEARS)	NINETEEN-MILE CREEK
2	57
5	78
10	91
20	102
50	116
100	128
200	148

*A bulking factor of 2 was applied to take into account debris floods on Nineteen-Mile Creek.

The risk of at least one occurrence of the 200-year flood on Nineteen-Mile Creek in the next 5 years is 2.5%, in the next 10 years is 4.9% and the in next 30 years is 14%.

5. HYDRAULIC MODEL

Hydraulic Model Development

The HEC-RAS water surface profile model, Version 4.1.0, developed by the Hydrologic Engineering Center was used for the hydraulic analysis of Nineteen-Mile Creek.

A total of 18 channel cross sections were surveyed and provided by the Doug Bush Survey Services Ltd. dated June 2015. This survey information included bridge deck elevations at three locations: Valley Trail Bridge, Highway Bridge and High School Bridge. The total length of the study reach is approximately 640 m, with the most upstream cross section located about 465 m upstream of the Property and the most downstream cross section located at Green Lake. For the training berm design sections 2 through 7 were used.

The upstream boundary condition was defined as the normal depth associated with the channel slope. The downstream boundary condition was specified as the 200-year water level in Green Lake of El. 635.6 m, which is the same elevation applied in the flood maintenance management of Fitzsimmons Creek. Based on site observations, available references and results of a sensitivity analysis, a main channel roughness of 0.045 was applied in this case while a roughness of 0.14 was applied for the forested floodplain area.

Five model scenarios were analyzed for Nineteen-Mile Creek:

- existing conditions;
- proposed training berm along the Nineteen-Mile Creek and extended to Green Lake (30 m setback);

- avulsion occurred downstream of Alpine Way;
- 50% blockage at the High School Bridge; and
- 50% blockage at the Highway Bridge.

In particular, a summary of the hydraulic model results at the Property for the proposed training berm scenario is provided in Table 3. It should be noted that the Flood Construction Level (FCL) was determined at each cross section based on the 200-year water surface elevation plus 0.6 m of freeboard for model uncertainties and 0.1 m of additional freeboard to take into account climate change. The design flow was increased by 10%, in accordance with APEGBC guidelines which resulted in which resulted in a corresponding increase in water level about 0.1 m.

The proposed training berm, which extends from modeled channel cross section 7 to modeled channel cross section 2, should have a minimum berm crest elevation equal to the FCLs determined along Nineteen-Mile Creek or 1.5 m above the existing adjacent grade (in the case of the existing entrance road and historical fill materials), whichever is the greater.

Table 3: Results of Hydraulic Analysis for Nineteen-Mile Creek (148 m³/s)

Modeling Channel Section	Water Surface Elevation	Average Channel Velocity	Minimum Berm Crest Elevation
No.	EL. (m)	(m/s)	(m)
XS 7	645.0	6.3	645.7
XS 6	643.9	3.4	644.6
XS 5	642.4	4.5	643.2
XS 4	639.8	3.0	640.6
XS 3	637.0	4.4	638.0
XS 2	635.7	3.3	636.9

6. SCOUR AND EROSION PROTECTION

As part of the current assignment, a general scour analysis for Nineteen-Mile Creek was performed using three scour depth analysis methods. The equations used in the three methods are found in Appendix B. Results from the HEC-RAS hydraulic model of Nineteen-Mile Creek such as the mean channel velocity, flow depth, energy slope, flow area and channel top width were extracted and applied to the above general scour equations. In particular, the design flood discharge equivalent to the 200-year flood of 148 m³/s was used in the scour depth calculations. The mean grain size of material in Nineteen-Mile Creek was determined to be 0.6 mm based on available information provided in the geotechnical report prepared by EXP Services Inc. dated May 2016. The average scour depths calculated

using the three methods at each modelled channel cross section in the vicinity of the proposed training berm were determined and summarized in Table 4.

Table 4: Nineteen-Mile Creek Estimated Scour Elevation

Modeling Channel Section	V_{chl}	Y_s	Min. Channel Elev.	Estimated Scour Elevation¹	Min. Berm Crest Elev.	Elev. Diff.²
No.	(m/s)	(m)	(m)	(m)	(m)	(m)
XS 7	6.3	0.6	643.6	643.0	645.7	2.8
XS 6	3.4	1.1	642.1	641.0	644.6	3.6
XS 5	4.5	1.1	641.2	640.1	643.2	3.1
XS 4	3.0	1.2	637.9	636.7	640.6	3.9
XS 3	4.4	1.3	635.8	634.5	638.0	3.5
XS 2 ³	3.3	1.2	633.6	632.4	636.9	4.5

1. Mean grain size of material used in the scour depth analysis = 0.6 mm as per EXP Services Inc. sieve analysis dated May 20, 2016 for AH16-01 S6 @ 5.8 m Test No. 5. (Appendix B).
2. Elevation difference between the minimum berm crest elevation and the scoured bed elevation.
3. The scour depth of 1.2 m is recommended for the Flood Wall portion of the berm XS2 which reflects the maximum range of the scour calculations (Blench).

7. CONCRETE FLOOD WALL

The training berm transitions into a concrete Flood Wall of approximately 46 lineal metres at the downstream end of the training berm. The purpose of this Flood Wall is to provide protection against flooding, erosion and scour for the proposed Studio Building to be located at the downstream terminus of the training berm (near Green Lake).

The scour modeling was reviewed and an additional scour depth of 0.4 m has been added increasing the scour depth to 1.2 m for the Flood Wall portion of the training berm which represents the maximum range of the scour depths (Blench). This maximum scour depth is shown for the Flood Wall in LCI Drawings dated December 19, 2016.

- The Flood Wall (designed and constructed by others) should:
- be structurally designed to withstand hydrostatic pressure including lateral and uplift;
- be structurally designed to withstand hydrodynamic forces including log ramming;
- be seismically designed;
- be constructed out of waterproof concrete;
- be constructed with footings below maximum scour depth of El. 632.4 m.
- have a service life of the any flood walls to be greater than the Studio Building;
- account for estimated settlement during the service life of the Studio Building;

- have no wall piercings by pipes or services;
- have all concrete joints sealed to be waterproof; and
- have all certifications by qualified Professional Engineers to be submitted to the Resort Municipality of Whistler

8. TRANSFER OF FLOOD AND EROSION RISK

The “transfer of risk” is defined as the scenario when changes are made at one location on a watercourse and/or floodplain that results in a measurable increase in flood or erosion risk elsewhere during the design flood. The transfer of risk of flood with and without the Nineteen-Mile Creek Training berm is limited to its existing floodplain within the Property therefore there is no transfer of flood risk or erosion from the proposed Nineteen-Mile Creek Training Berm to third party properties.

9. CONCLUSIONS AND RECOMMENDATIONS

1. This report is based on the existing topographic conditions for Nineteen-Mile Creek provided by Doug Bush Survey Services Ltd., 2015 land/creek survey, civil engineering information from Creus Engineering Ltd. dated June 23, 2016, and augerhole information from EXP Services Inc. dated April 13, 2016.
2. The purpose of the Nineteen-Mile Creek Training Berm is to train 200-year peak flood flows in Nineteen-Mile Creek past the development area of the Property into Green Lake. The risk of at least one occurrence of the 200-year flood on Nineteen-Mile Creek in the next 5 years is 2.5%, in the next 10 years is 4.9% and the in next 30 years is 14%.
3. The proposed Nineteen-Mile Creek Training Berm is defined as a Private Dike owned by the Property owner. The operation and maintenance and upkeep of the Private Dike will be the sole responsibility of the landowner. If the property is subdivided or is transferred to public lands in the future, then the berm would require adjudication pursuant to the BC Dike Maintenance Act.
4. The proposed Nineteen-Mile Creek Training Berm crest elevations including the access road raising are based on 200-year flood levels plus a climate change factor and freeboard. A total freeboard of 0.7 m was applied to the 200-year water surface profile resulting from the hydraulic modeling. The recommended minimum Nineteen-Mile Creek Training berm crest elevations are illustrated in Table 3 and on the berm profile found in Appendix C, LCI Final Design Berm Drawings, dated November 19, 2016.

5. The existing Nineteen-Mile Creek Training Berm upstream of the Highway 99 Bridge shall be maintained adequately and any debris blocking the waterway opening of the Highway 99 Bridge, and/or the High School Bridge on Nineteen-Mile Creek shall be cleared immediately in an environmentally responsible manner with approval by the appropriate concerned government agencies. Any logjams within Nineteen-Mile Creek located on the Property, shall be removed immediately by the owner of the Property, in an environmentally responsible manner with approval by the appropriate concerned government agencies.
6. No area used for habitation or any structures shall be located on the river side of the Nineteen-Mile Creek Training Berm.
7. There shall be no bridges, dams or any other hydraulic structures installed on Nineteen-Mile Creek without the certification by a Professional Engineer (Hydrotechnical).
8. The minimum recommended crest height of the Nineteen-Mile Creek Training Berm and Flood Wall above the surrounding ground shall be 1.5 m.
9. The recommended minimum Nineteen-Mile Creek Training Berm estimated scour elevations are illustrated in Table 4 and on the berm profile found in Appendix C, LCI Final Design Berm Drawings dated November 19, 2016.
10. It is recommended that the Nineteen-Mile Creek Training Berm be designed for seismic forces by a qualified Professional Engineer (Geotechnical). The training berm would be subject to earthquake damage and any damage to the berm shall be repaired immediately to provide the design flood protection.
11. A rock stack wall or Lock-Block arrangement shall be designed by a qualified Professional Engineer (Geotechnical) is proposed for both the river side and land side of the training berm. This revetment shall be designed by a qualified Professional Engineer (Geotechnical) to provide adequate stability to the berm as well as seepage control.
12. A minimum crest width of the Nineteen-Mile Creek Training Berm (not including the Flood Wall portion) of 4 m not including river side bank protection works is recommended to provide long-term access for construction, inspection and maintenance of the berm erosion/scour protection and maintaining the berm crest.
13. Where the training berm transitions into a concrete Flood Wall of approximately 46 lineal metres at the downstream end of the training berm. The purpose of this Flood Wall is to provide protection against flooding, erosion and scour for the proposed Studio Building (designed by others) to be located at the downstream terminus of the training berm (near Green Lake).

14. The Flood Wall (designed and constructed by others) should:
- i. be structurally designed to withstand hydrostatic pressure including lateral and uplift;
 - ii. be structurally designed to withstand hydrodynamic forces including log ramming;
 - iii. be seismically designed;
 - iv. be constructed out of waterproof concrete;
 - v. be constructed with footings below maximum scour depth of El. 632.4 m.
 - vi. have a service life of the any flood walls to be greater than the Studio Building;
 - vii. account for estimated settlement during the service life of the Studio Building;
 - viii. have no wall piercings by pipes or services;
 - ix. have all concrete joints sealed to be waterproof; and
 - x. have all certifications by qualified Professional Engineers to be submitted to the Resort Municipality of Whistler.
15. The Estimated Scour Elevation has been applied to the proposed extension of the berm not the existing entrance road which has existing rock riprap erosion and scour protection works to protect the roadway. The current condition of the existing rock riprap was inspected and deemed acceptable to LaCas Consultants Inc., however inspections of the berm, and berm bank protection works shall be carried out and reported on by a qualified Professional Engineer (Hydrotechnical) annually and after any significant flood event on Nineteen-Mile Creek.
16. The crest of the Nineteen-Mile Creek Training Berm shall be sloped or cambered to promote drainage and minimize surface ponding. All services should be located prior to final design and construction. If services are required to be installed within the training berm a qualified Professional Engineer (Geotechnical) shall certify that the Nineteen-Mile Creek Training Berm is stable with installed services and meets the original design specifications discussed in this report and shown in LCI Drawings found in Appendix C (15-10-000/001/002/003, dated November 19, 2016).
17. A qualified Professional Engineer (Geotechnical) shall certify that the existing ground under the proposed training berm alignment is adequate for the foundation of the berm, otherwise the qualified Professional Engineer (Geotechnical) shall recommend proper engineering solutions for the training berm foundation.
18. All plantings and vegetation configurations on the berm shall be in accordance with the "Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (MELP, DFO, 1999). A qualified Professional Biologist shall approve all plantings. No future planting of trees or shrubs is to be undertaken without the written approval of a qualified Professional Engineer (Hydrotechnical) and qualified Professional Biologist.

19. The Nineteen-Mile Creek Training Berm crest shall be constructed higher to account for estimated settlement in the next 30 years, to be confirmed by a qualified Professional Engineer (Geotechnical) prior to completion of construction. Notwithstanding, settlement should be periodically inspected by a qualified Professional Engineer (Geotechnical) and rectified by the Property owner as soon as possible.
20. Nineteen Mile Creek Berm including the Flood Wall is recommended to be a private dike for the service life of the Studio Building located at the downstream terminus of the training berm.
21. Interior drainage ditch adjacent to the land side of berm should be lined with 150 mm thick clean gravel or non-woven geo-textile filter fabric overlain with 10kg Class Rock Riprap (0.35 m thick) at direction of a qualified Professional Engineer (Geotechnical). The interior ditch shall be setback from the toe of the interior slope of the berm at the direction of a qualified Professional Engineer (Geotechnical). This ditch location shall also be reviewed by the qualified Professional Biologist.
22. A qualified Professional Engineer (Geotechnical) shall certify that the berm is constructed adequately to handle anticipated seepage through the Nineteen-Mile Creek Training Berm.
23. The constructed scour protection will be subject to review by LaCas Consultants Inc. based on the recommendations by EXP Services Inc. with respect to subsurface soil conditions during construction. If subsurface soil conditions change from EXP Services Inc.'s, Augerhole AH16-01 then scour protection will be altered to suit the conditions with LaCas Consultants Inc.'s and EXP Services Inc.'s written permission. The contractor shall not bury the scour protection without LaCas Consultants Inc.'s and EXP Services Inc.'s permission.
24. To ensure a safe design, LaCas Consultants Inc. must be able to confirm design assumptions and revise the Nineteen-Mile Creek Training Berm design if unanticipated conditions are encountered. Construction review is mandatory by LaCas Consultants Inc. in order to ensure that the construction work complies with the plans and specifications and meets standards of good workmanship. Therefore, construction inspection of a Nineteen-Mile Creek Training Berm design is required by LaCas Consultants Inc. at critical construction periods of the berm construction. Final certification of the Nineteen-Mile Creek Training Berm by LaCas Consultants Inc. is mandatory, otherwise LaCas Consultants Inc. will not accept responsibility for the completed construction of the berm.
25. Construction of habitable areas above the foundation of the habitable areas, (including any space or room within a building or structure, including a manufactured home or unit and a modular home or unit, which is used or is capable of being used for human occupancy or industrial, business or commercial use, or storage of goods, including equipment and

furnaces), which is susceptible to damage by floodwaters, shall be not constructed on the land side the Nineteen-Mile Creek Training Berm until the Nineteen-Mile Creek Training Berm has been completed and approved by LaCas Consultants Inc. in writing.

26. Final certification of the Nineteen-Mile Creek Training Berm by LaCas Consultants Inc. is mandatory prior to occupancy of any habitable areas on the Property.
27. Workers, site works, services, excavations, foundations, construction equipment, and/or construction offices/facilities on the Property, shall be adequately protected against floodwaters, and is the responsibility of the construction contractor.
28. An Operation and Maintenance manual for the Nineteen-Mile Creek Training Berm shall be prepared and sealed by a Professional Engineer (Hydrotechnical).
29. Construction of the Nineteen-Mile Creek Training berm will be subject to all environmental laws and subject to pertinent environmental approvals. All work in and about a stream shall not detrimentally affect the environment or fish & wildlife values.
30. The original sealed hardcopy of this report shall be submitted to the Resort Municipality of Whistler.

All elevations are metres above sea level, based on the Geodetic NAD83 derived from Monument No. 95HA141 located on NW Highway Bridge abutment over the River of Golden Dreams (Alta Creek) (Elevation = 636.339 m).

10. CLOSURE AND LIMITATIONS

This document has been prepared by LaCas Consultants Inc. for the Property described as 8030 Alpine Way, Whistler, BC, District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114, Whistler, BC, Canada only; under its Standard Terms and Conditions for the exclusive use of the Client. LaCas Consultants Inc. is only responsible for the hydrotechnical engineering relating to the Nineteen-Mile Creek Training Berm (Private Dike).

No other party other than White Glacier International, Lamoureux Architect Incorporated, Doug Bush Survey Services Ltd., EXP Services Inc., EVR-Fine Homes, Creus Engineering Ltd., and the Province of British Columbia, Resort Municipality of Whistler is entitled to rely on any of the conclusions, data, opinions, or any other information in whole or in part which is contained in this document for this project only and no other project.

In order to properly understand the suggestions, recommendations and opinions expressed in this document, reference must be made to the whole of the document. LaCas Consultants Inc. cannot be responsible for use by any party of portions of the document without reference to the whole document.

This document is the intellectual property of LaCas Consultants Inc. LaCas Consultants Inc. upon discovery of an unauthorized party using or anyone unauthorized to distribute this document in whole or in part, reserves the right to seek damages through the full extent of the law.

This document represents LaCas Consultants Inc.'s best professional judgment based on the information available at the time of its completion and as appropriate for the project scope of work.

Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practising under similar conditions.

In accepting this report, the Client (Property owner: Mr. Teck Yuen Lee, of White Glacier International Ltd., 1890 Ocean Drive, Singapore, 098454), and any future owner of the Property or future owner of any subdivision of the Property agrees notwithstanding the availability of any insurance, the Client agrees that any and all claims which the Client may have against LaCas Consultants Inc., its employees, officers, agents, representatives, and sub-consultants in respect of the services in howsoever arising, whether in contract, tort, breach of statutory duty or based on any other cause of action, shall be absolutely limited, individually and in the aggregate, to an amount equal to the amount of fees paid to LaCas Consultants Inc. for the White Glacier project, Whistler, BC, Canada. This provision survives performance and termination of this agreement. Use of this report is subject to LaCas Consultants Inc.'s Standard Terms and Conditions.

The Client and any future purchaser agrees that the liability of LaCas Consultants Inc. shall expire 2 years after the date of substantial completion of the Nineteen-Mile Creek Training Berm project. The Client further agrees that the employees, shareholders, officers and directors of LaCas Consultants Inc. shall have no personal liability to the Client in respect to any claim, accordingly the Client agrees that it will bring no proceedings and take no action in any court of law against such individuals and their personal capacity.

When LaCas Consultants Inc. submits both electronic file and hardcopies of this document including drawings and other documents and deliverables (LaCas Consultants Inc.'s instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by

Seal (not electronically scanned) shall be the original documents of record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by LaCas Consultants Inc. shall be deemed to be the overall original for the project. LaCas Consultants Inc. agrees to ensure that the Client has a sealed copy of the overall original archived report and drawings for the project and no changes will be made to the archived version of this report dated November 3, 2016 unless permission is received in writing by the Client or the Client's representative.

Prepared by:



Brian LaCas, P.Eng, Senior Hydrotechnical Engineer
LaCas Consultants Inc.

APPENDIX A – LOCATION MAP



FIGURE 1
LOCATION MAP

APPENDIX B – DESIGN INFORMATION

B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 1)

B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT

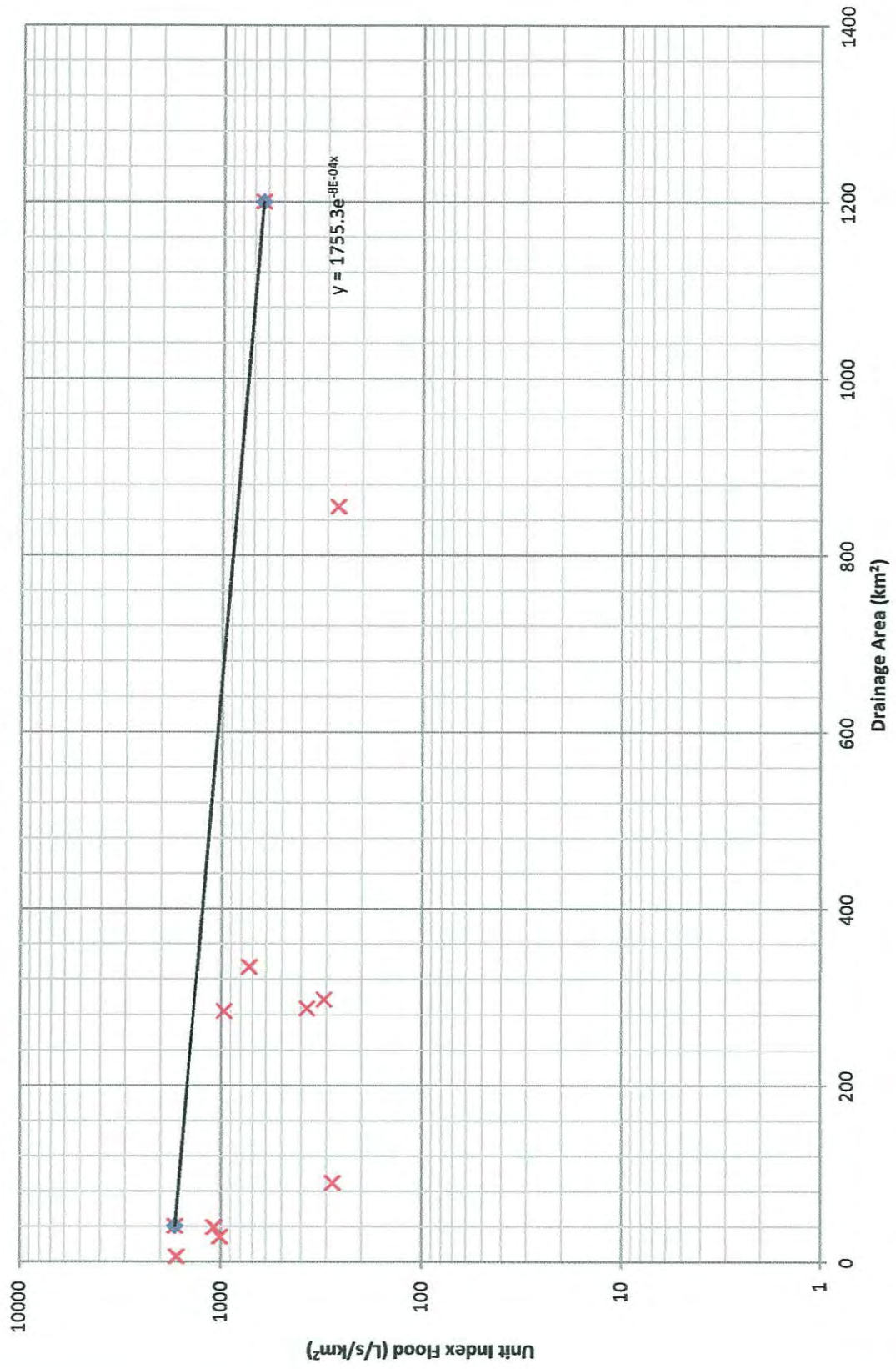
B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

B6 - SCOUR DEPTH CALCULATIONS

B7 - EXP SERVICES INC. AUGERHOLE: AH16-01

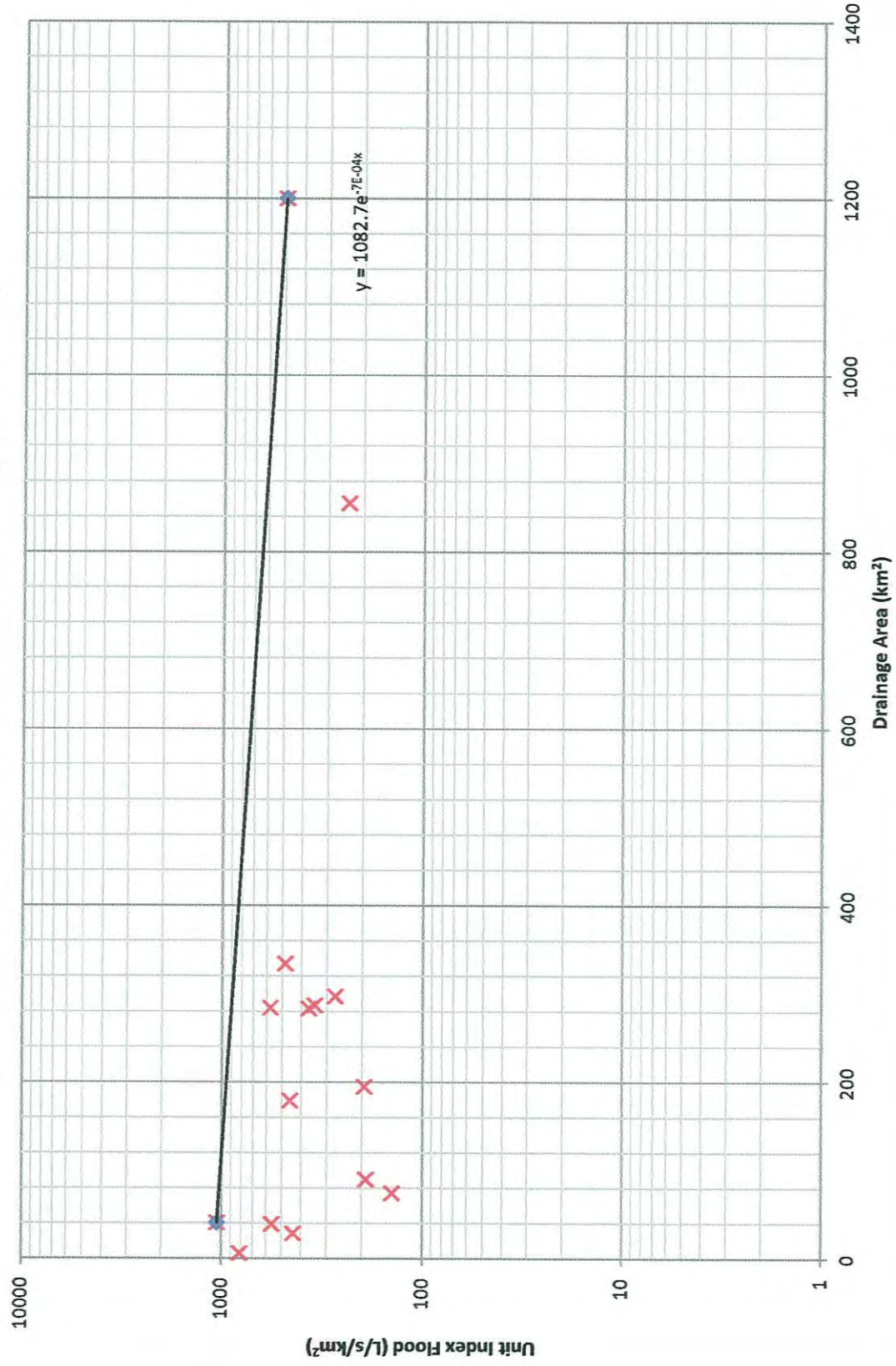
B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE)

Unit Index Flood vs. Drainage Area (Envelope Curve 1 Using Maximum Instantaneous Flow Data)



B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

Unit Index Flood vs. Drainage Area (Envelope Curve 2 Using Maximum Daily Flow Data)



B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

PEAK FLOW IN THE LOWER MAINLAND REGION 10-Year Peak Flow Curves

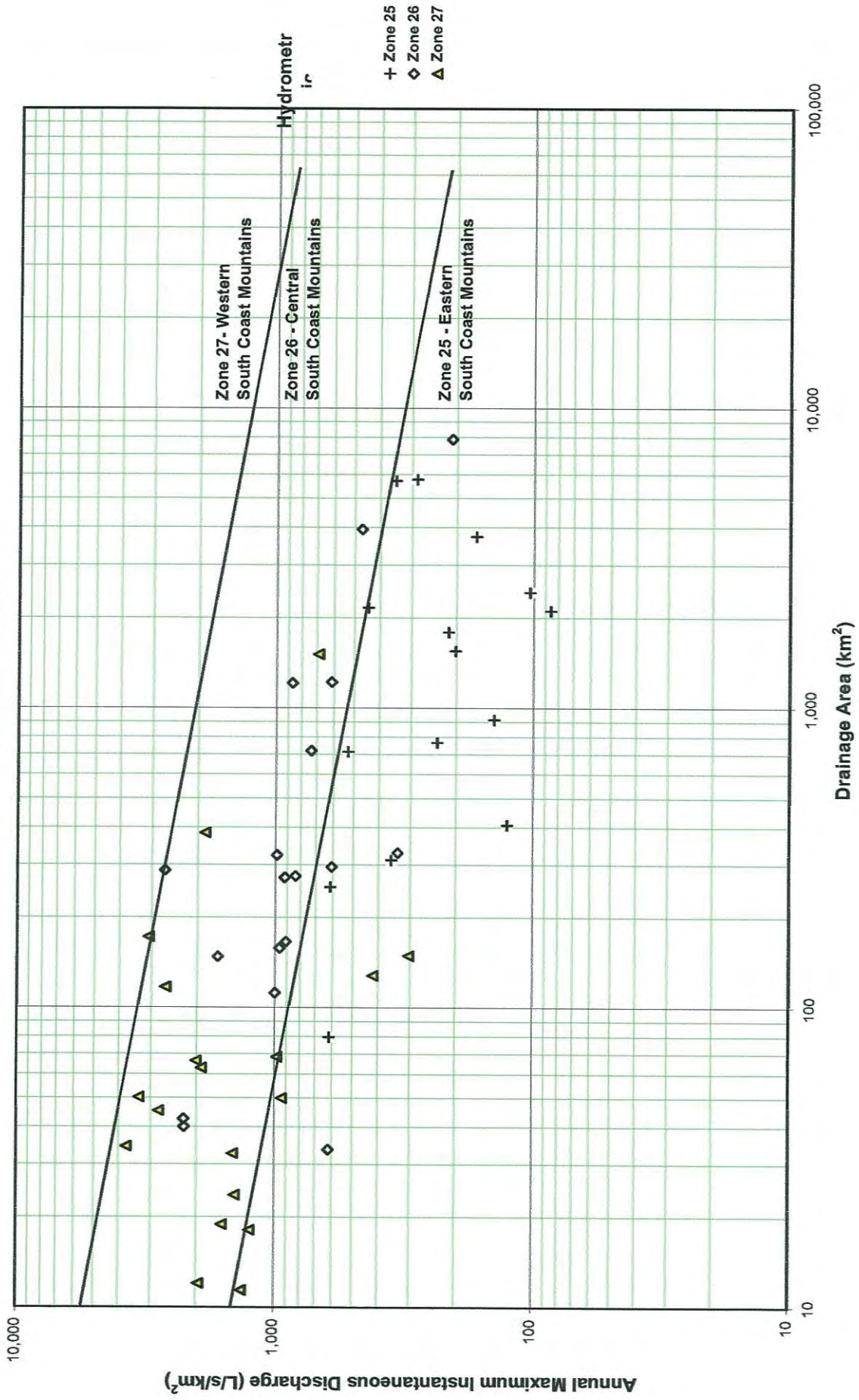
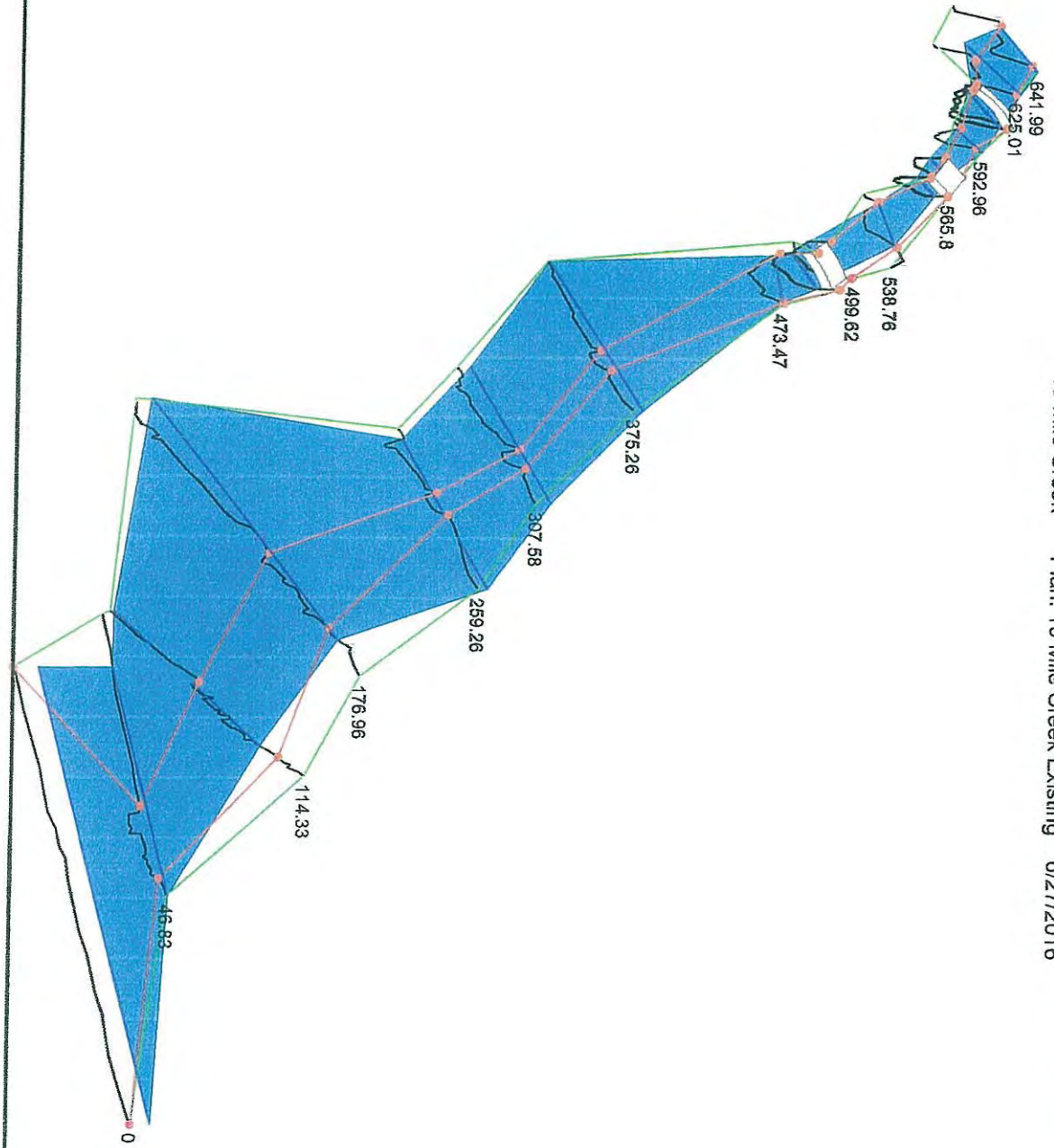


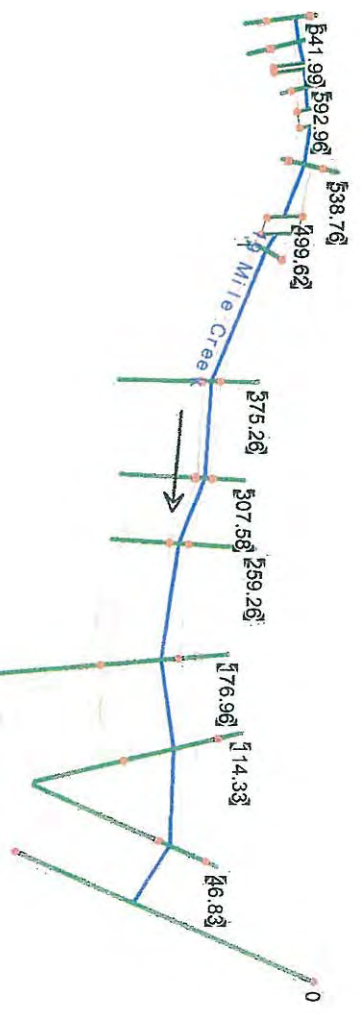
Figure 3 Watershed Peak Flow (page 1 of 2)

B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT

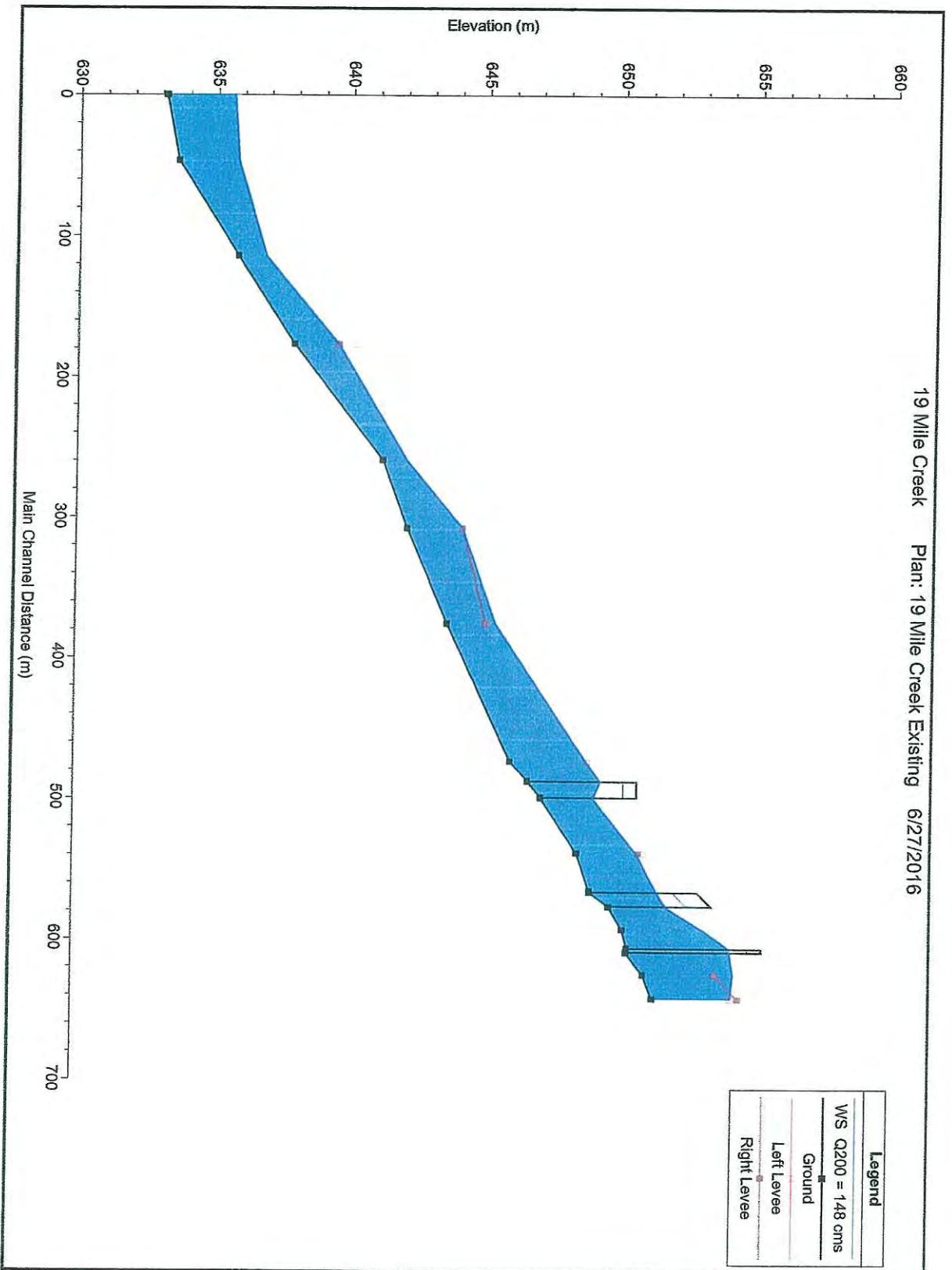
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016



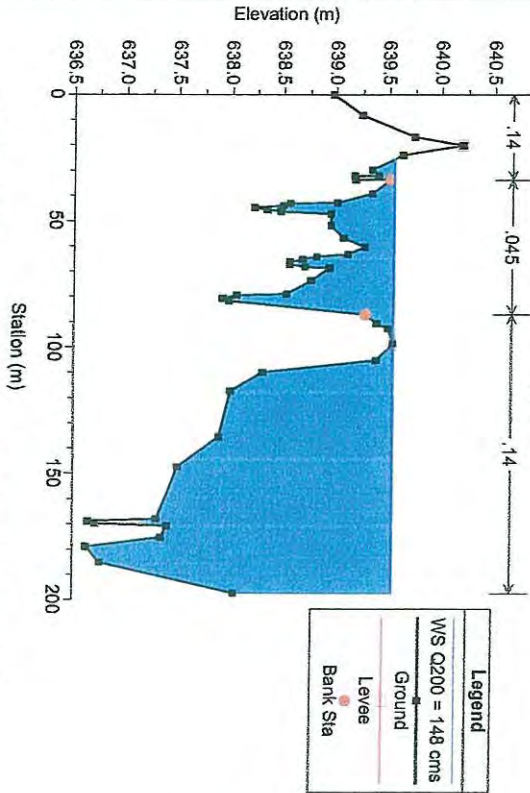
Legend	
	WS Q200 = 148 cms
	Ground
	Levee
●	Bank Sta



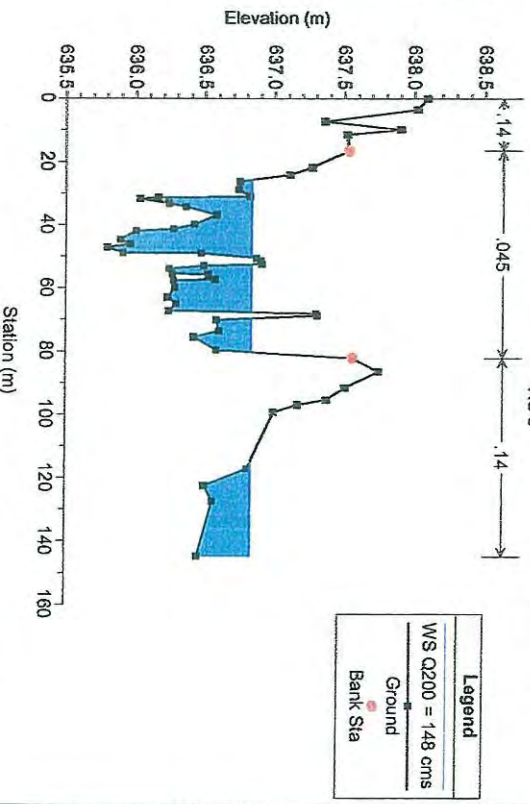
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016



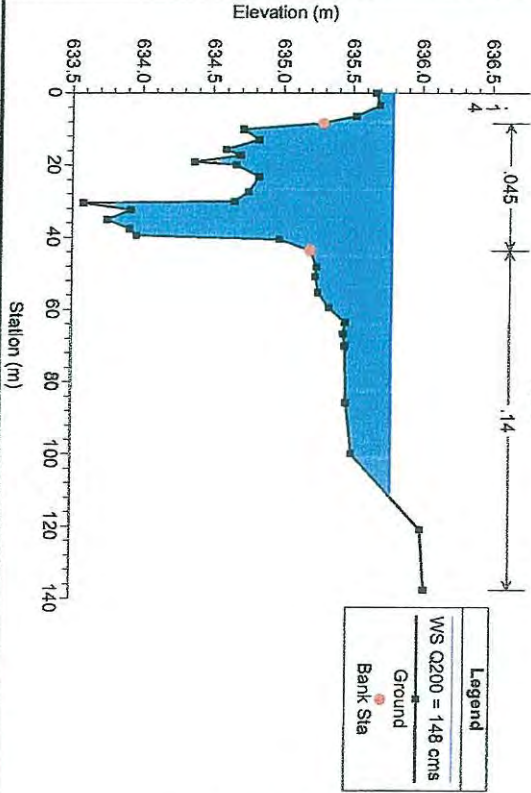
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 4



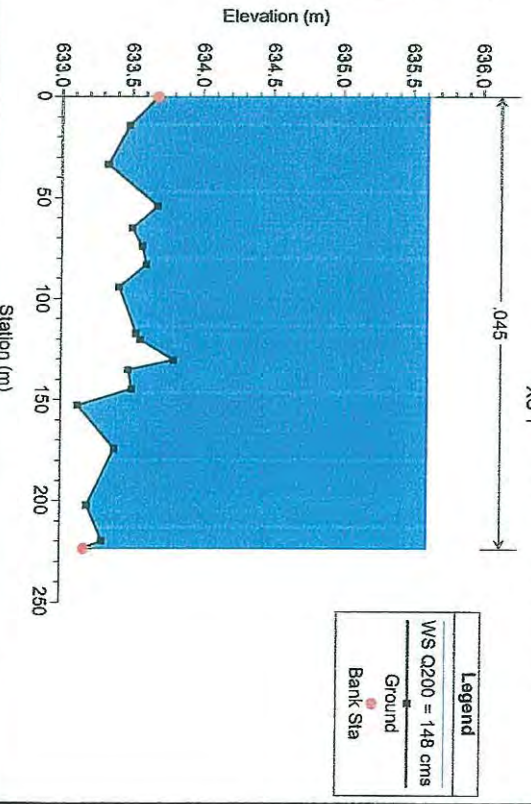
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 3



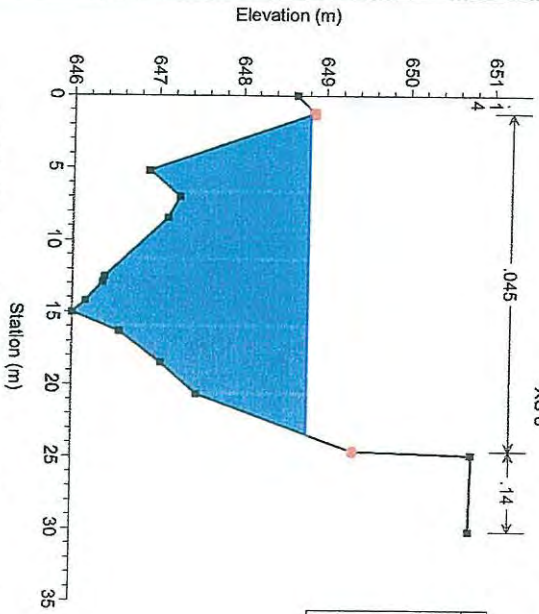
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 2



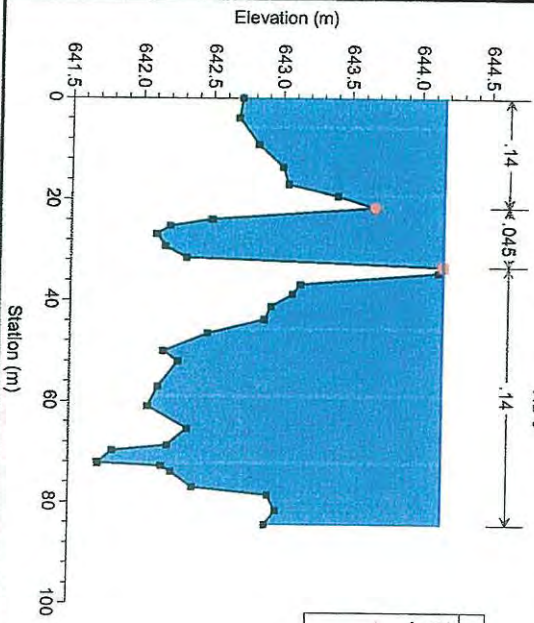
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 1



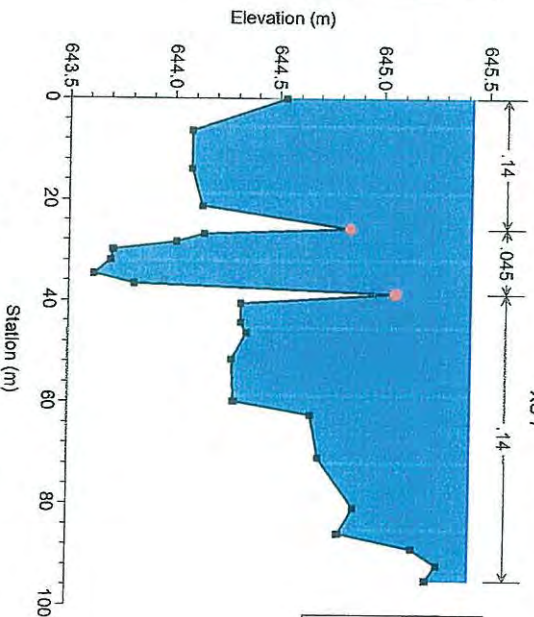
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 8



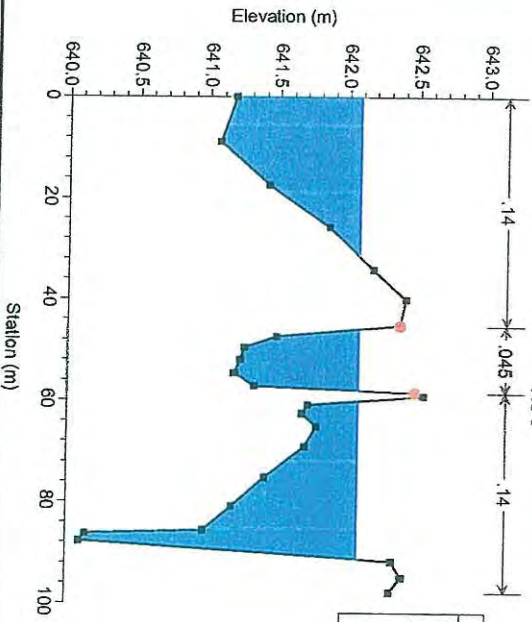
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 6



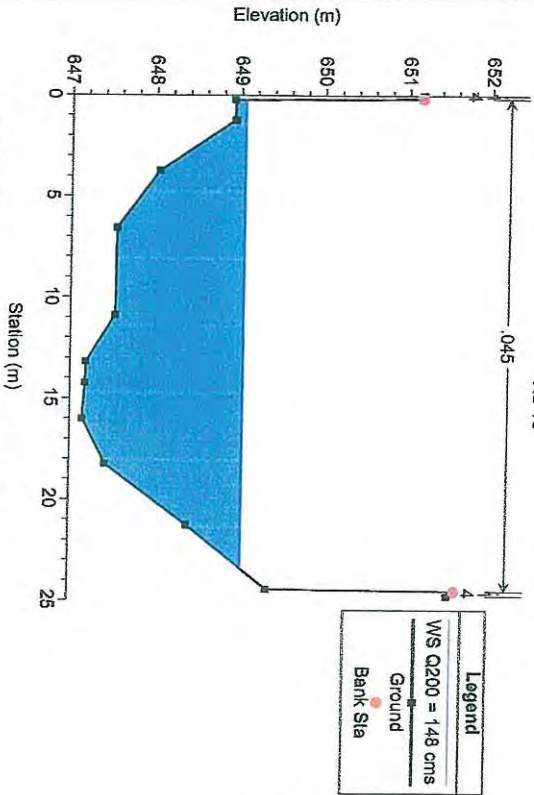
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 7



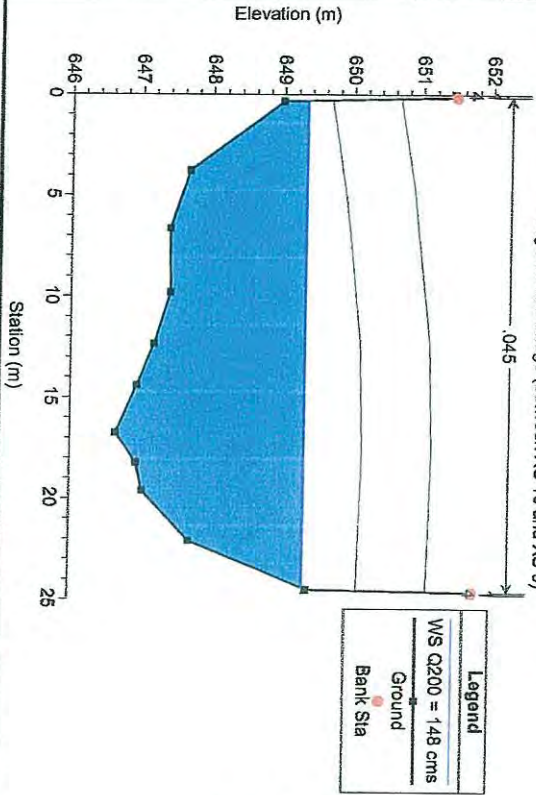
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 5



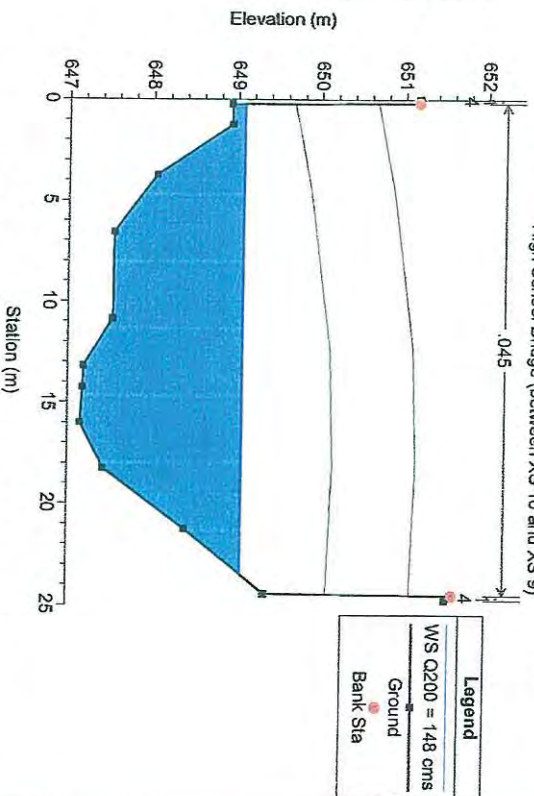
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 10



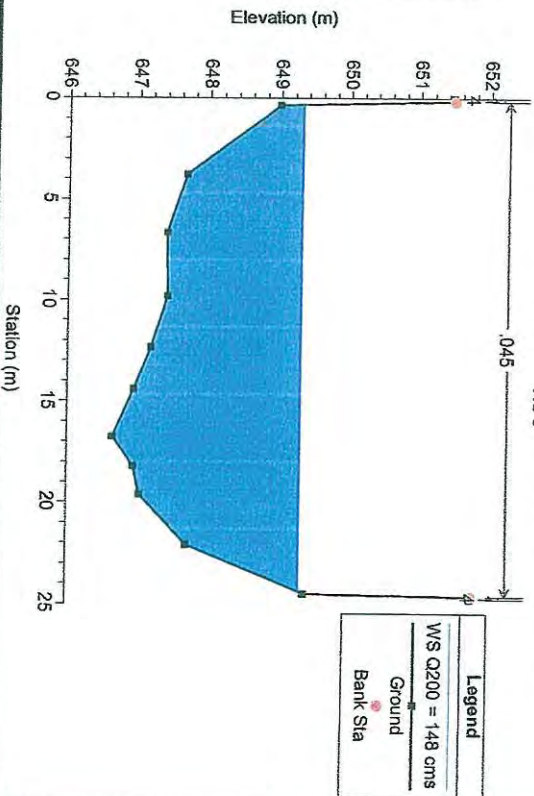
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
High School Bridge (between XS 10 and XS 9)



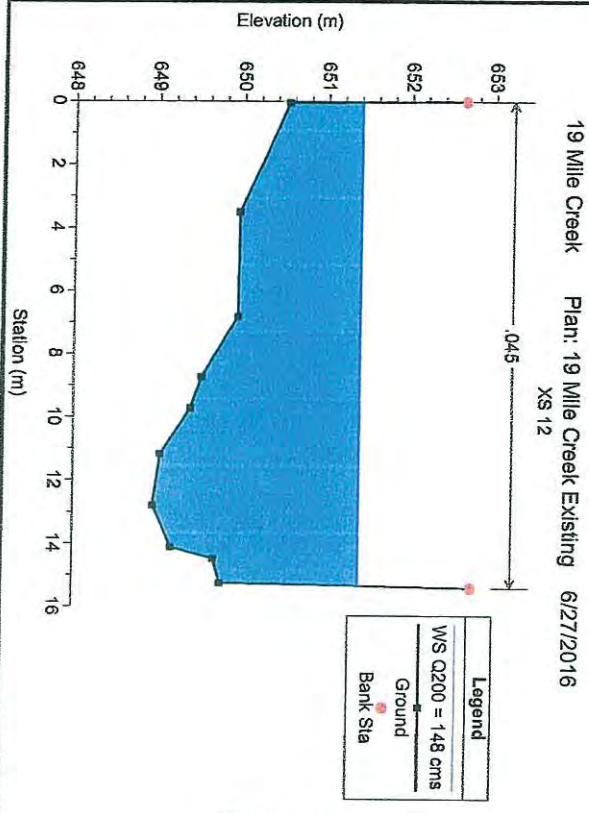
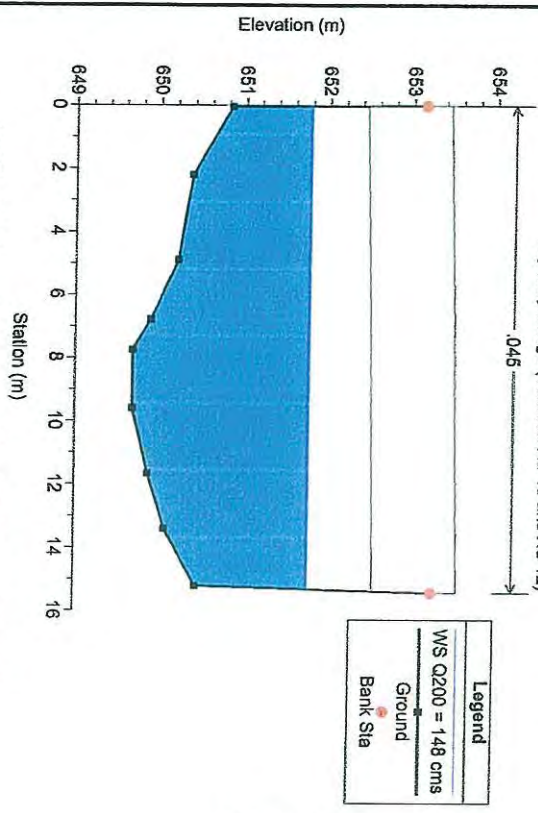
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
High School Bridge (between XS 10 and XS 9)



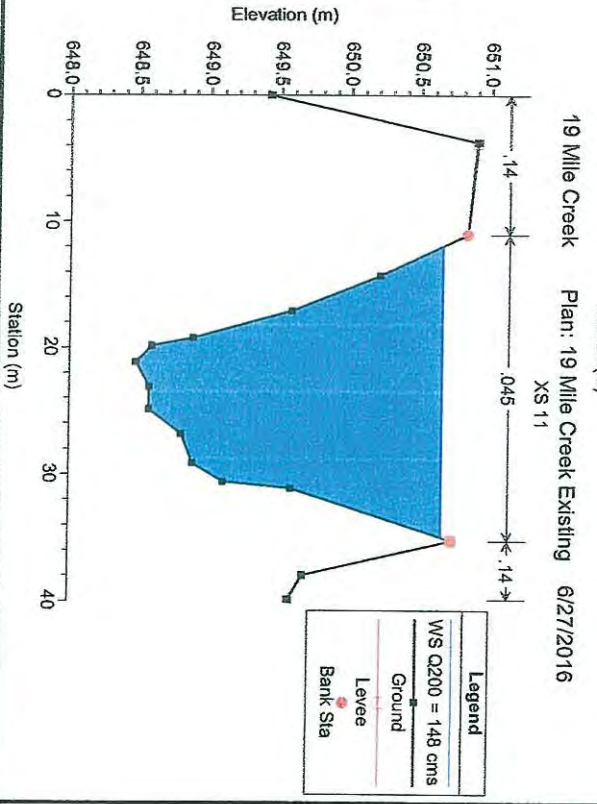
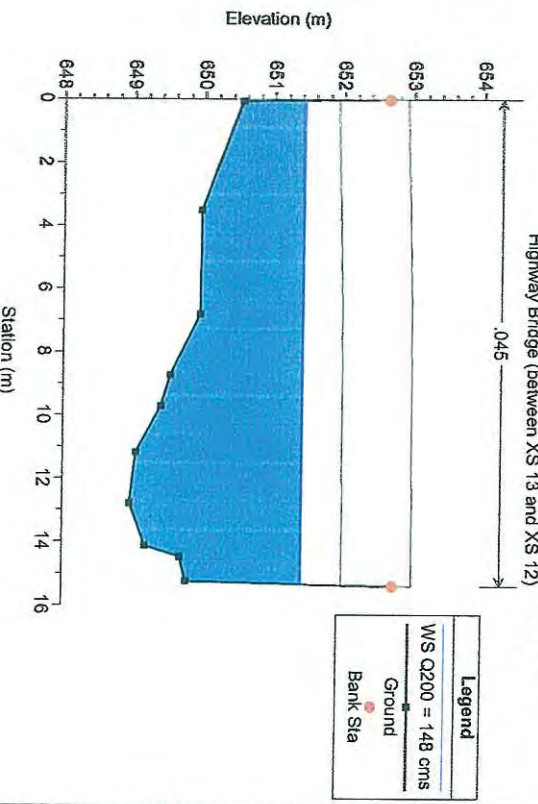
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 9



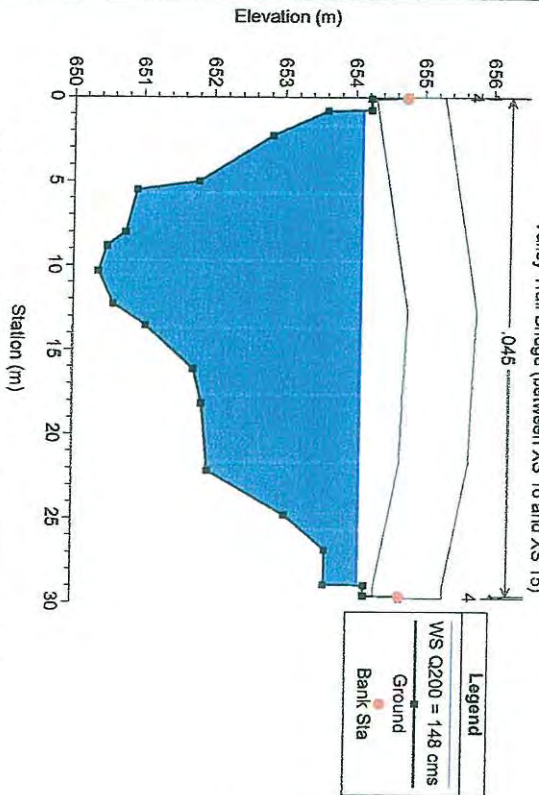
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Highway Bridge (between XS 13 and XS 12)



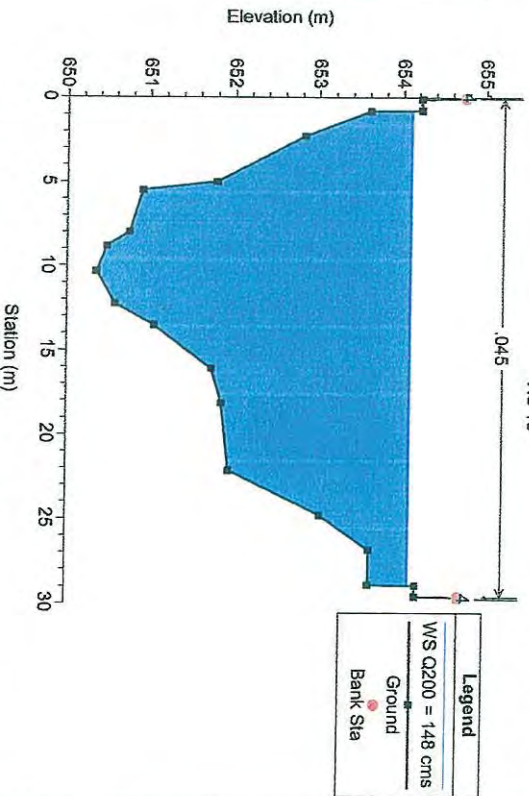
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Highway Bridge (between XS 13 and XS 12)



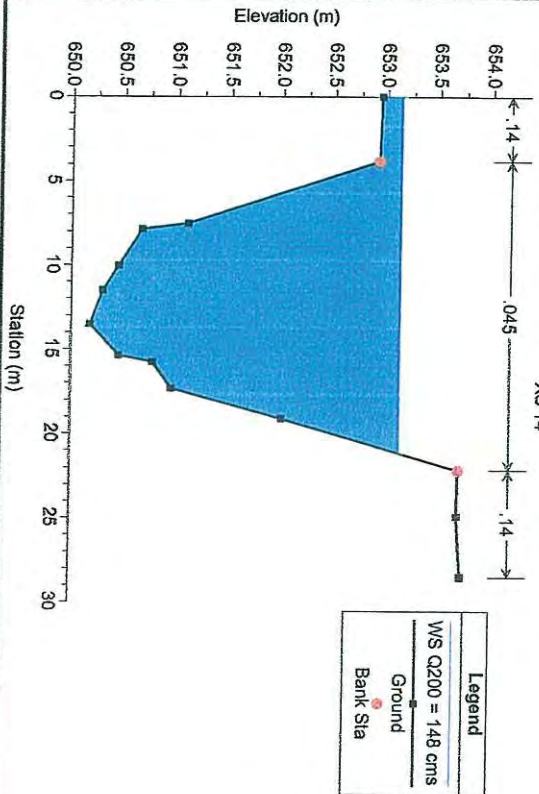
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



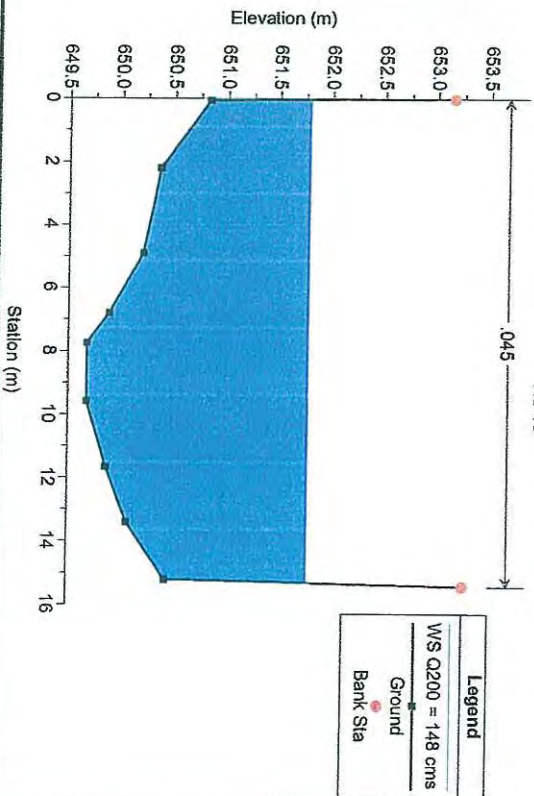
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 15



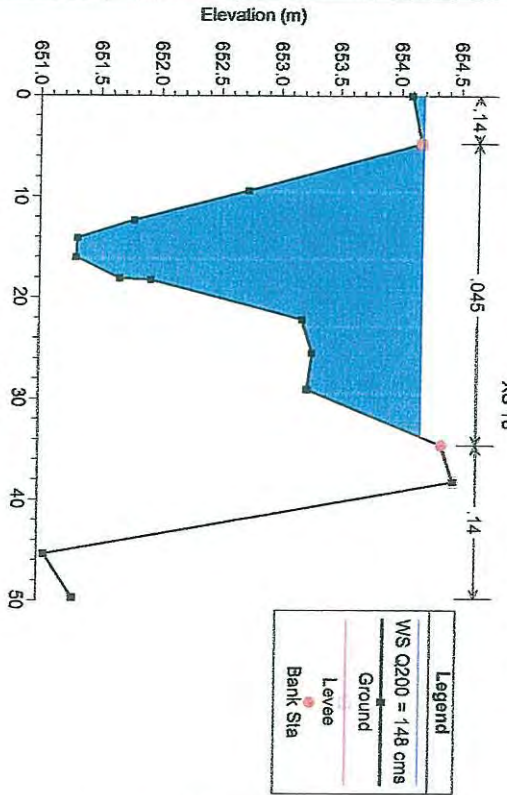
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 14



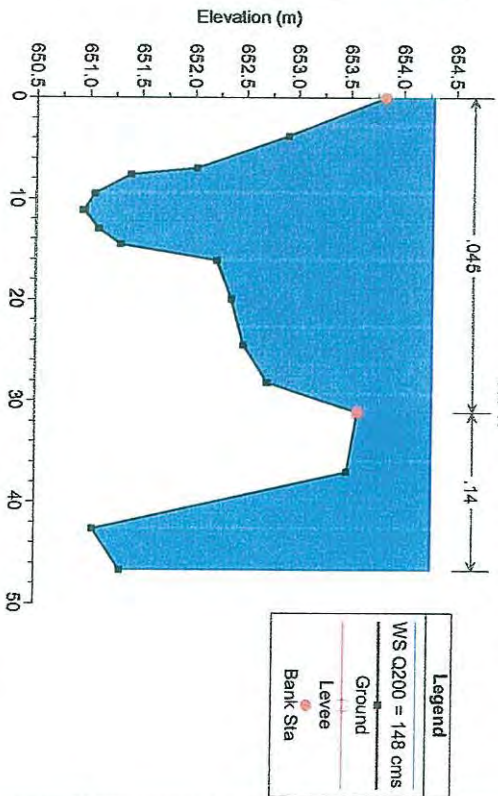
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 13



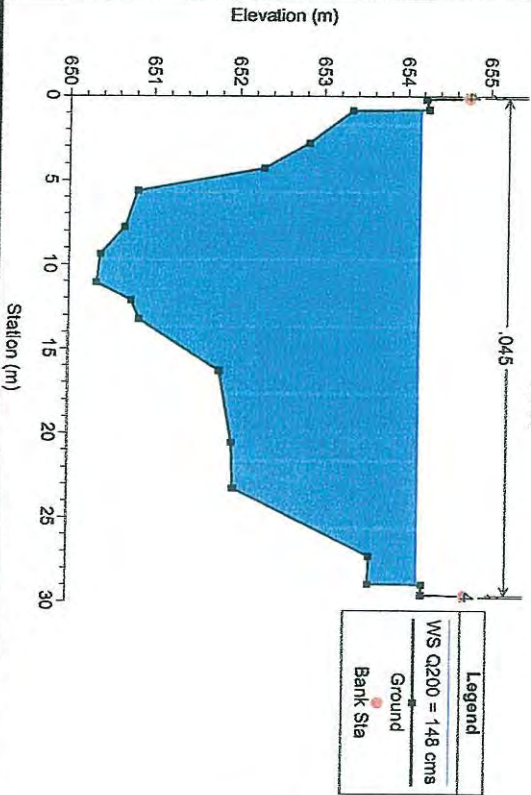
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 18



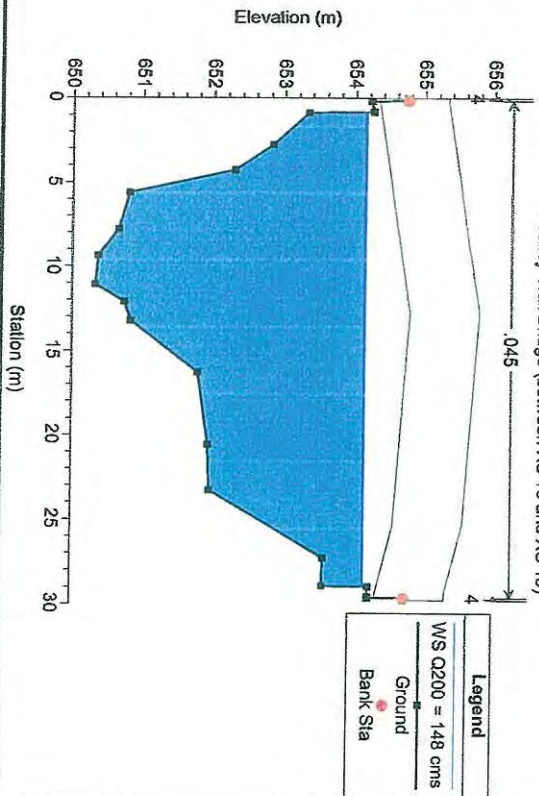
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 17



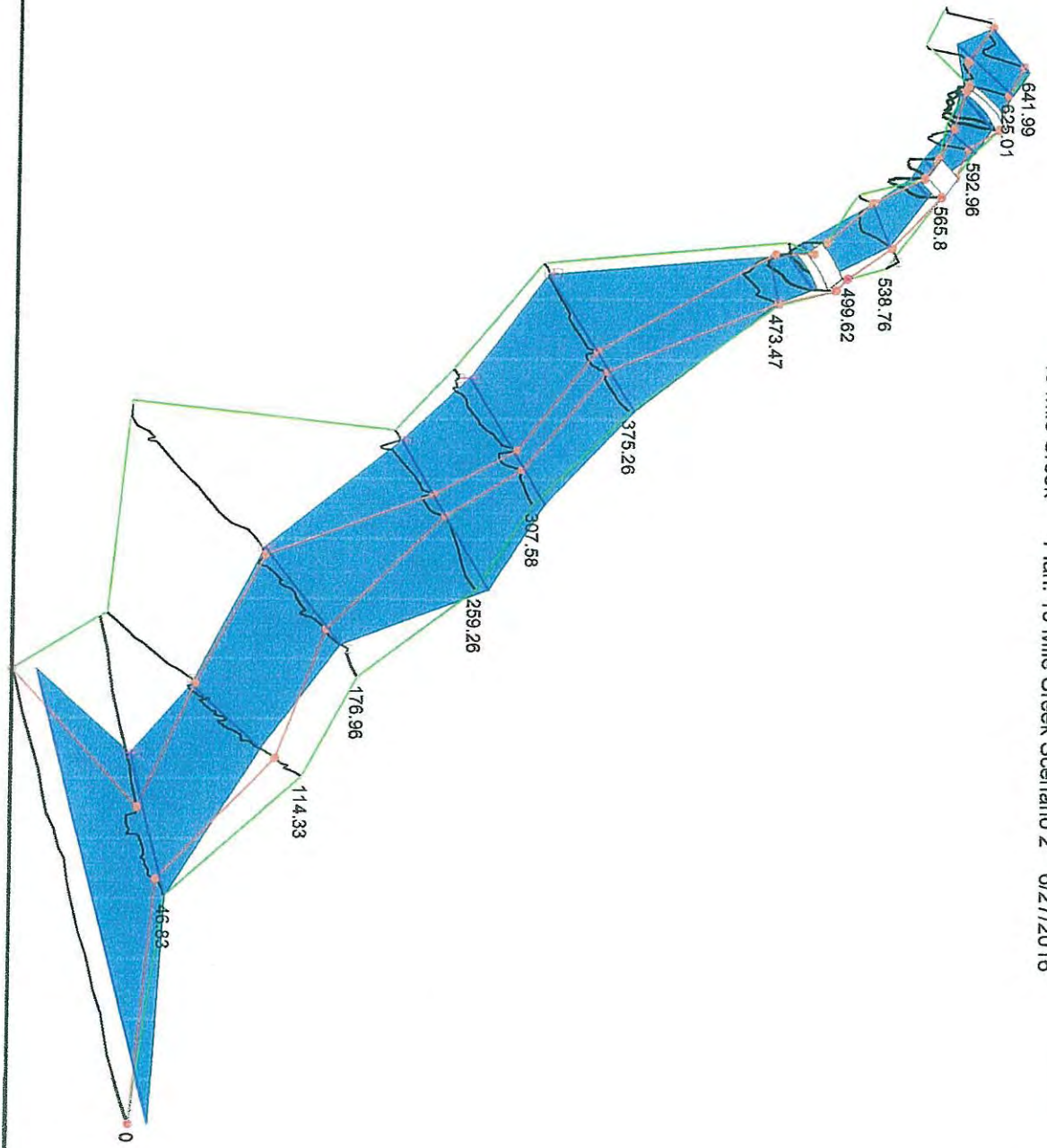
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 16



19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 Valley Trail Bridge (between XS 16 and XS 15)

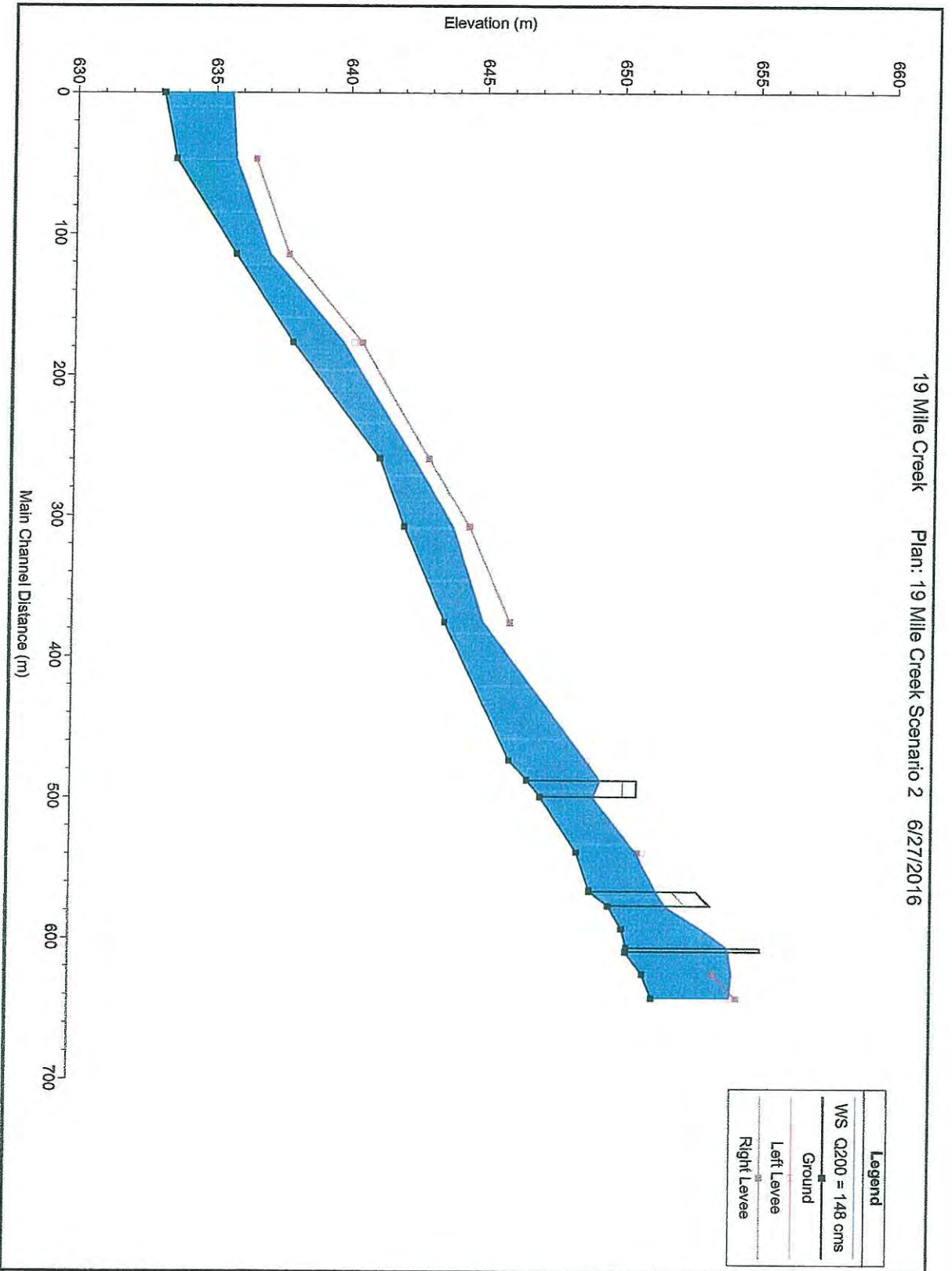


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

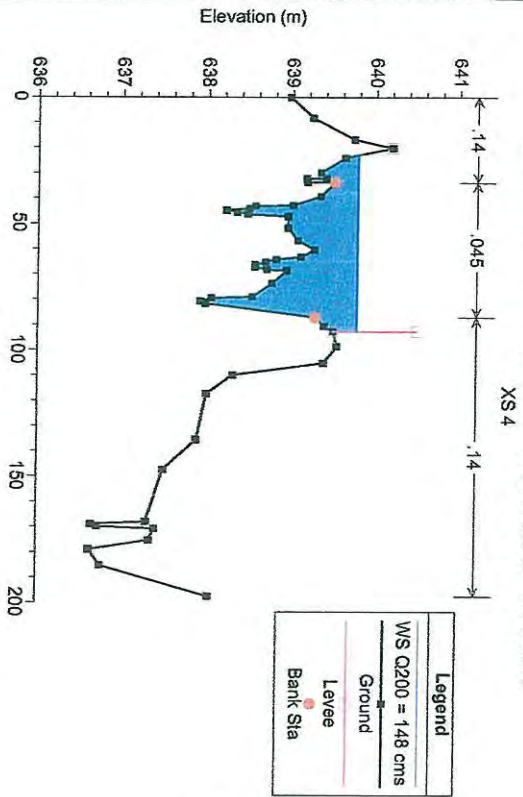


Legend	
WS Q200 = 148 cms	
Ground	
Levee	
Bank Sta	

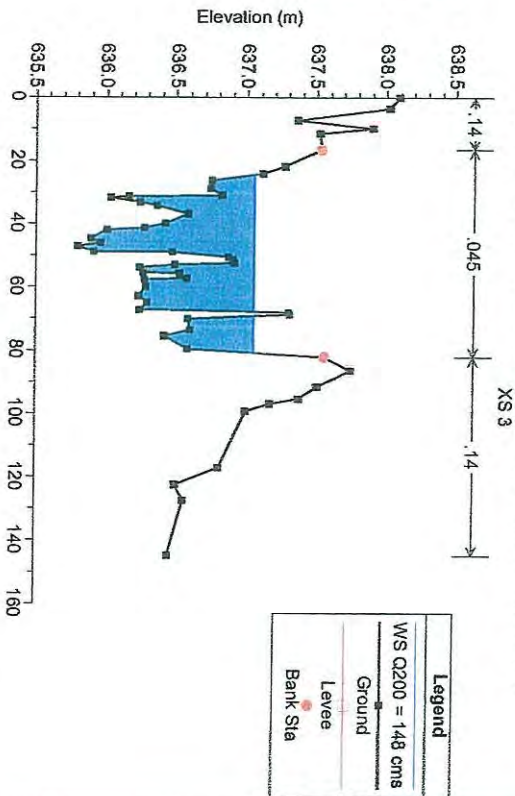
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



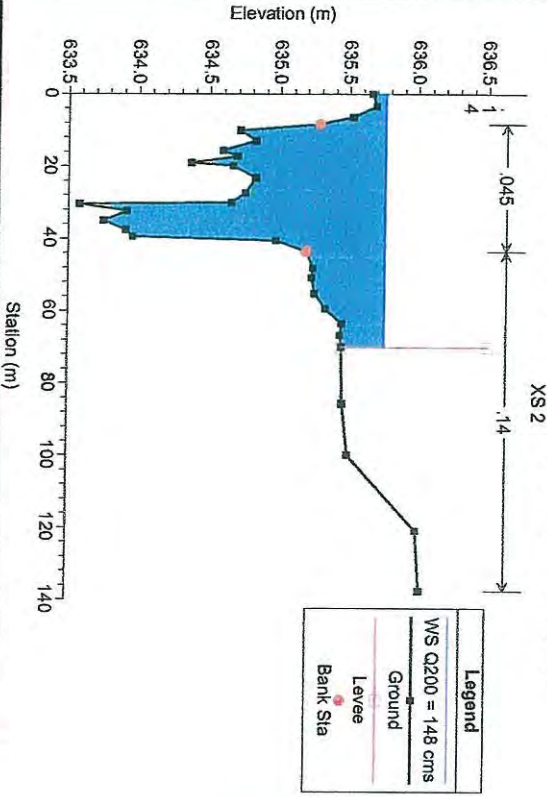
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



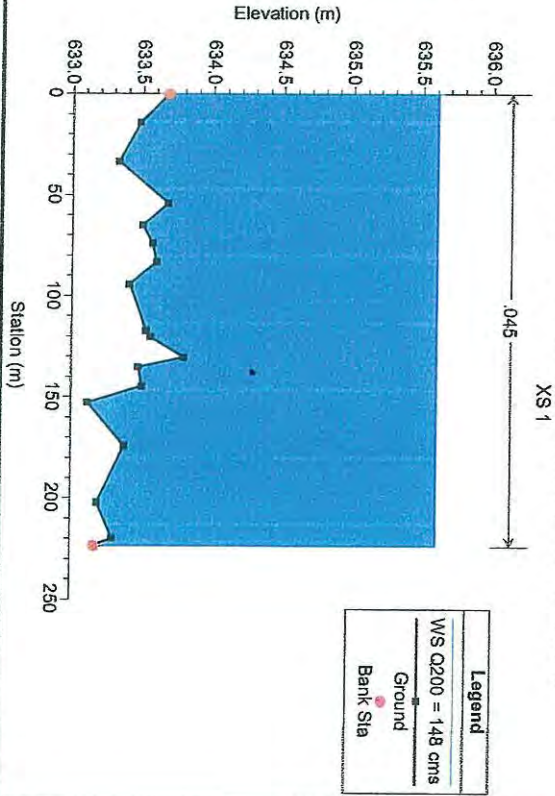
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



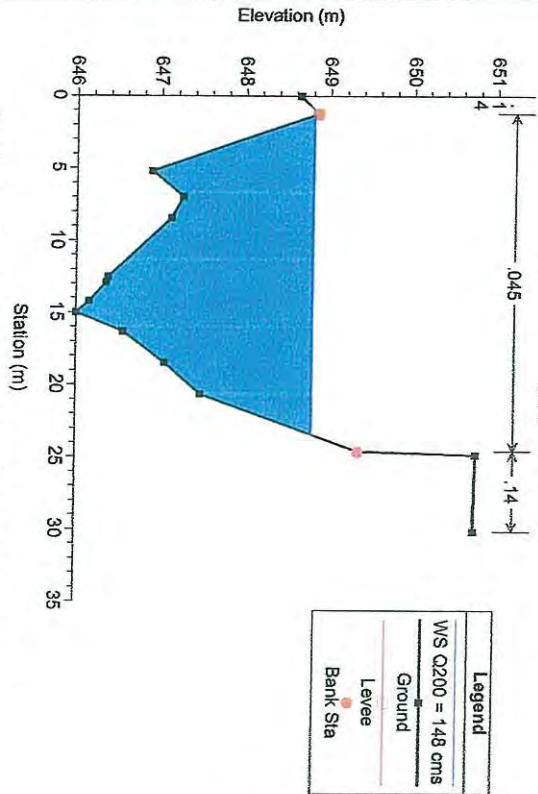
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



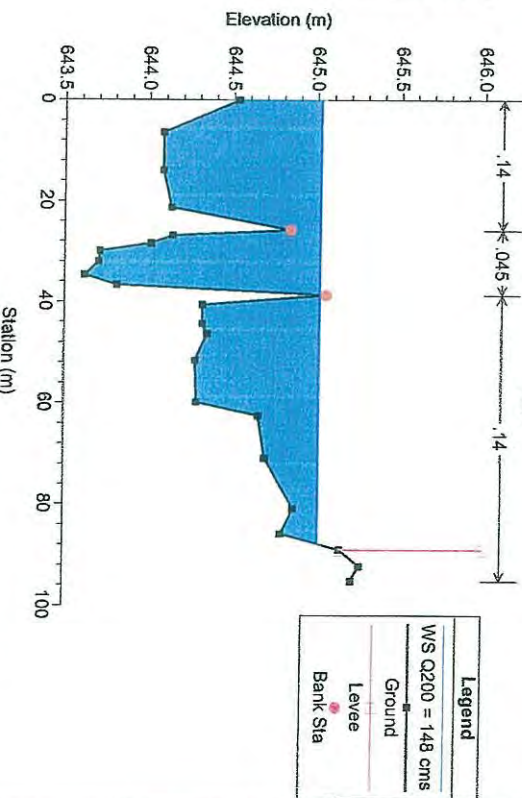
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



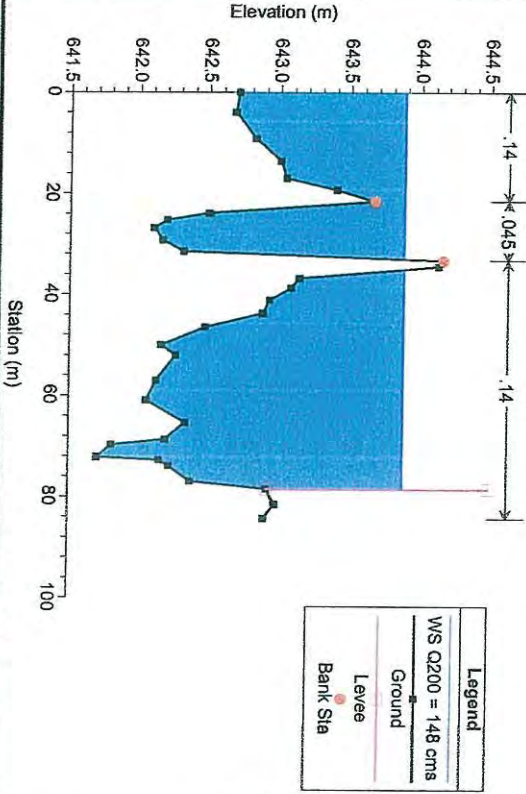
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 8



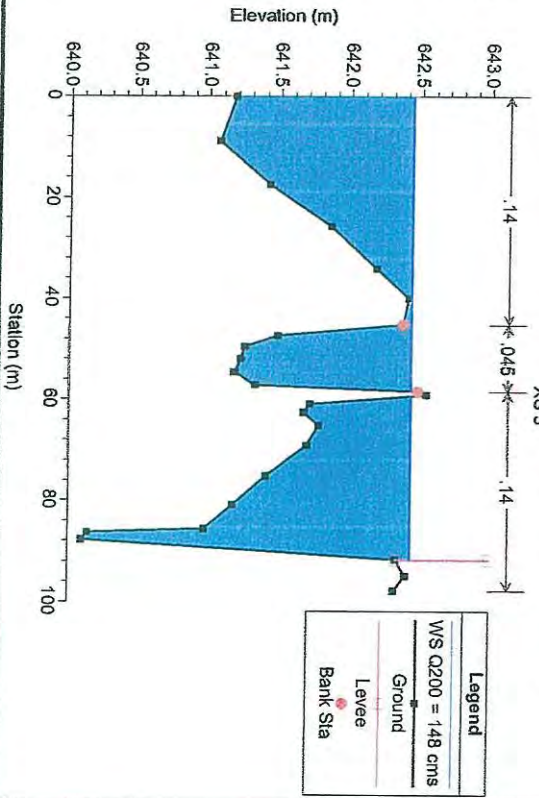
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 7



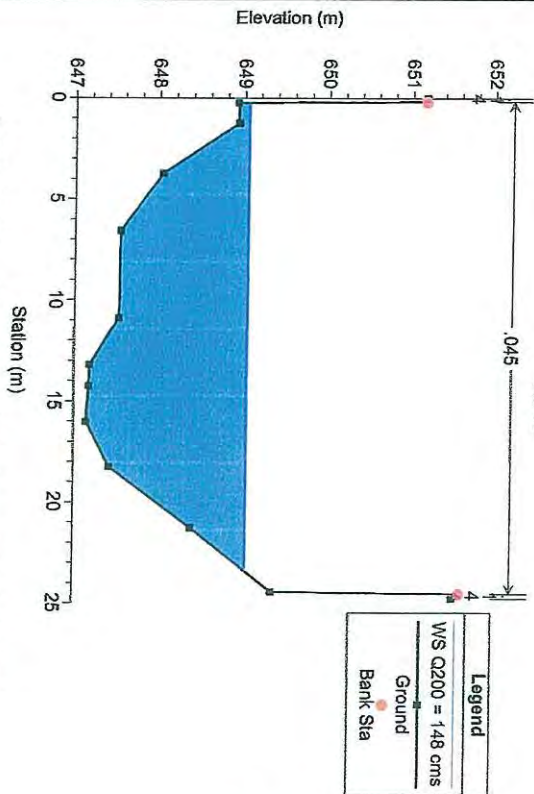
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 6



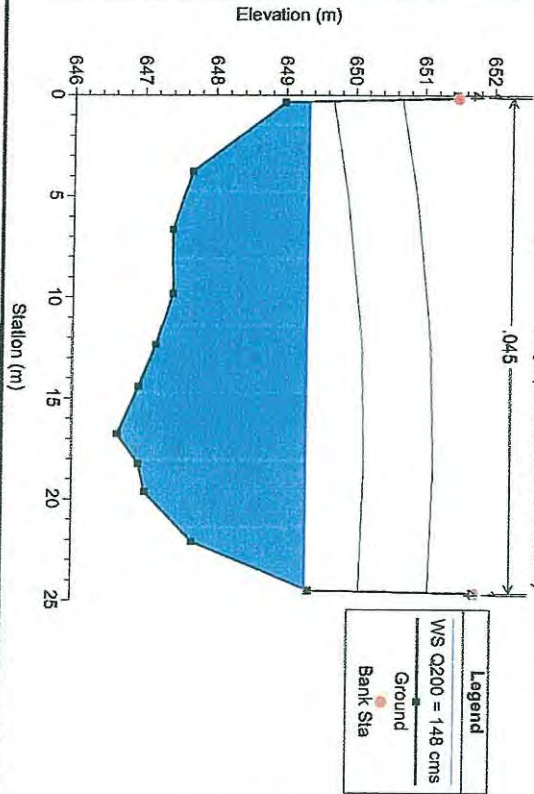
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 5



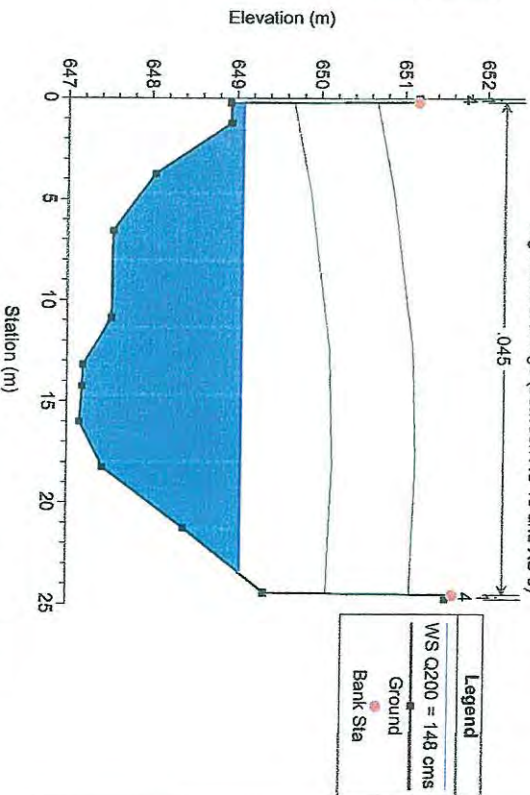
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 10



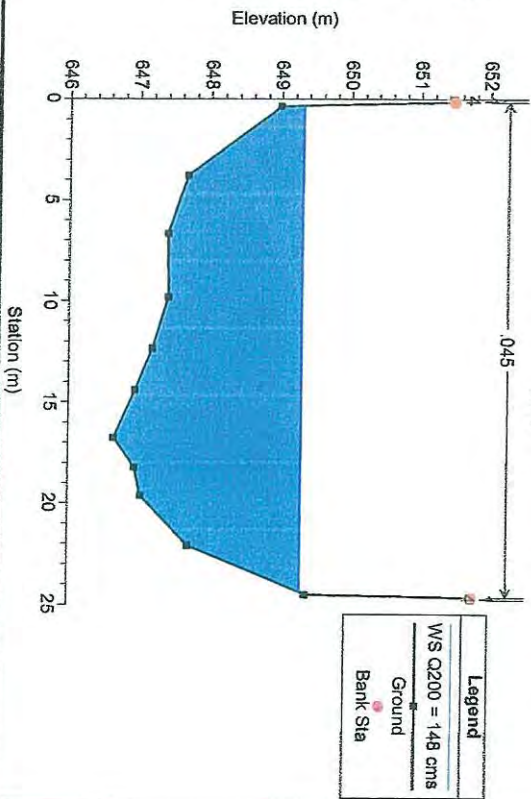
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
High School Bridge (between XS 10 and XS 9)

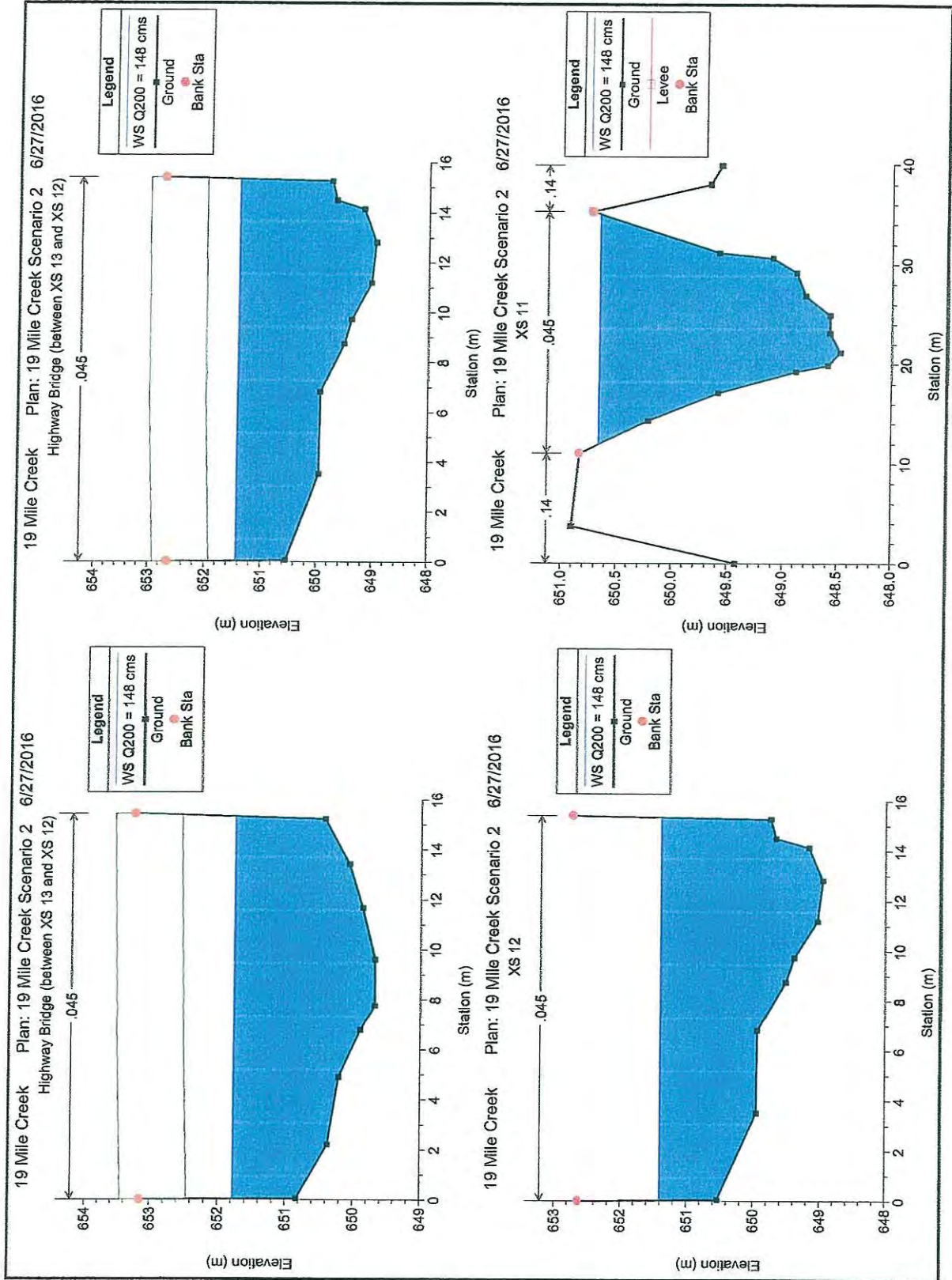


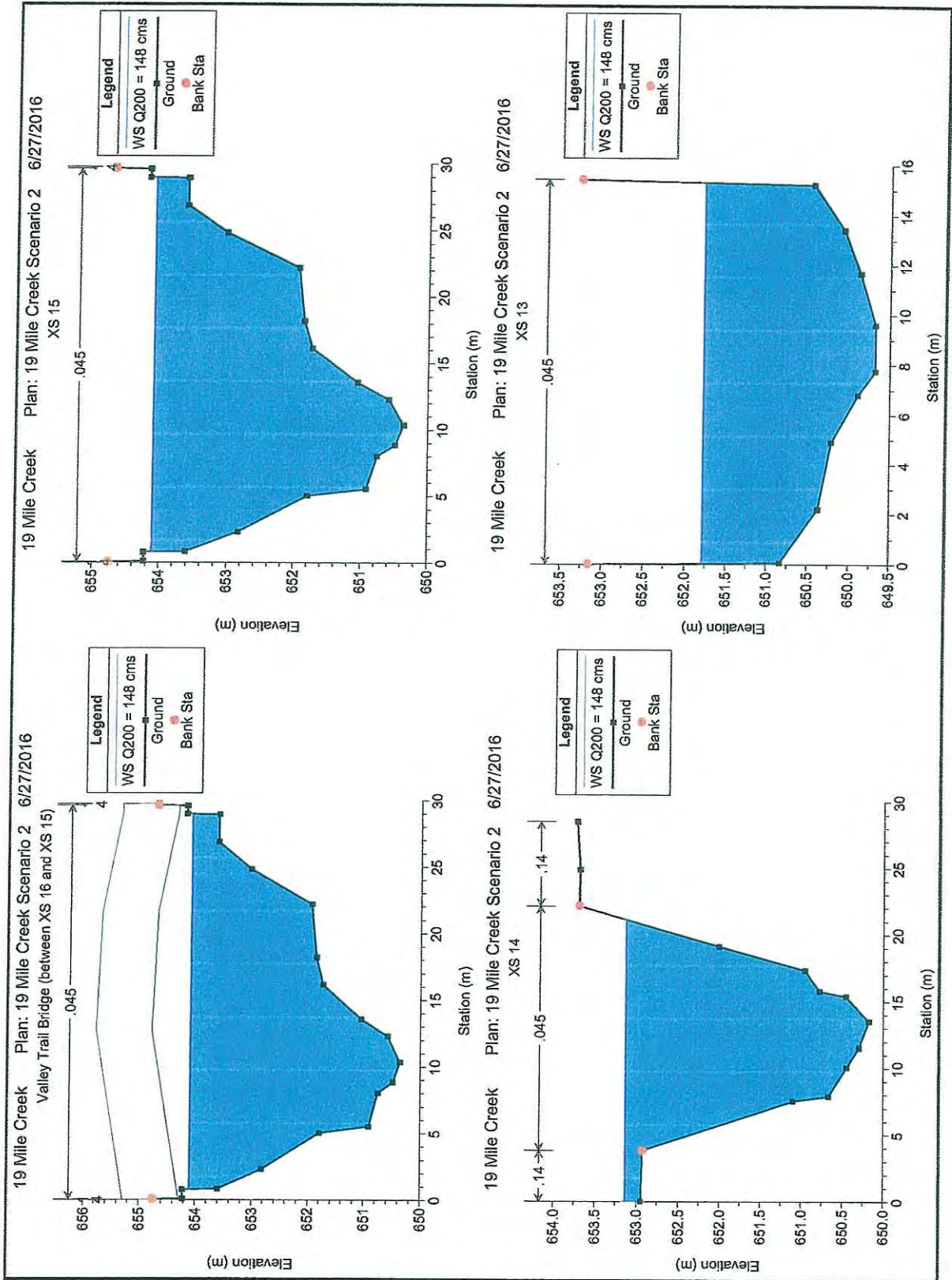
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
High School Bridge (between XS 10 and XS 9)

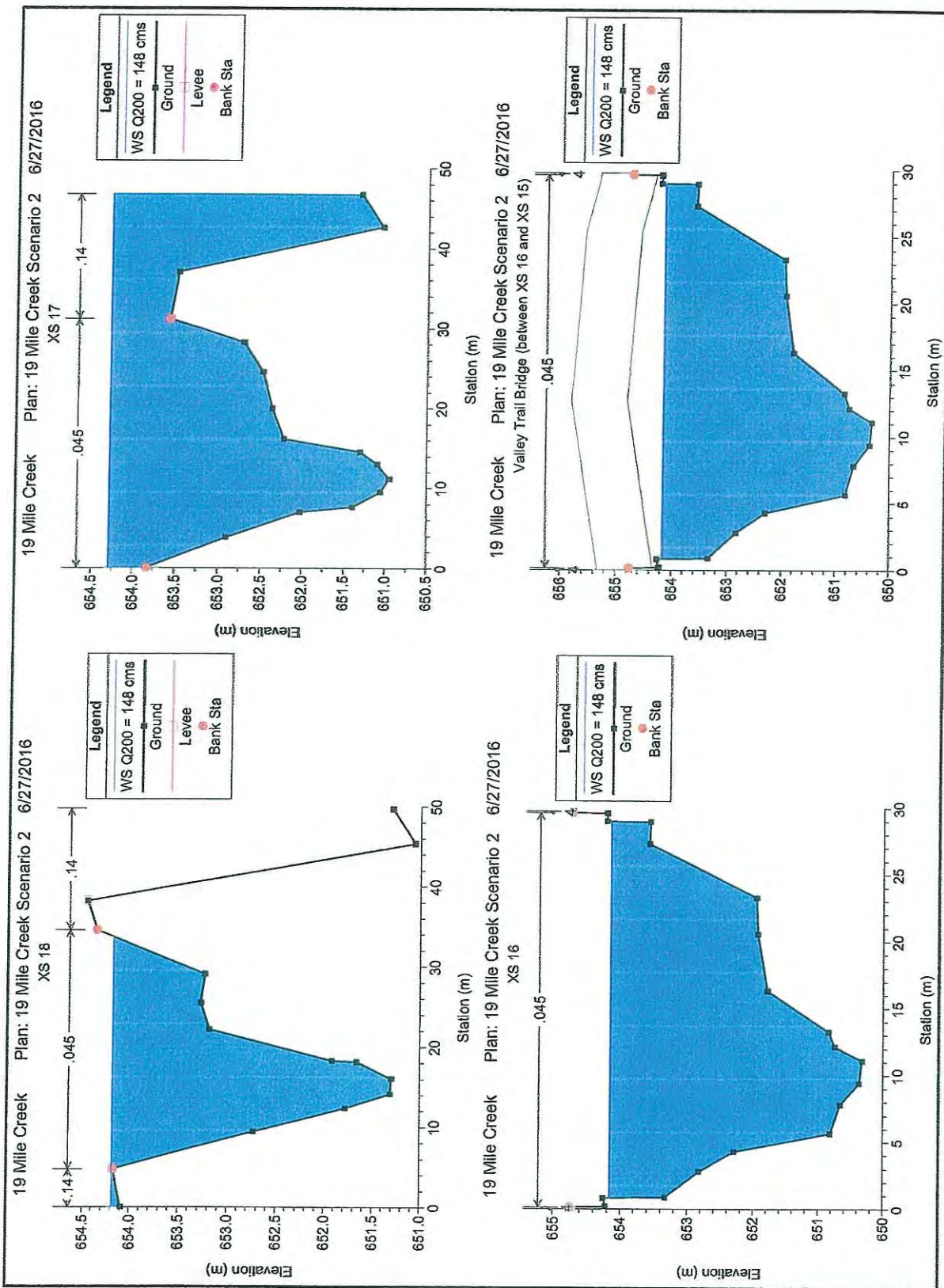


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 9

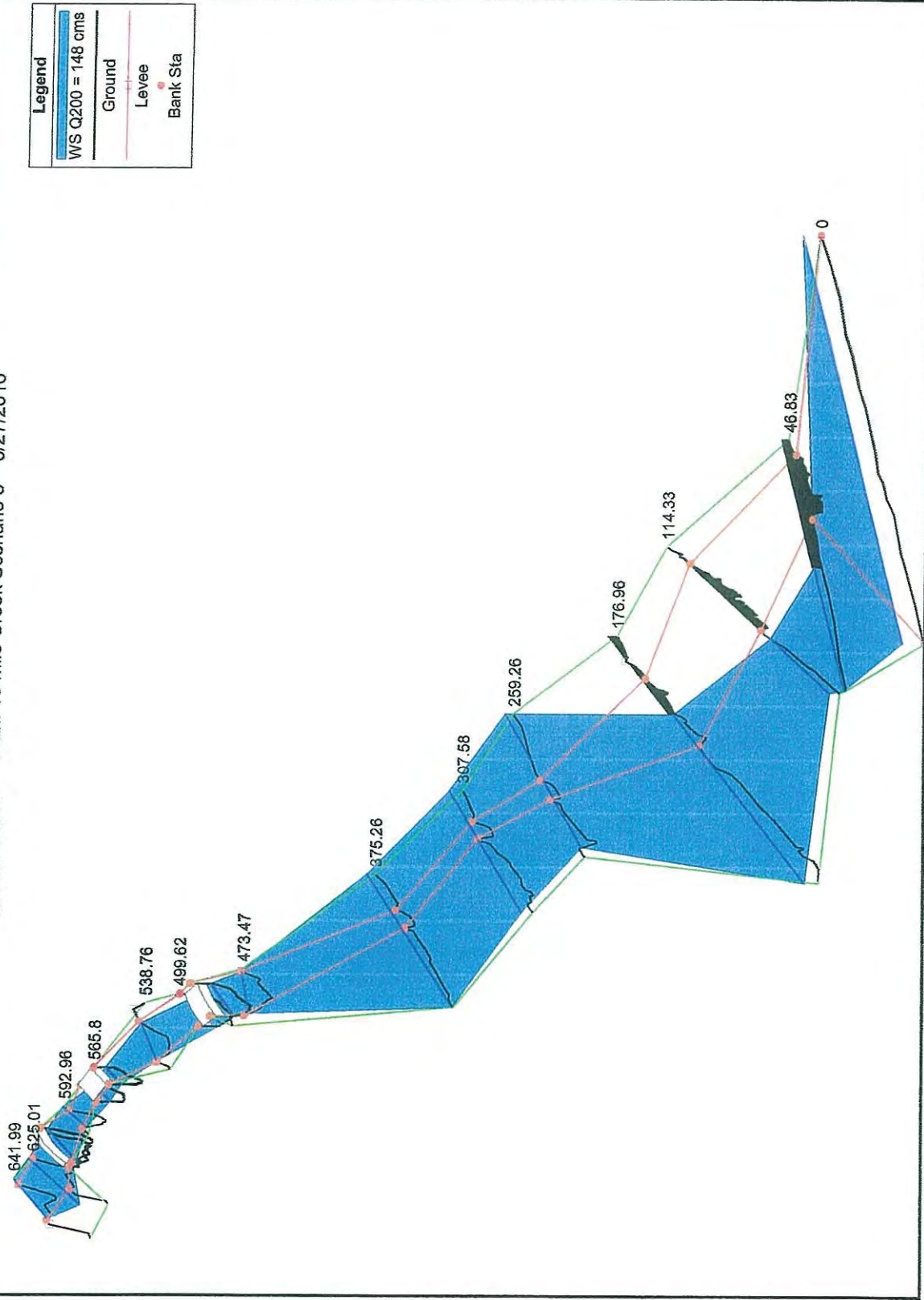


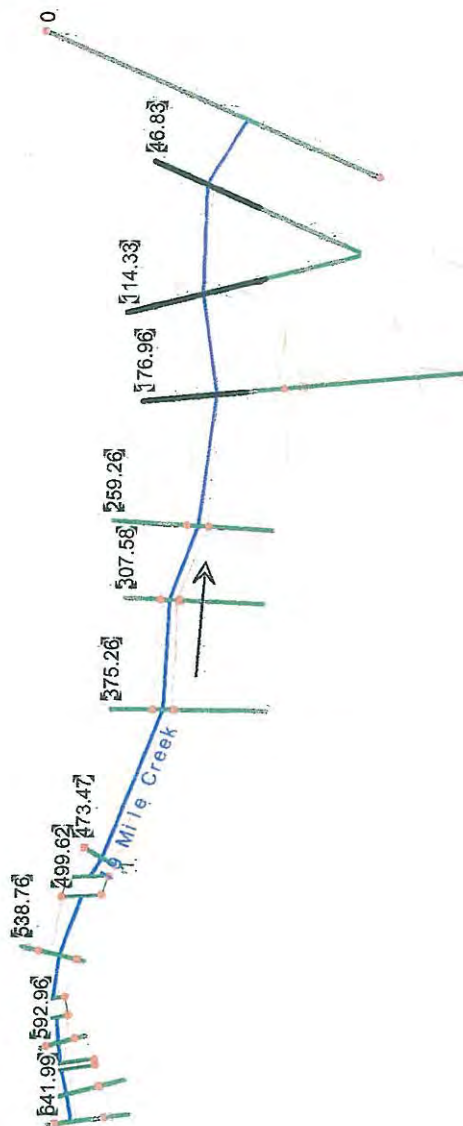






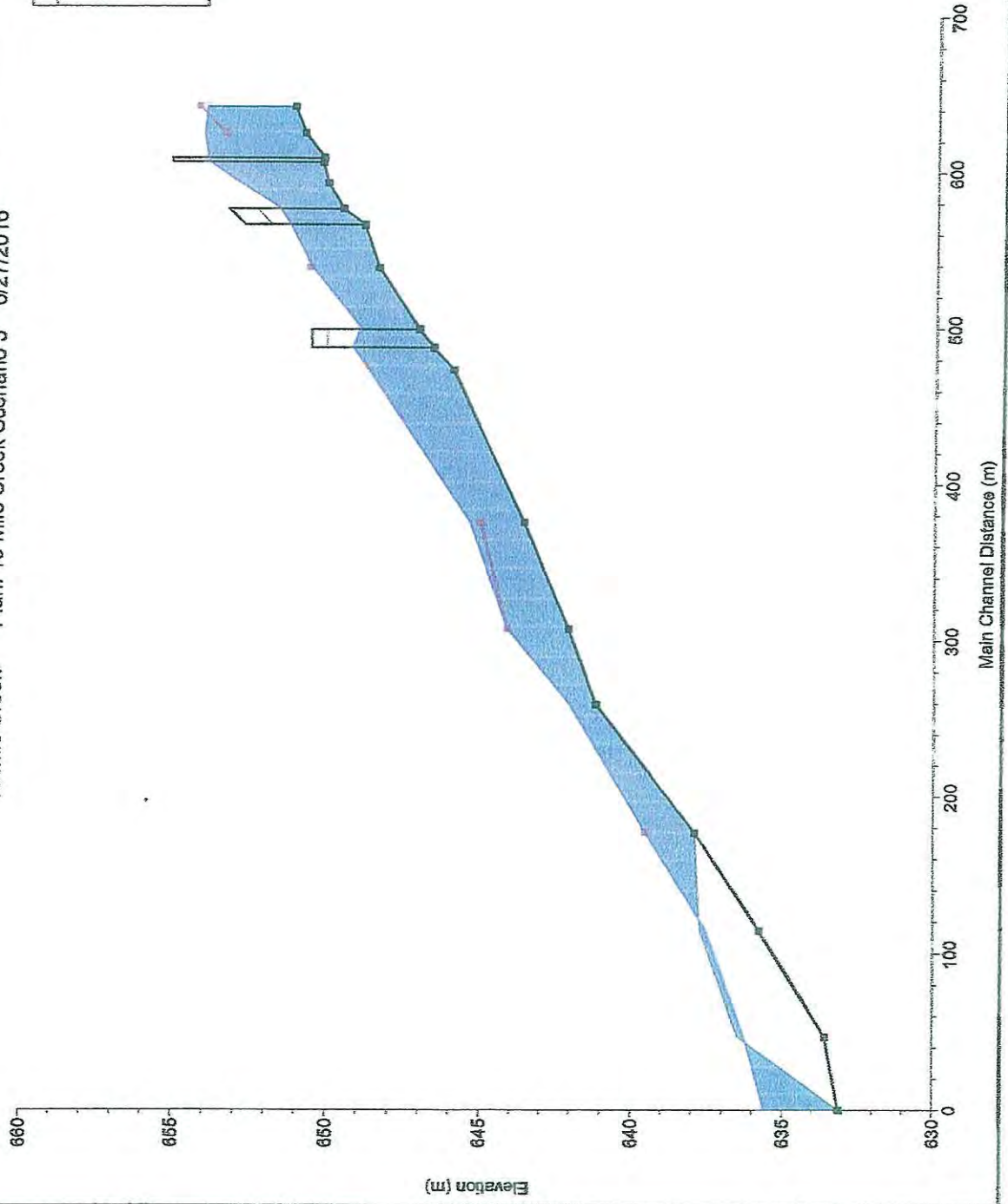
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

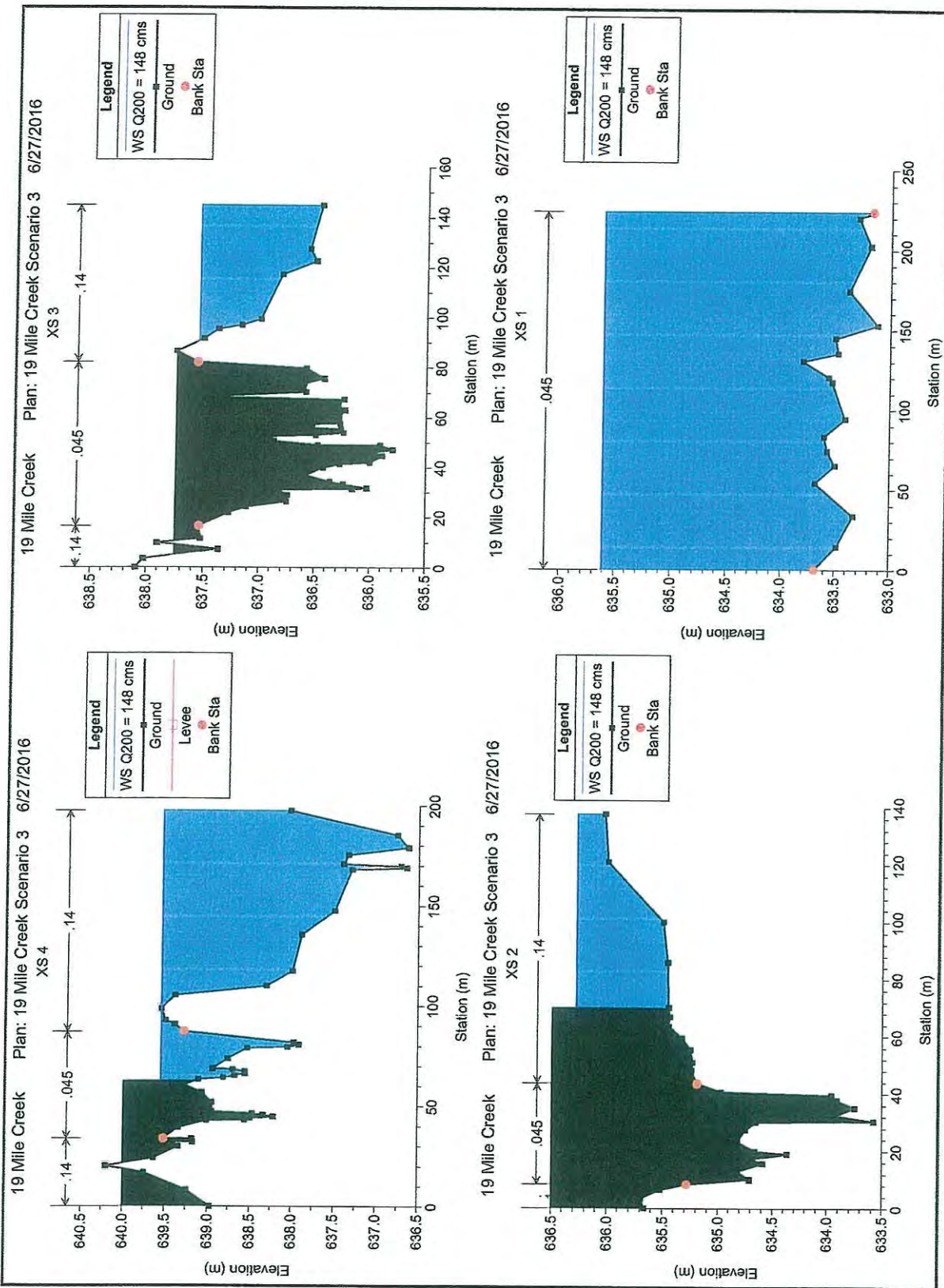




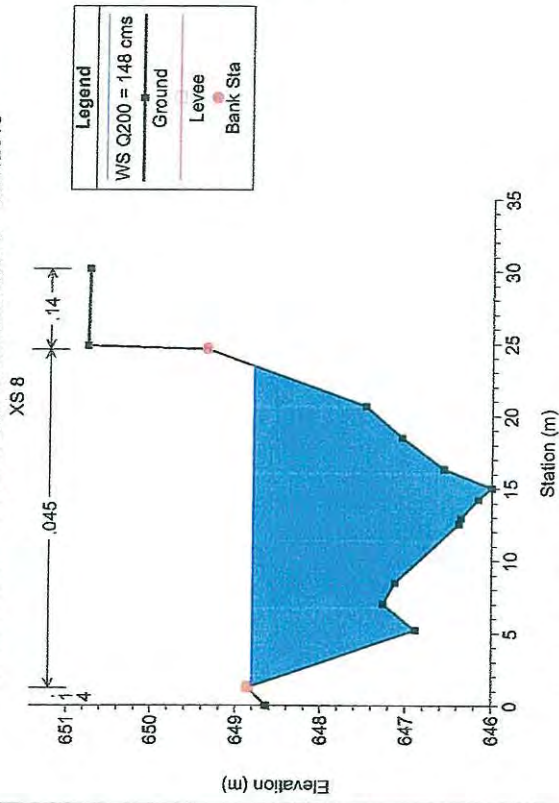
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

Legend	
WS Q200 = 148 cms	
Ground	
Left Levee	
Right Levee	

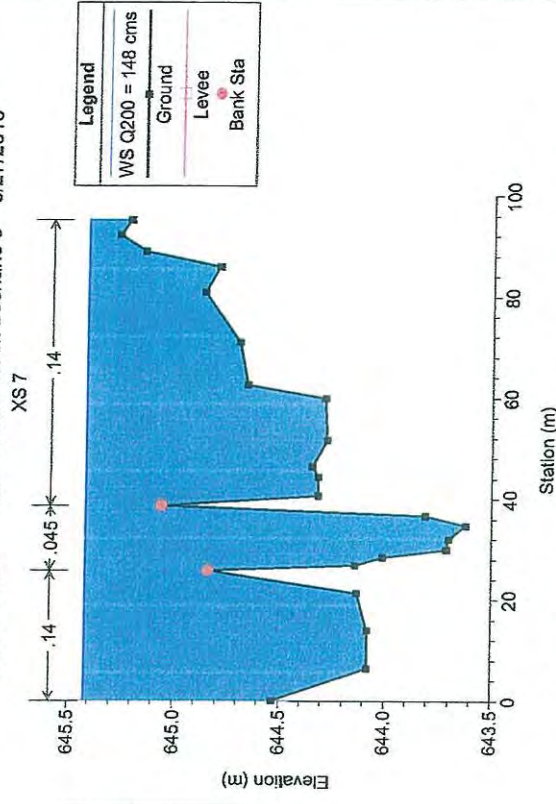




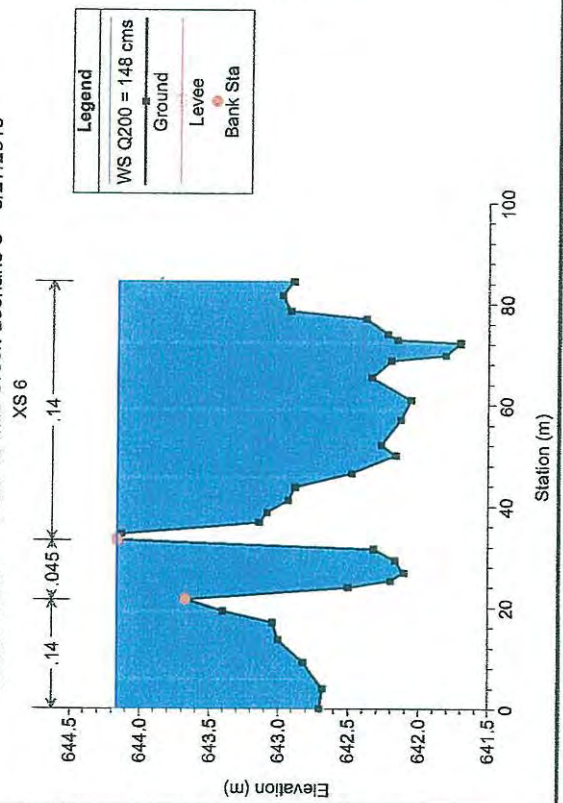
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



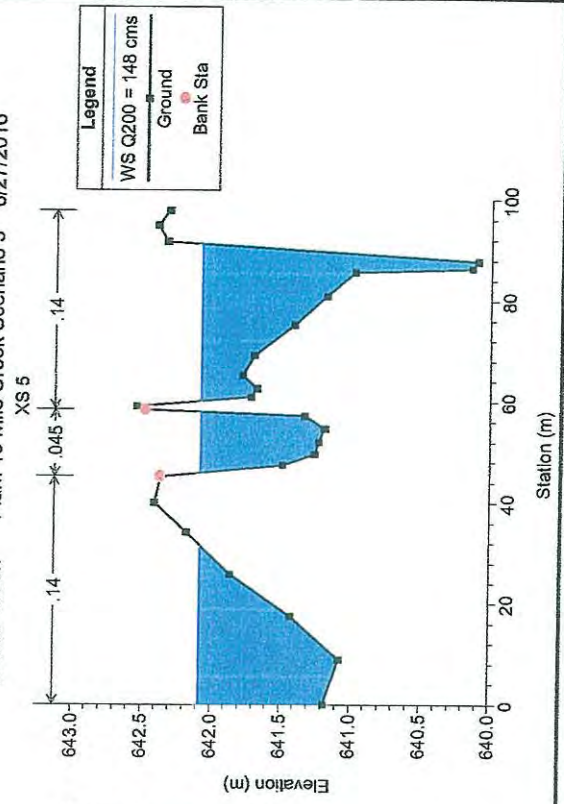
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

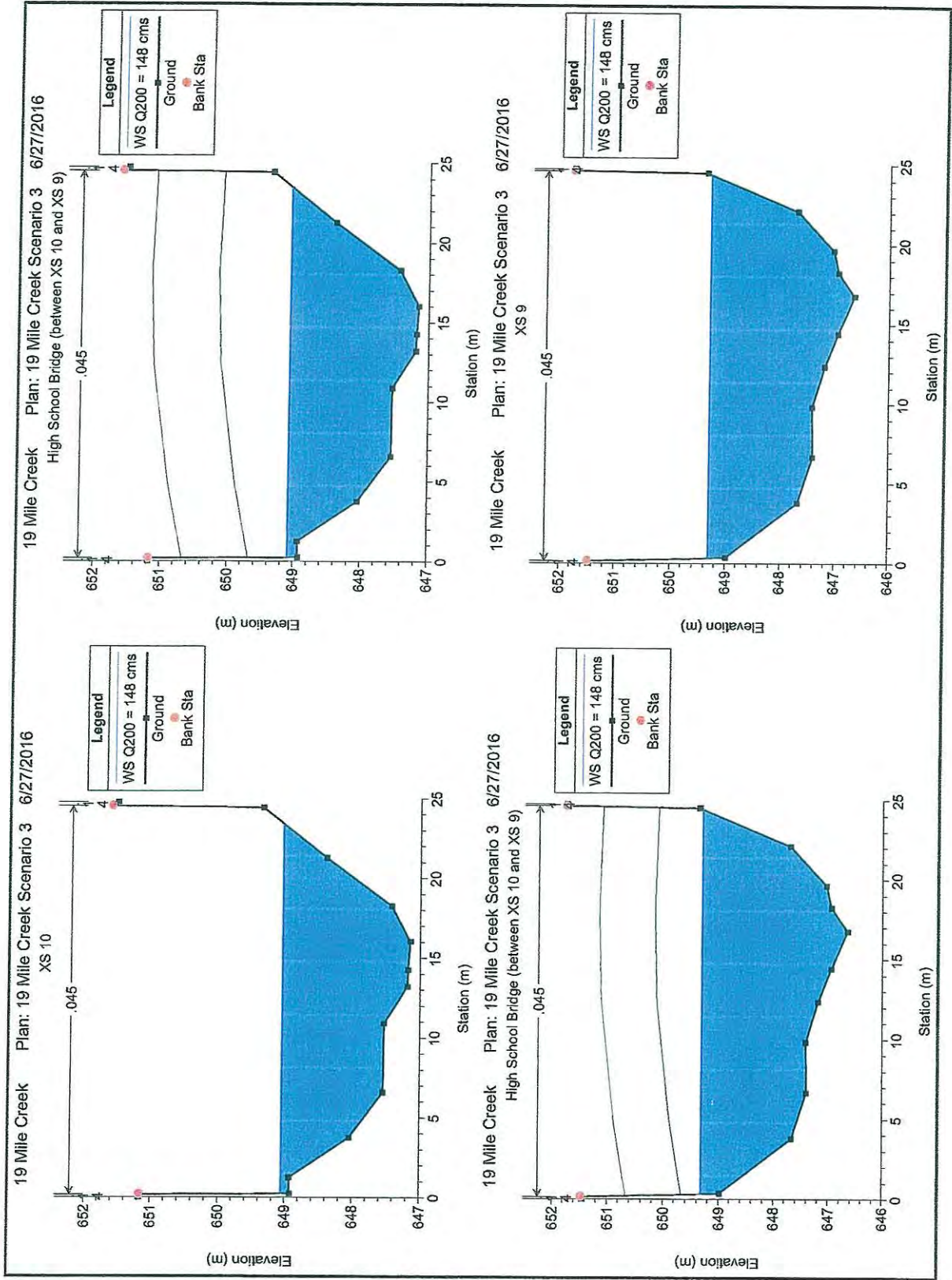


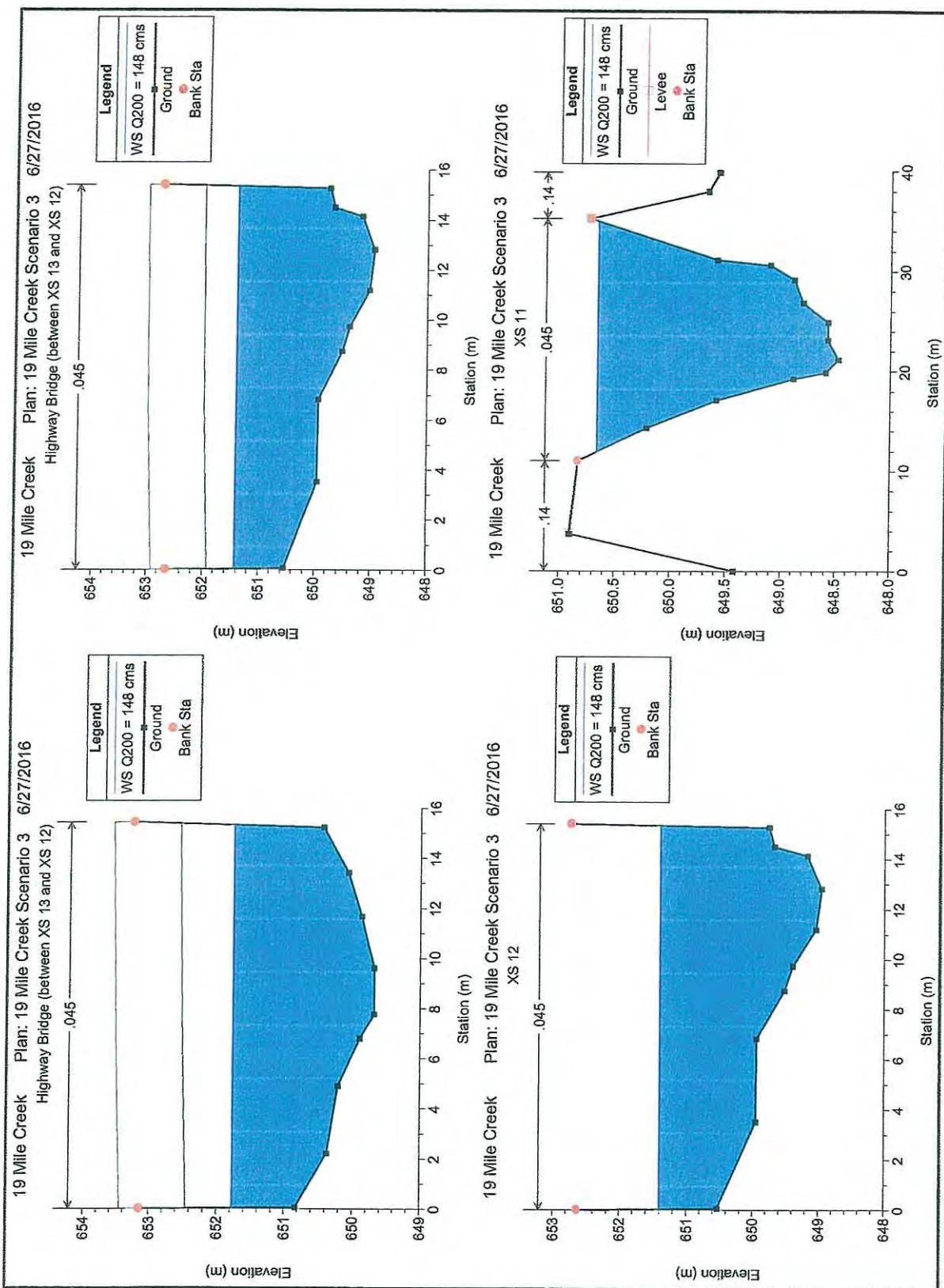
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

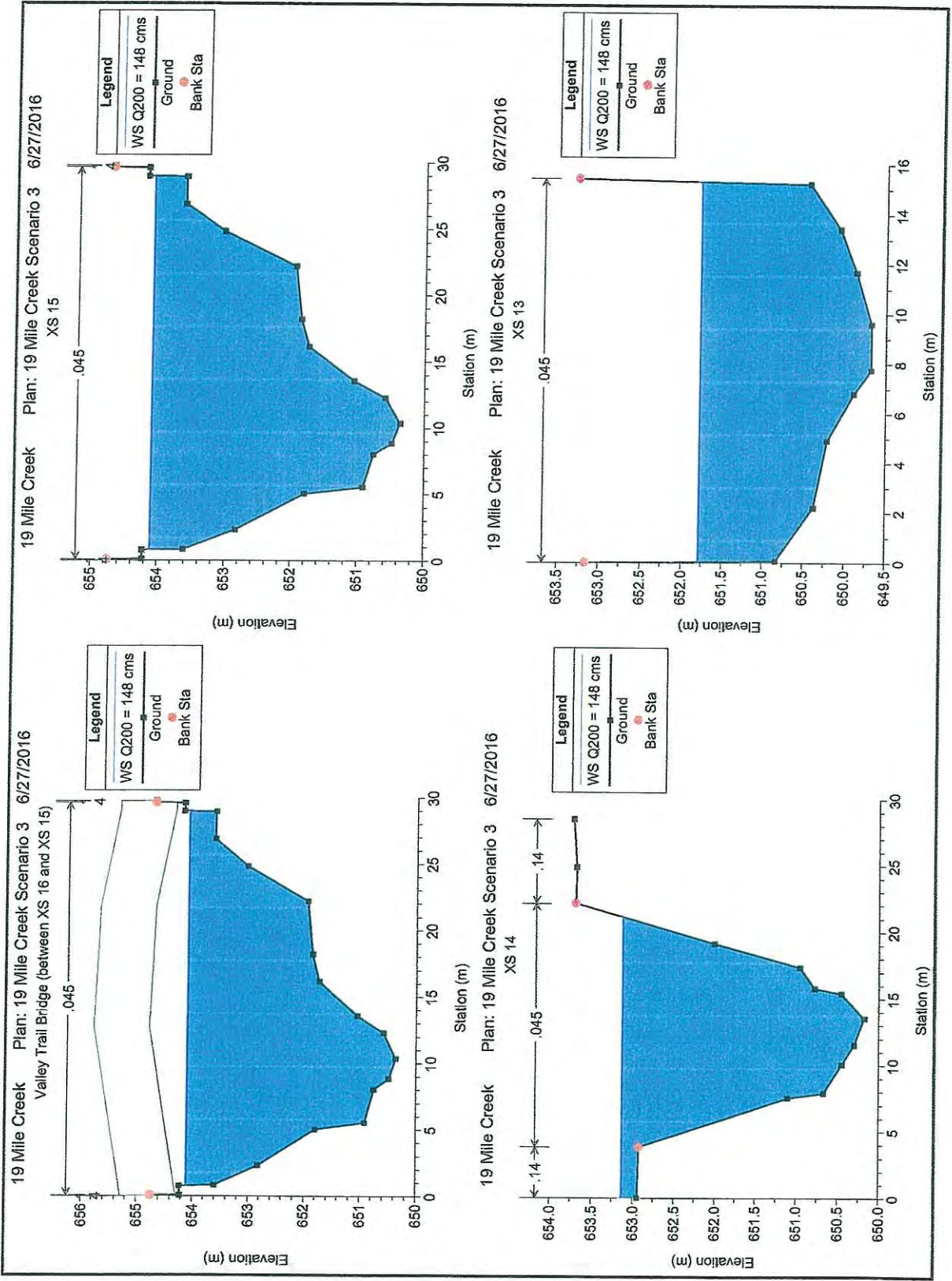


19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016







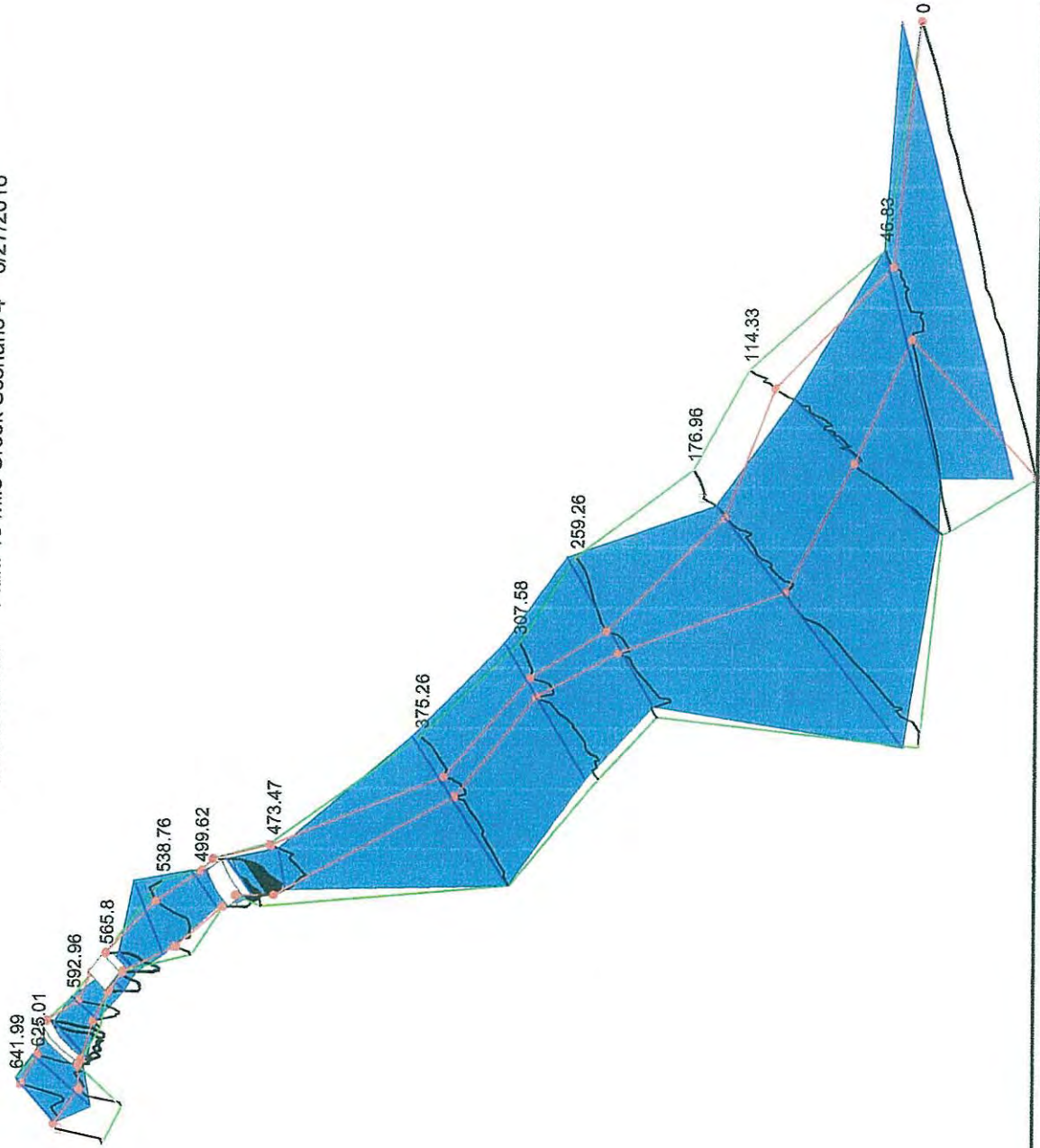






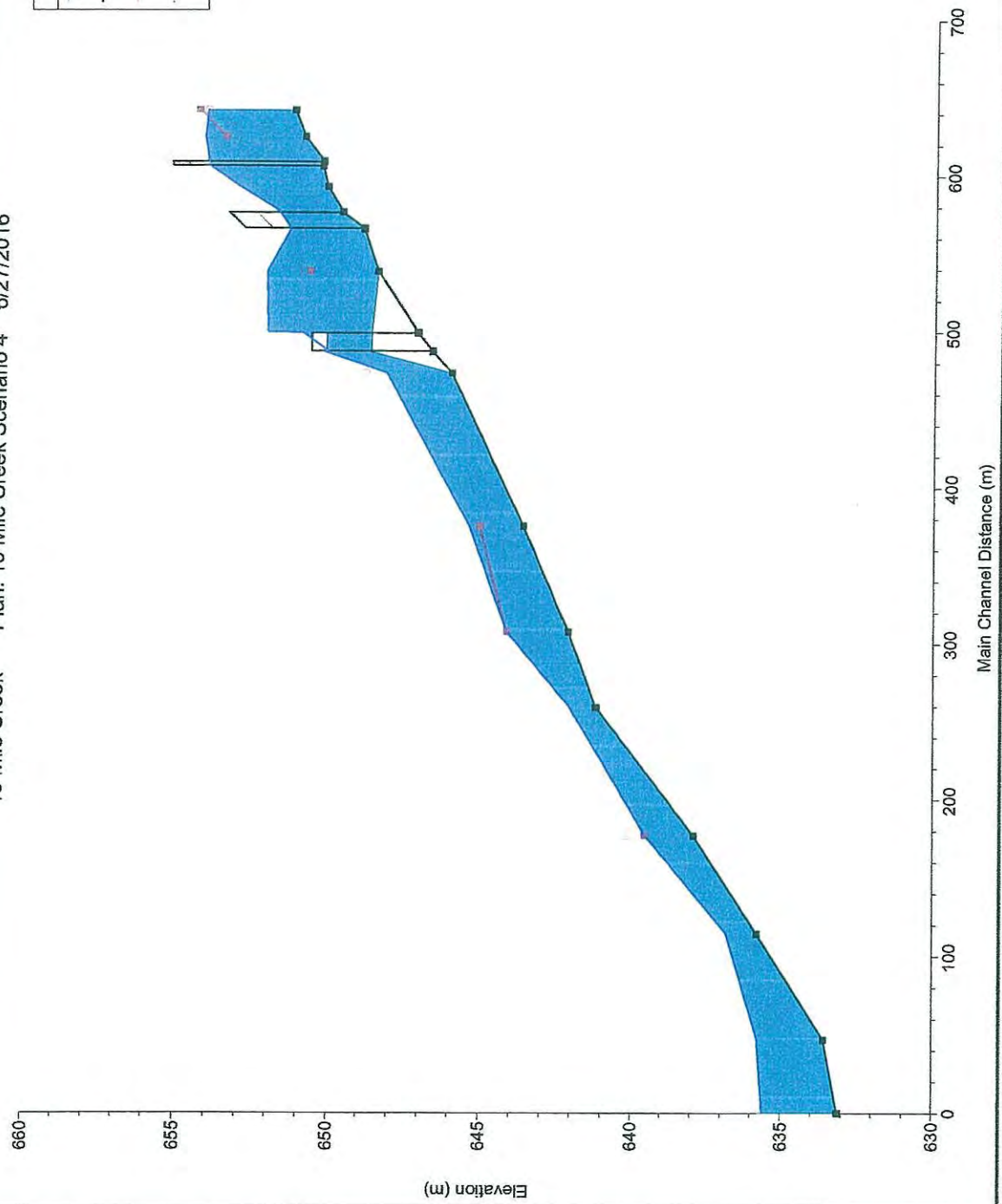
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

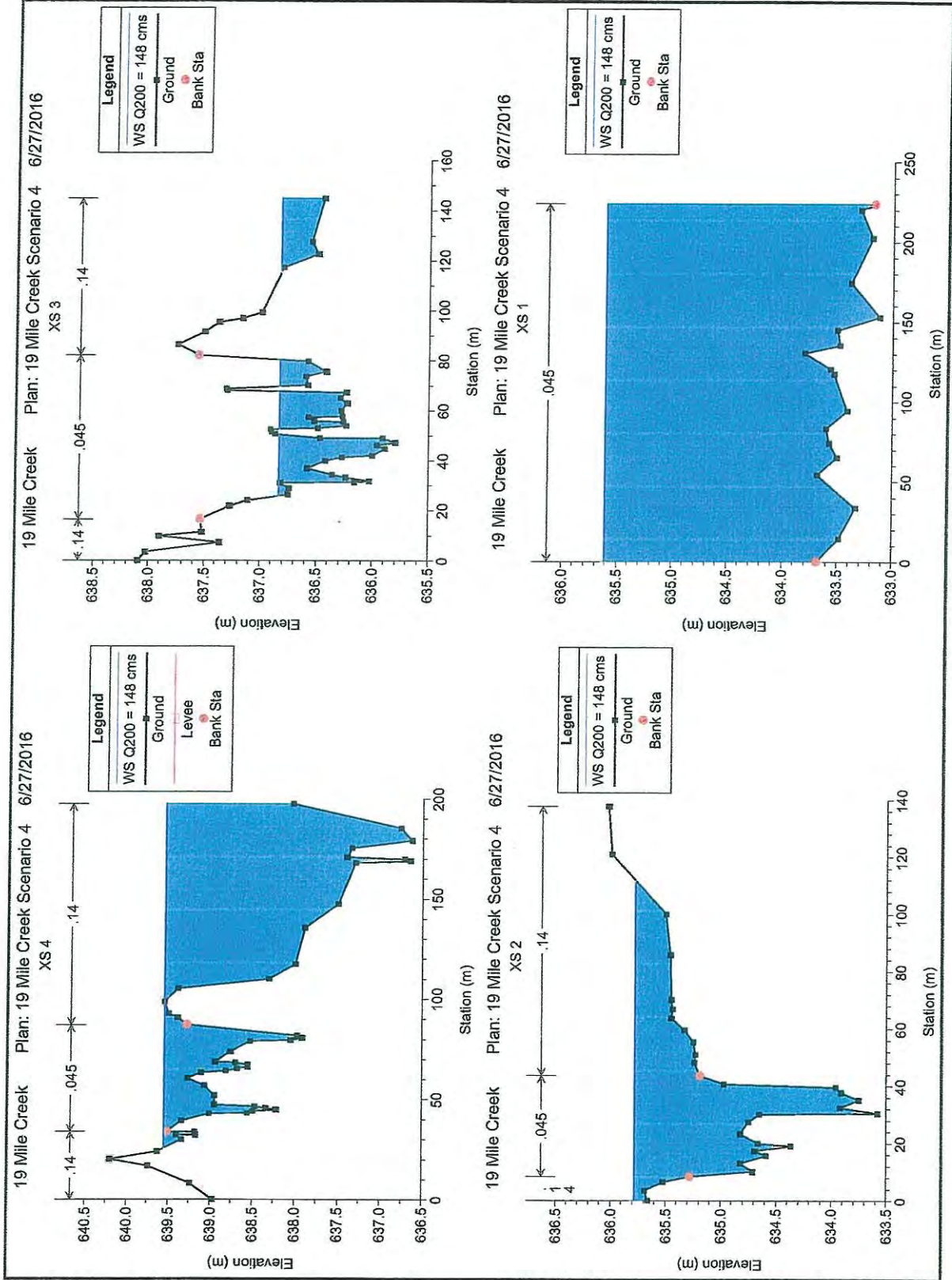
Legend	
	WS Q200 = 148 cms
	Ground
	Levee
	Bank Sta



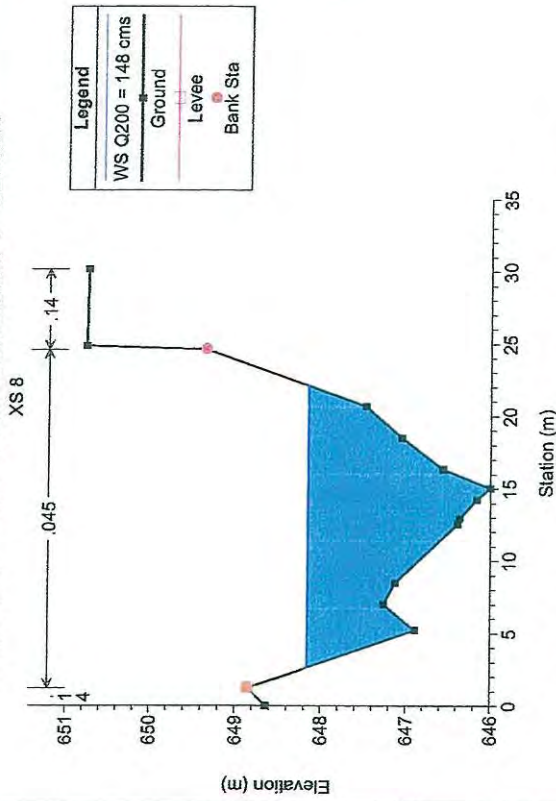
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

Legend	
WS Q200 = 148 cms	
Ground	
Left Levee	
Right Levee	

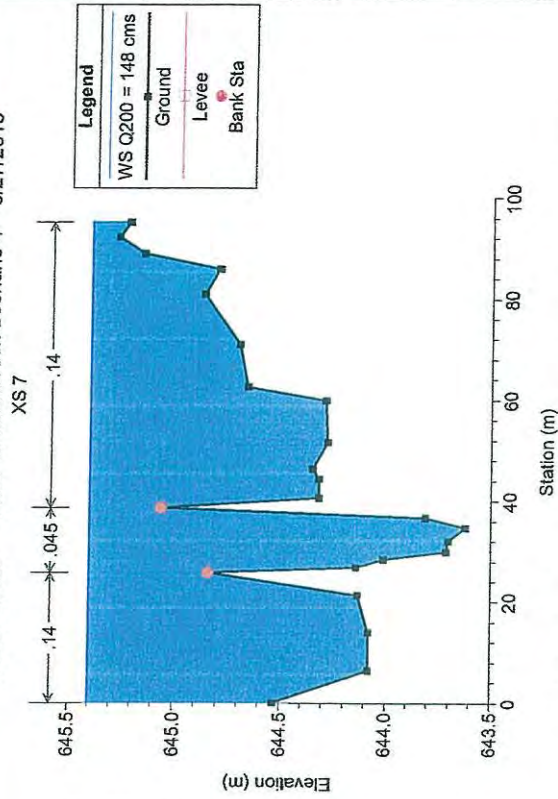




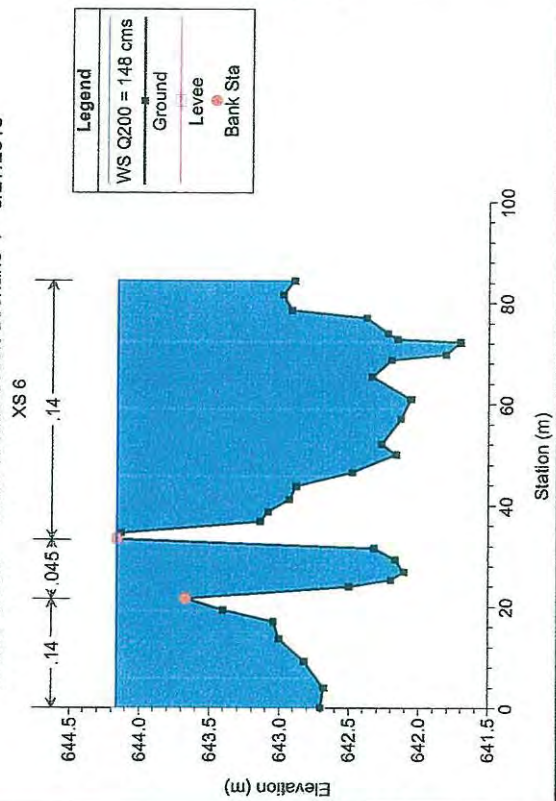
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



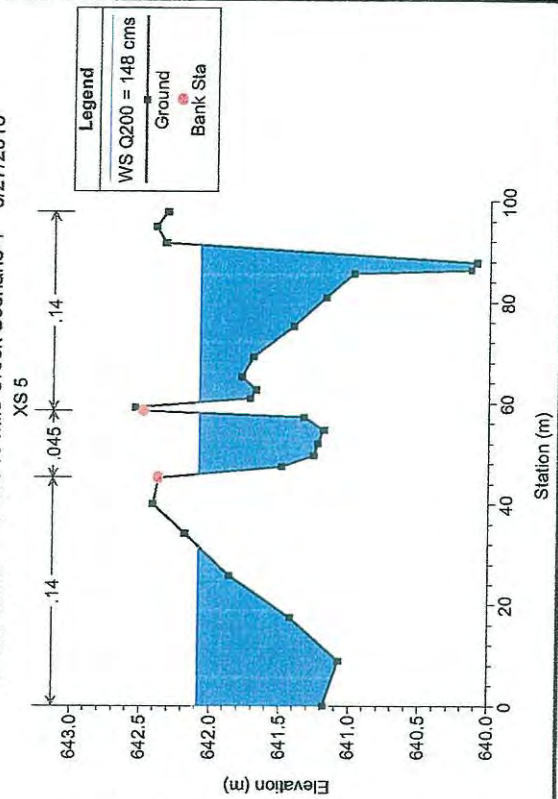
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

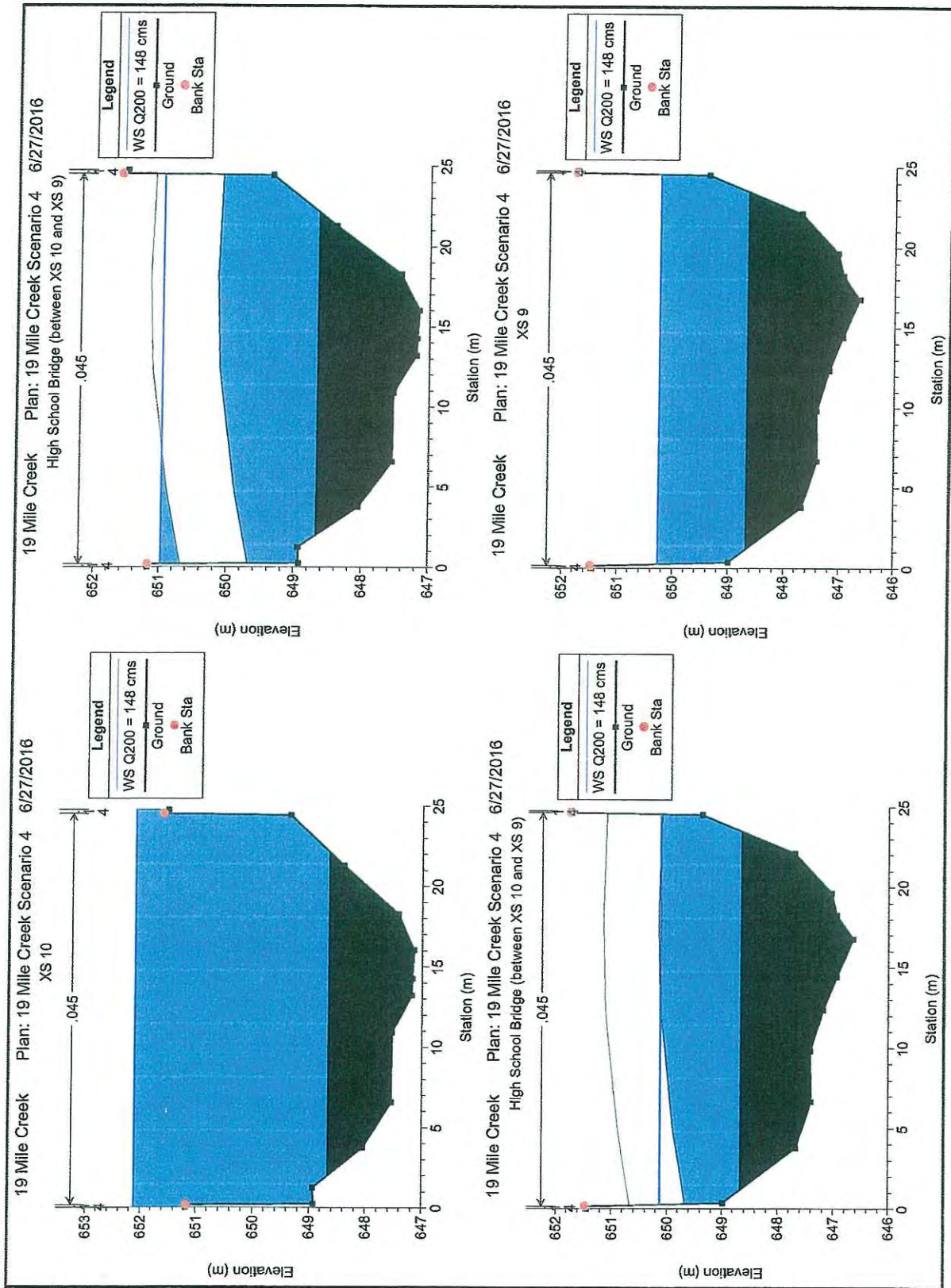


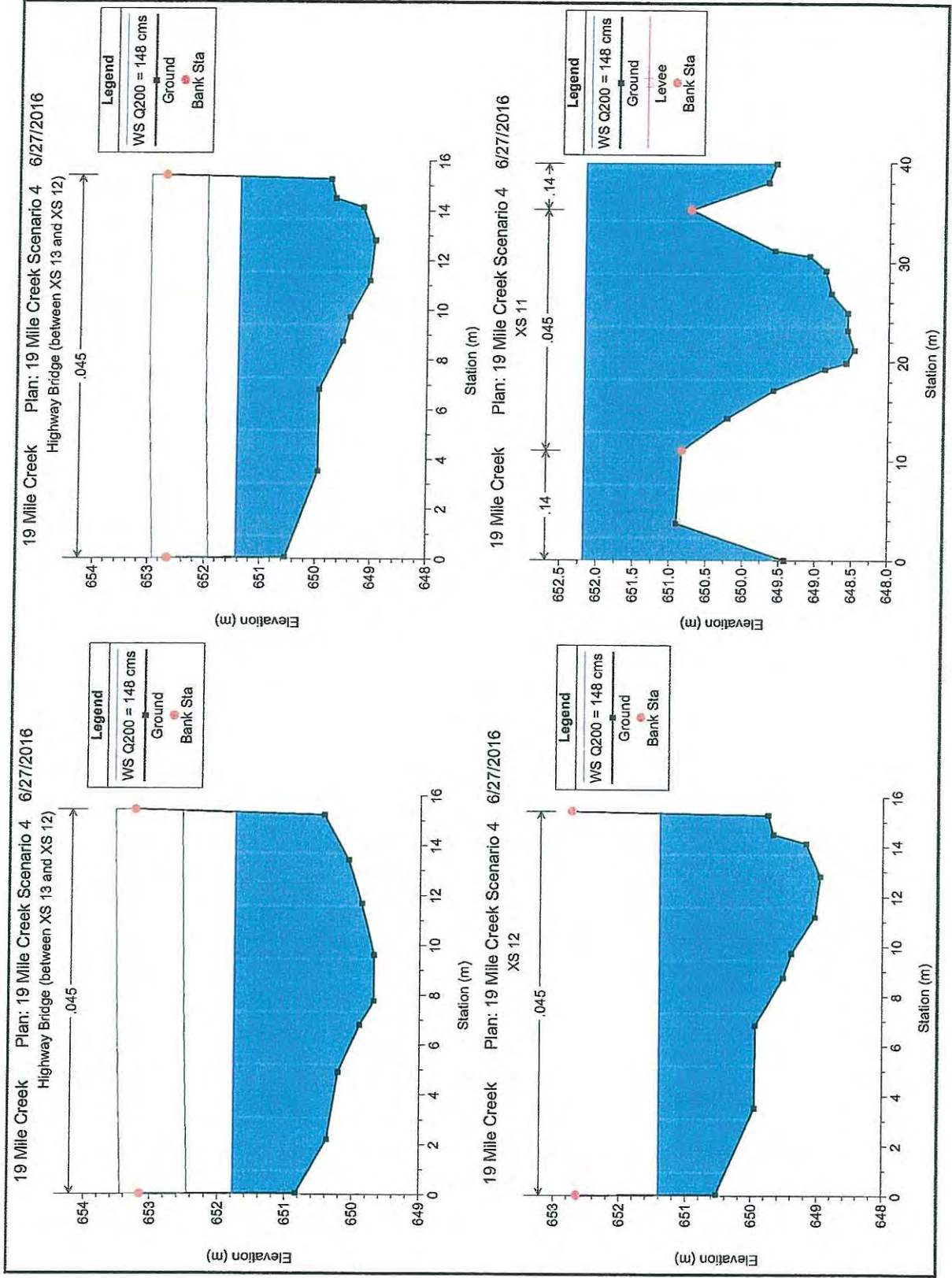
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

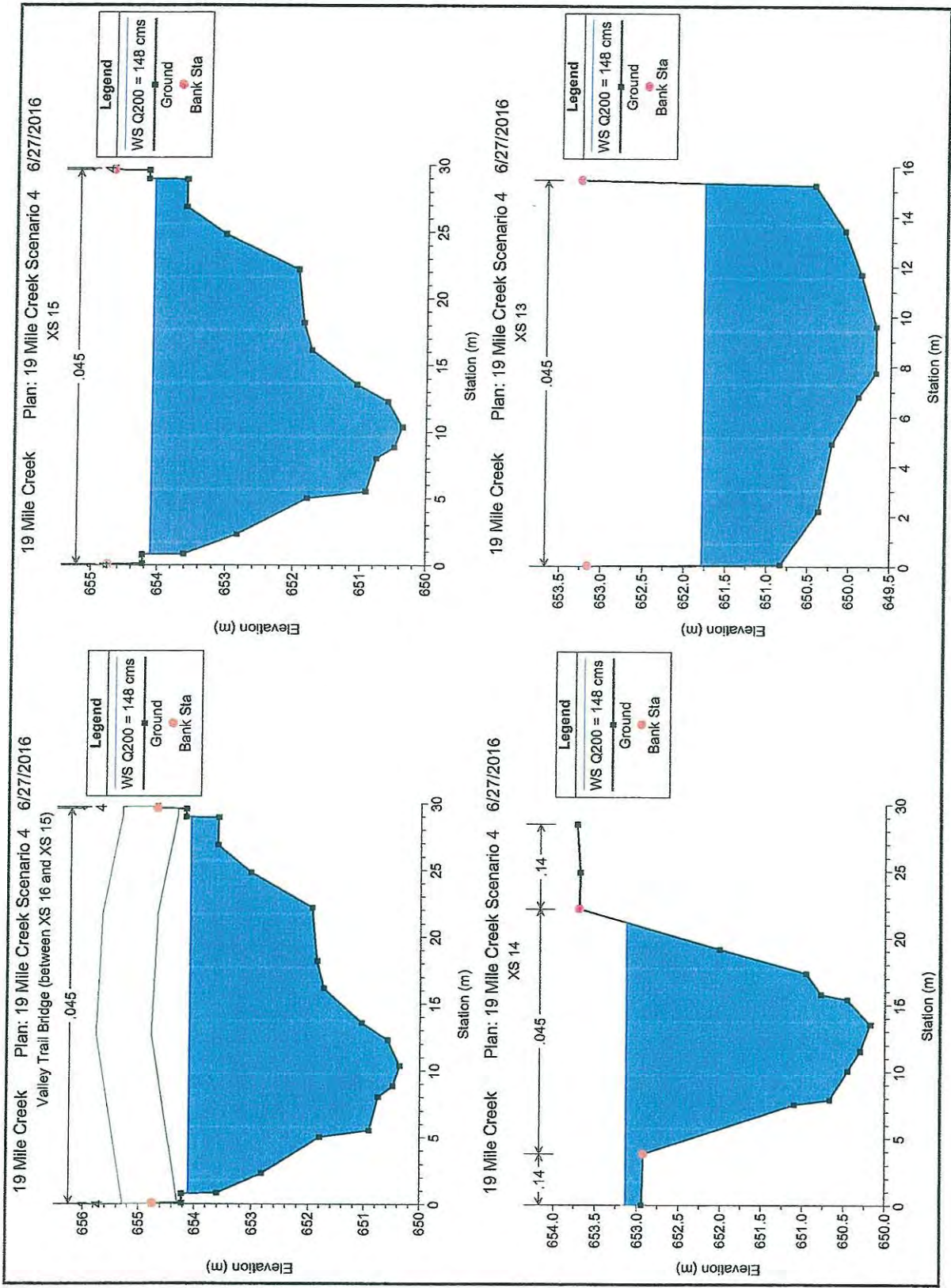


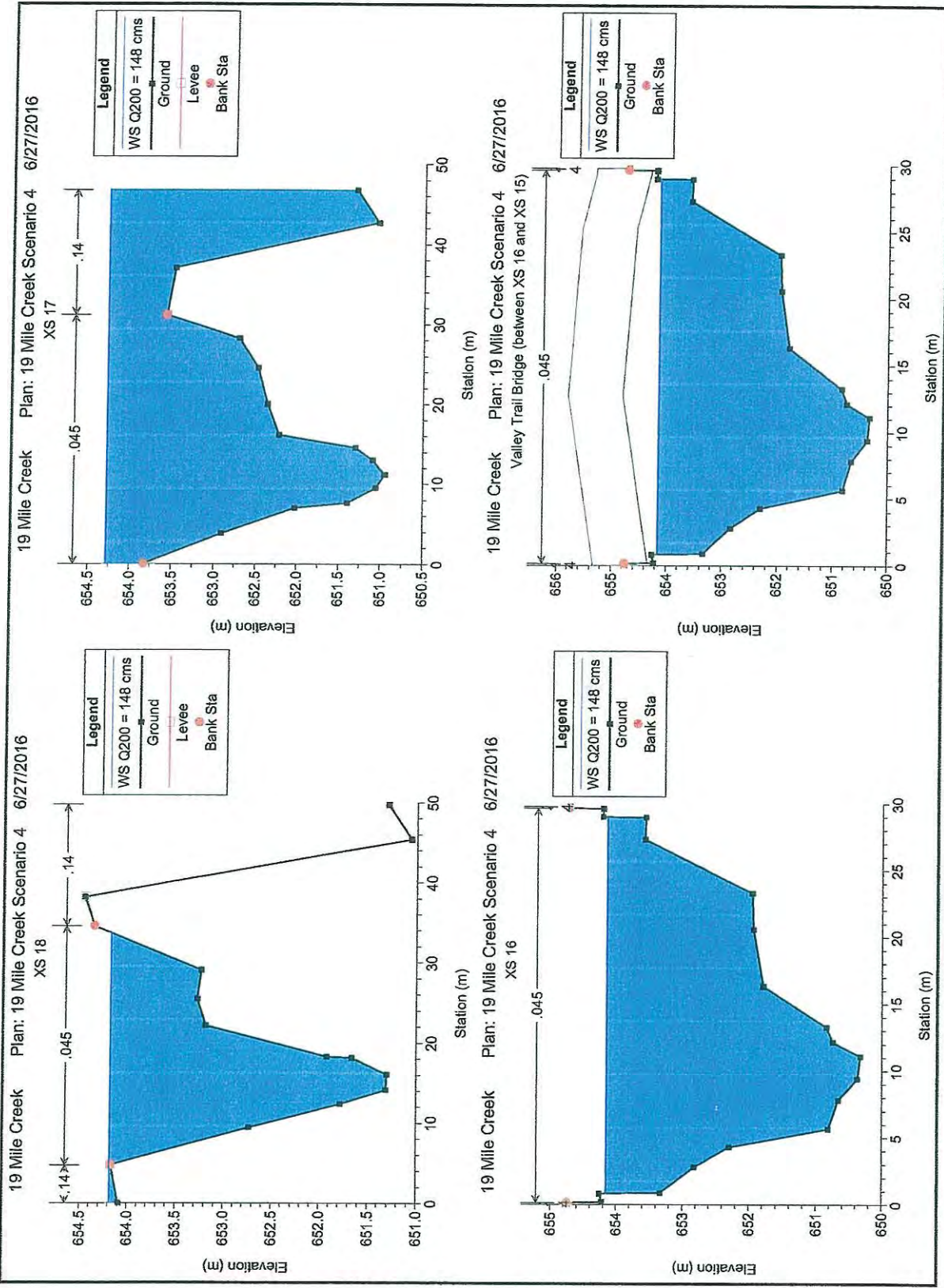
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



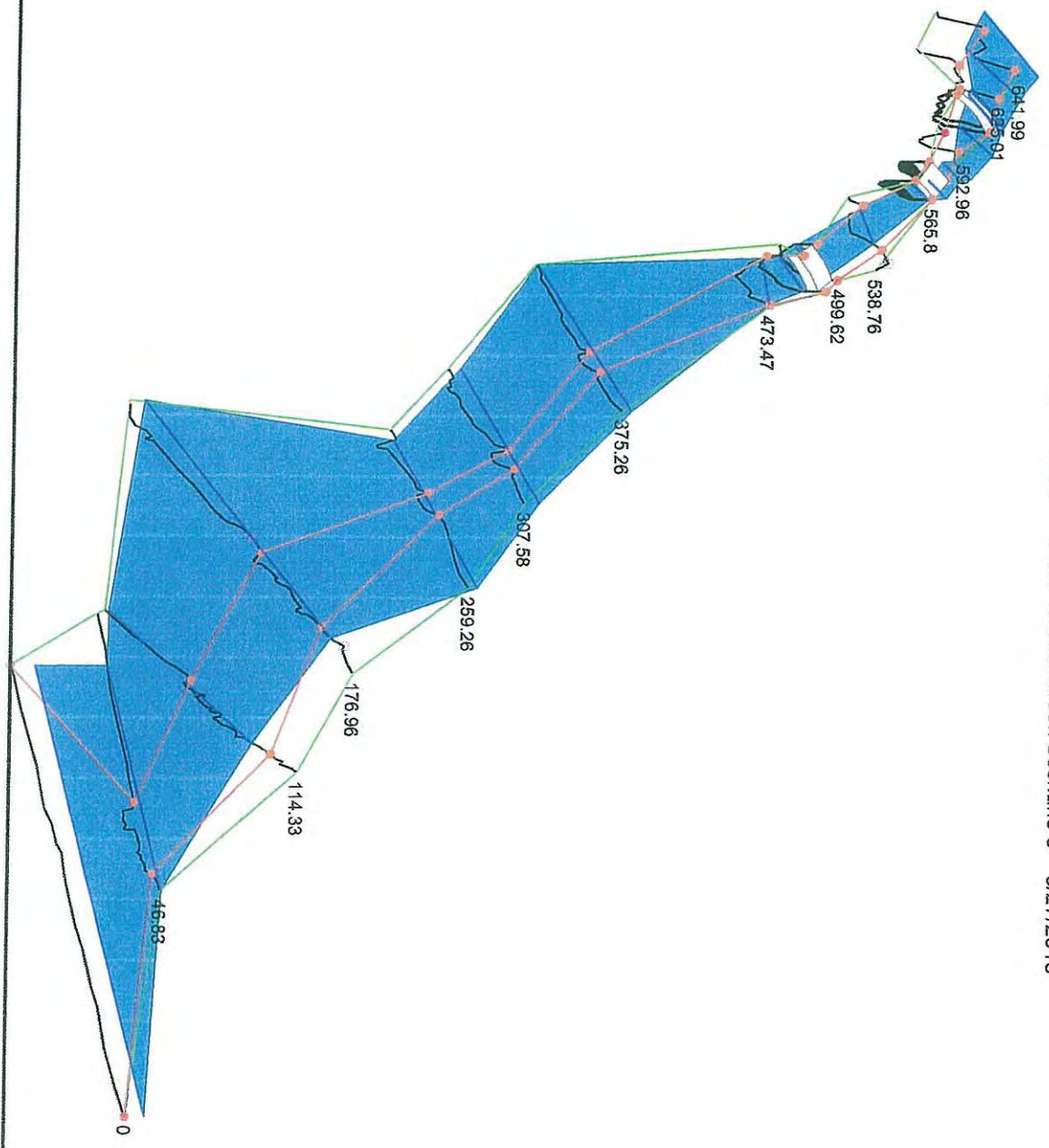








19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016



Legend

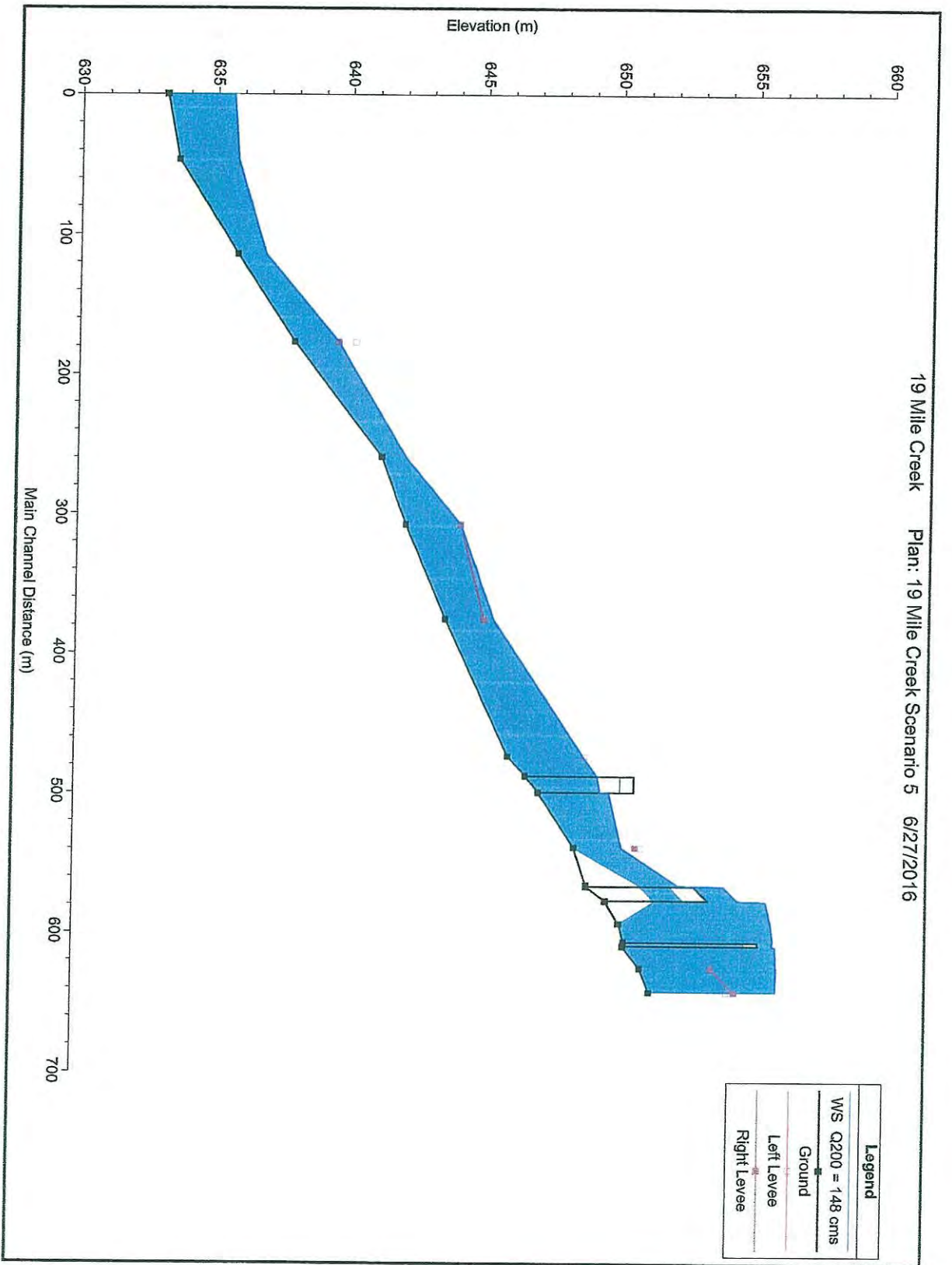
W/S Q200 = 148 cms

Ground

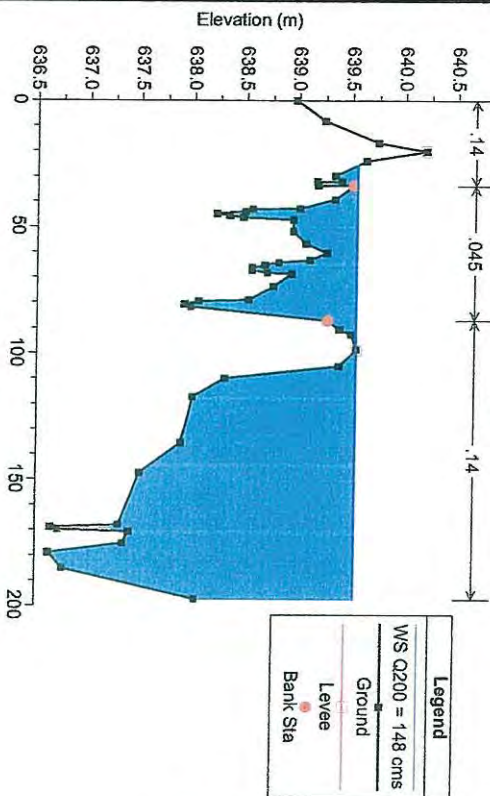
Levee

Bank Sta

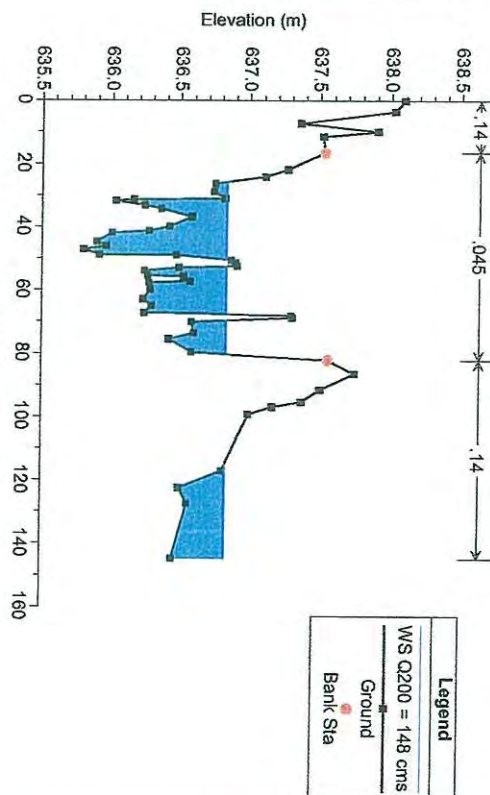
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016



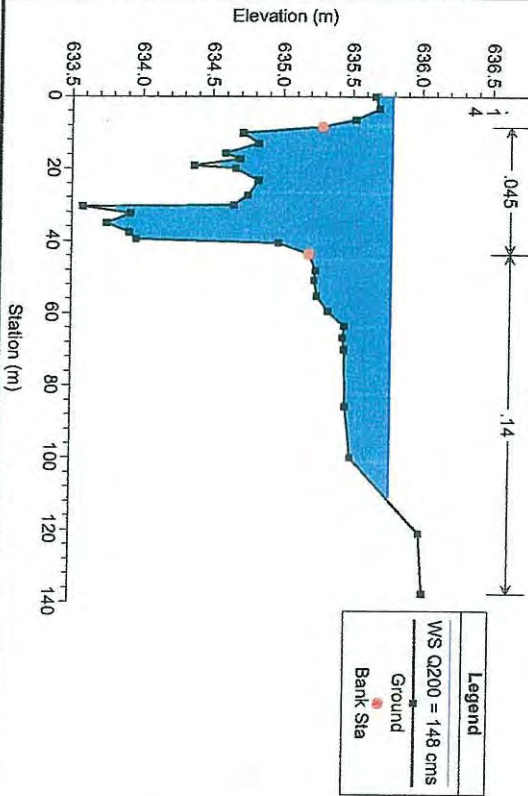
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 4



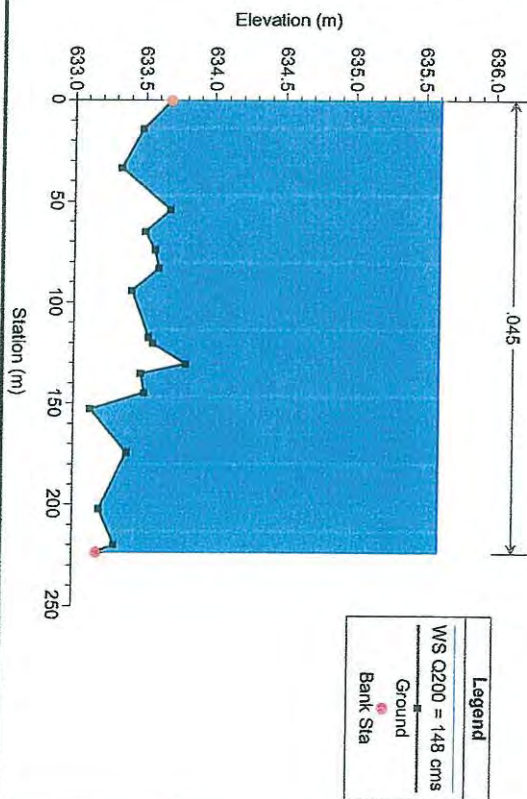
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 3



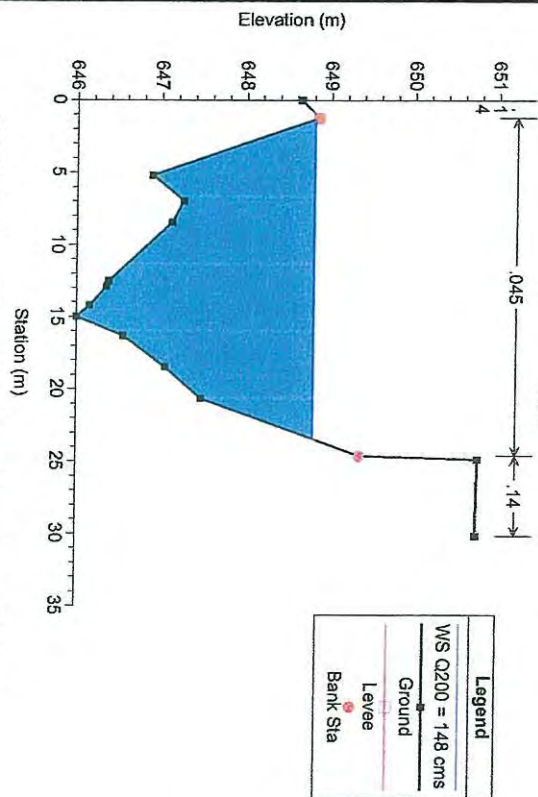
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 2



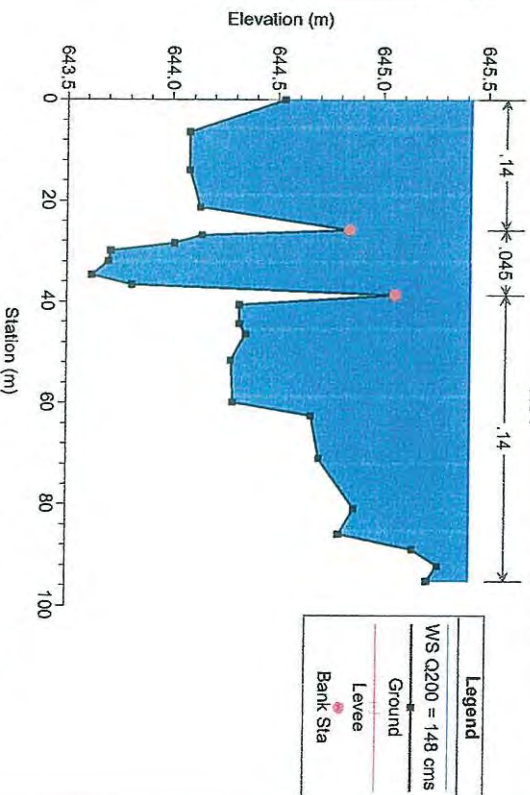
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 1



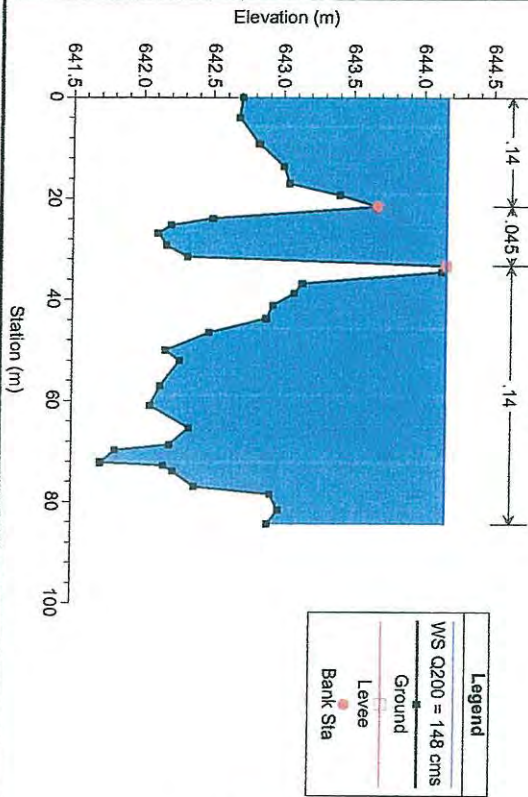
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 8



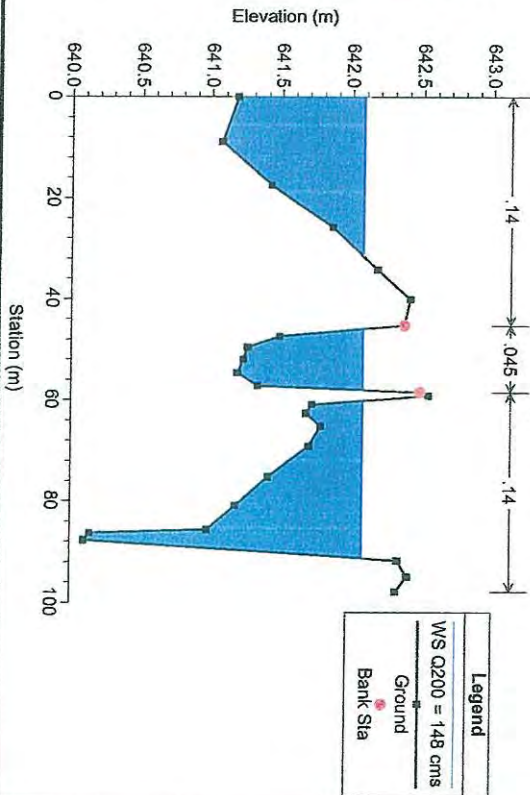
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 7



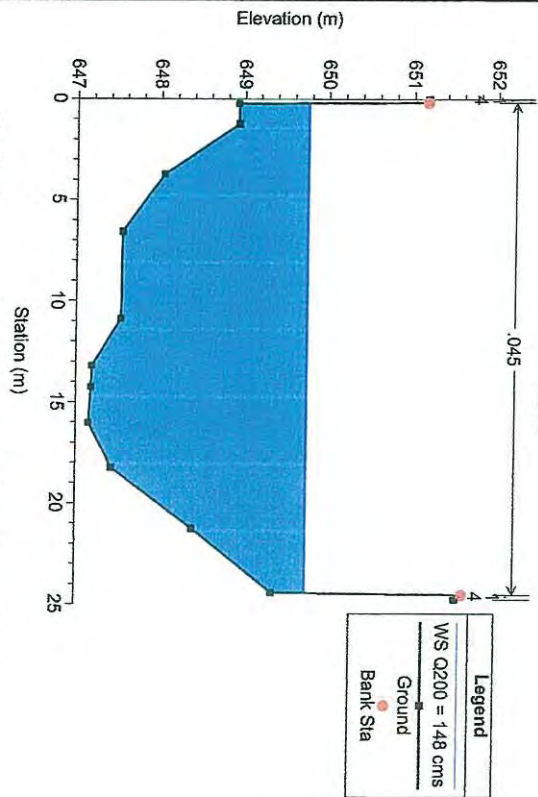
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 6



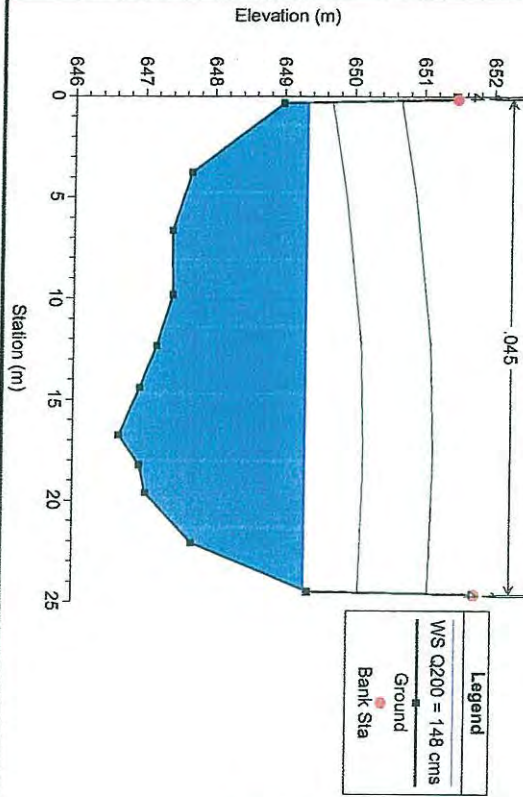
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 5



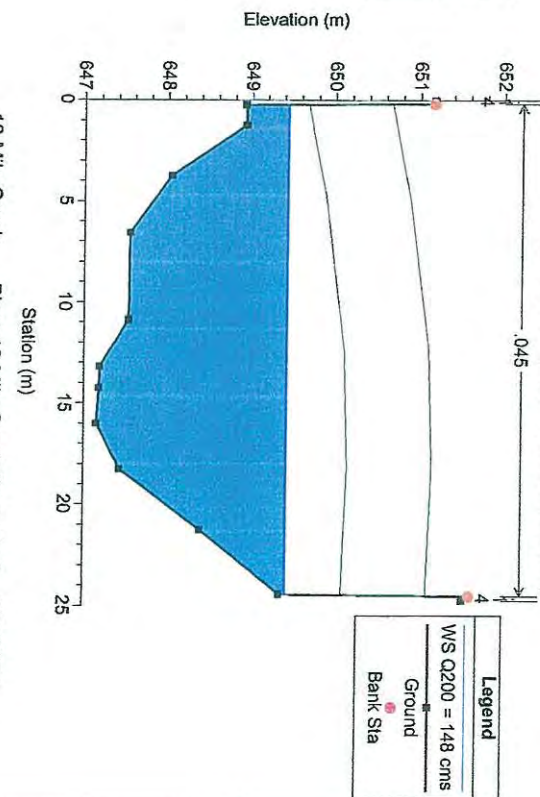
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 10



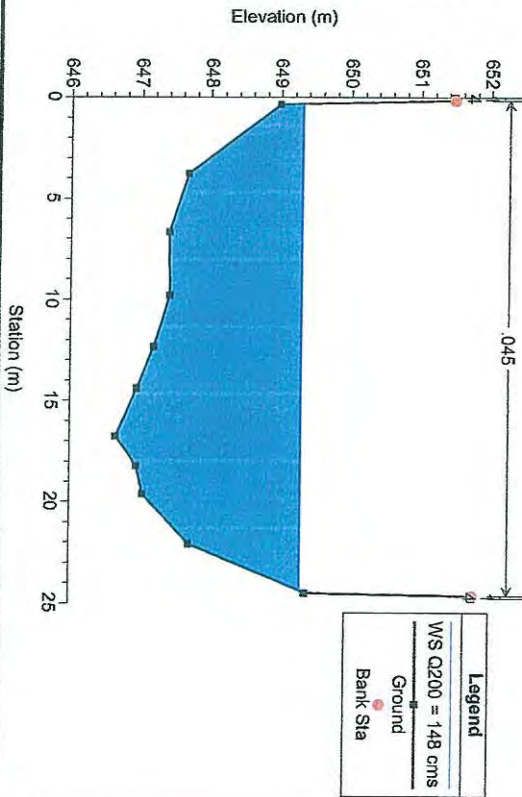
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
High School Bridge (between XS 10 and XS 9)



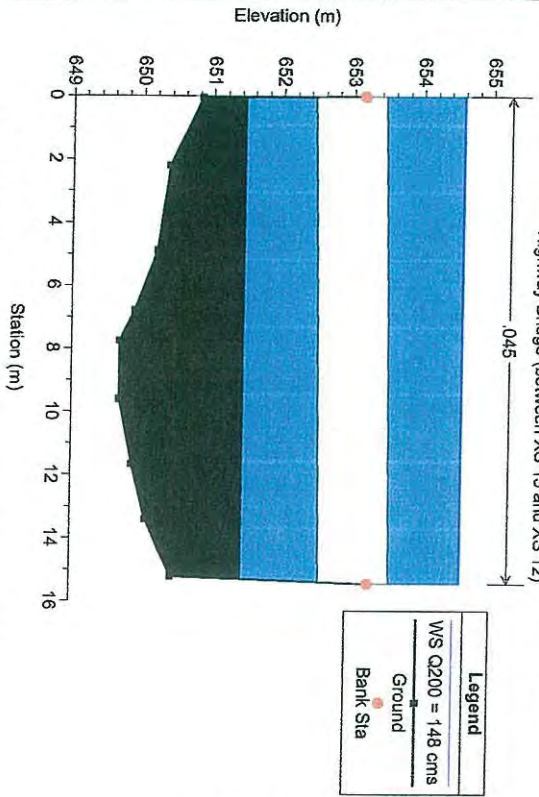
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
High School Bridge (between XS 10 and XS 9)



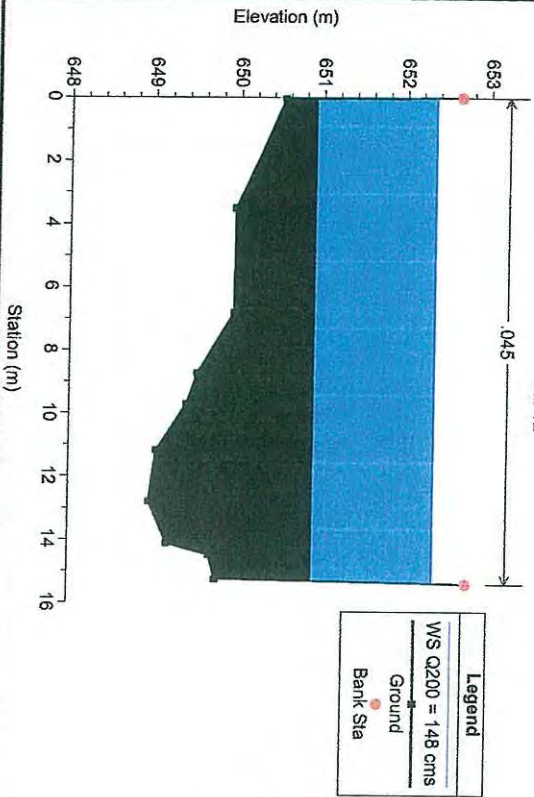
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 9



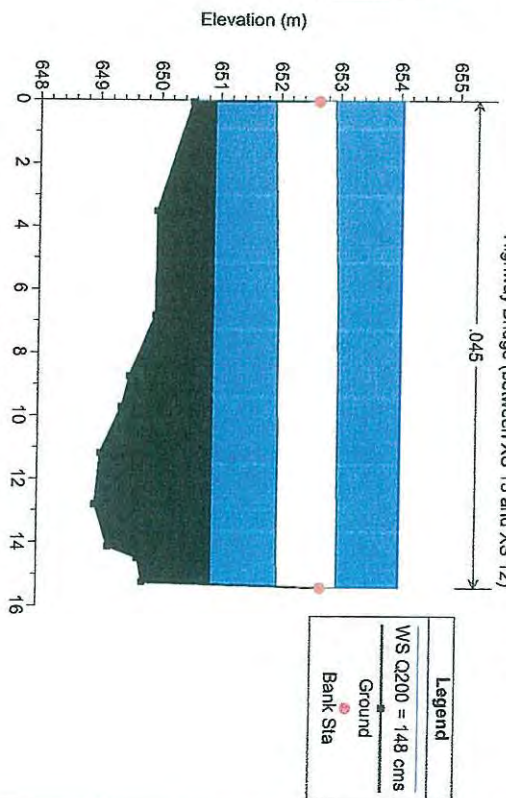
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Highway Bridge (between XS 13 and XS 12)



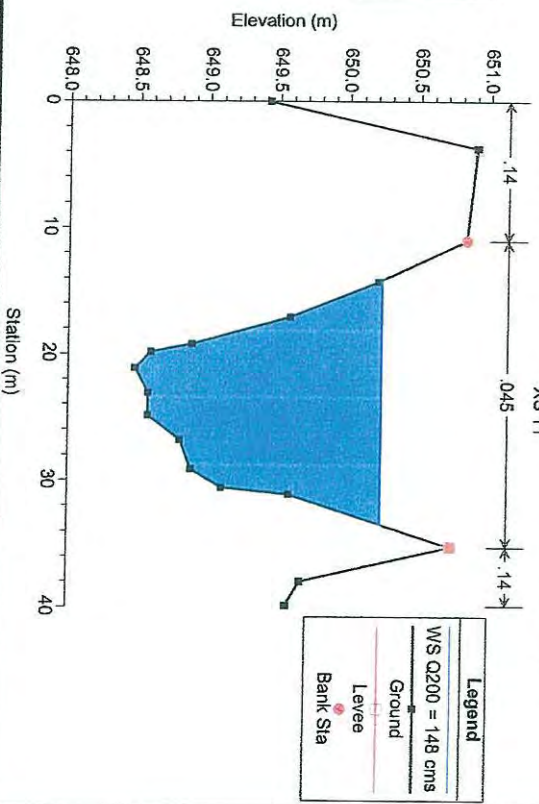
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 12



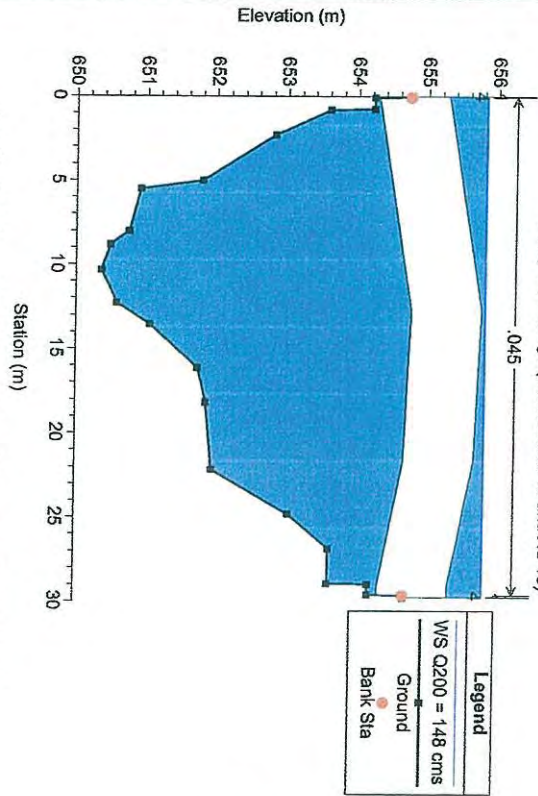
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Highway Bridge (between XS 13 and XS 12)



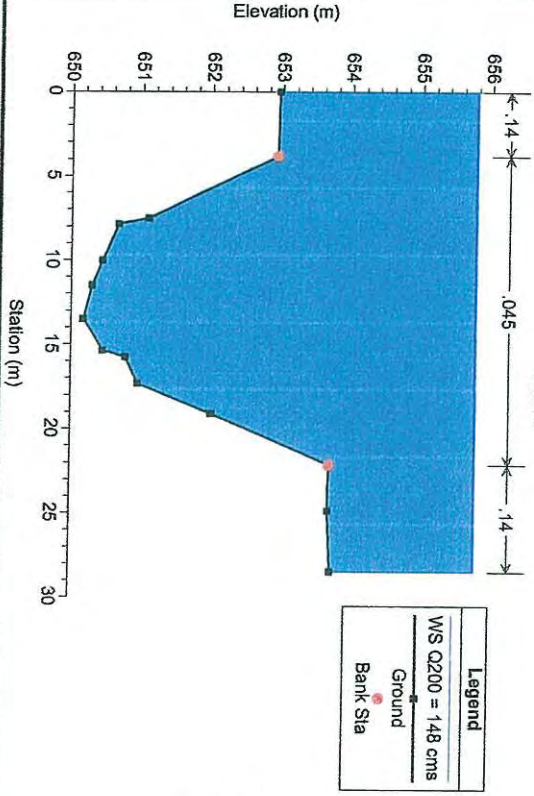
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 11



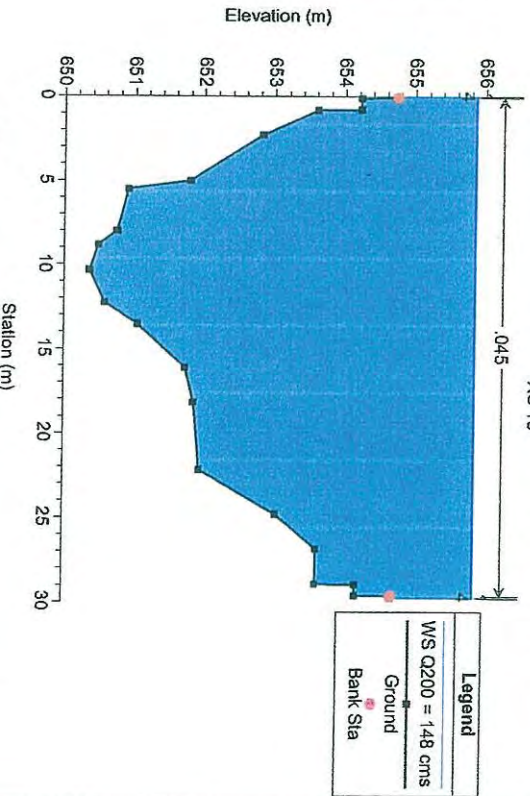
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



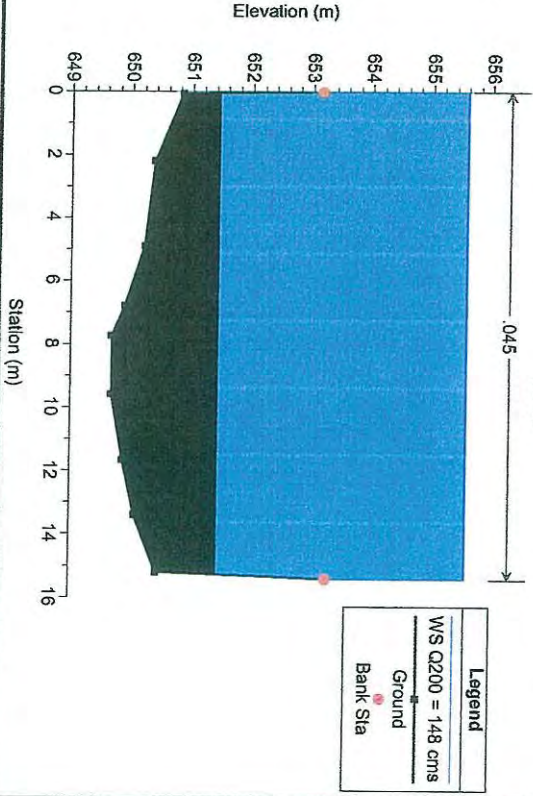
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 14



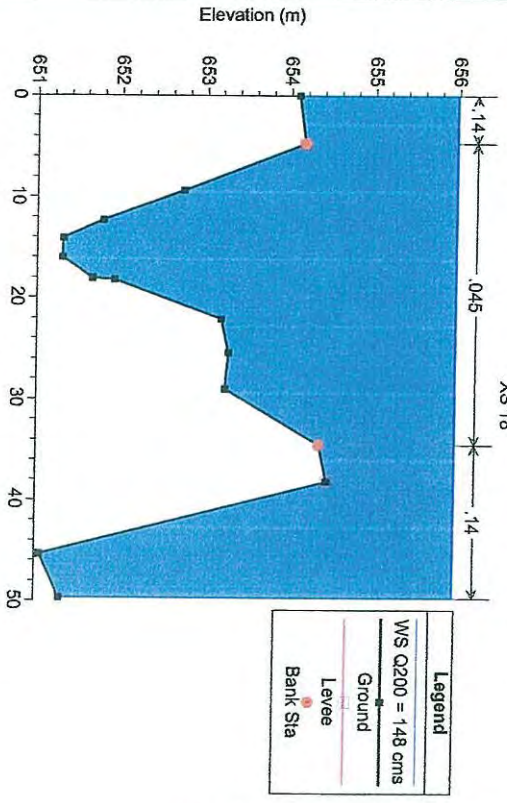
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 15



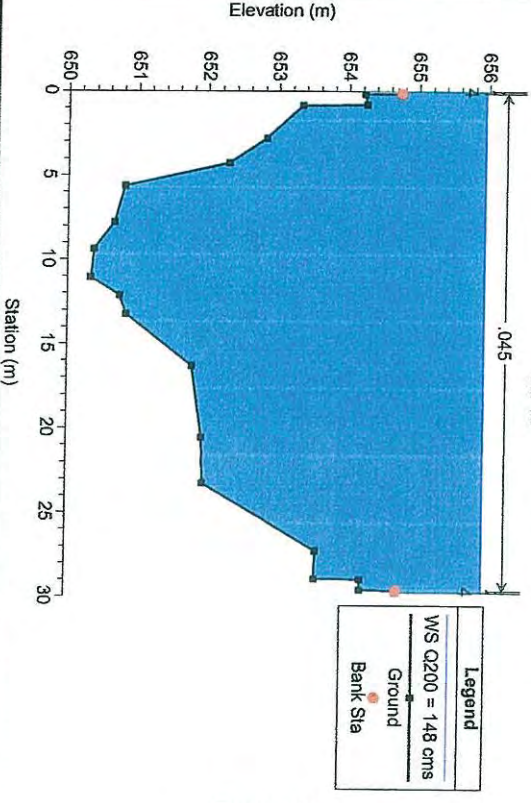
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 13



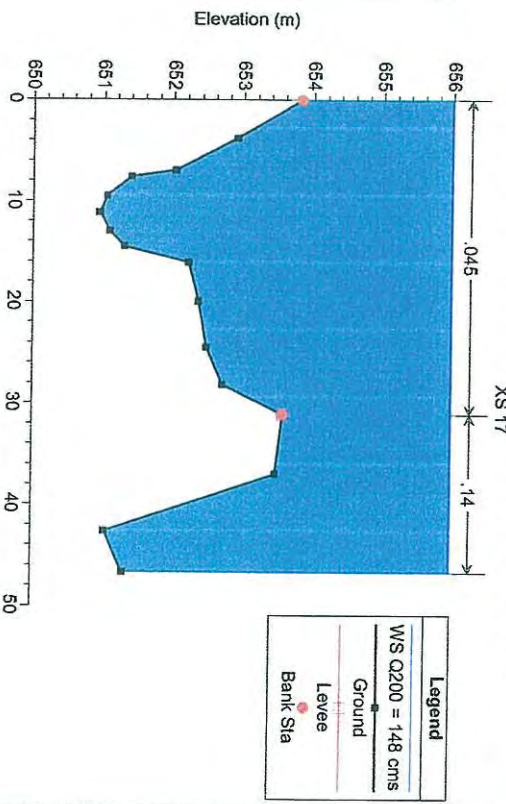
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 18



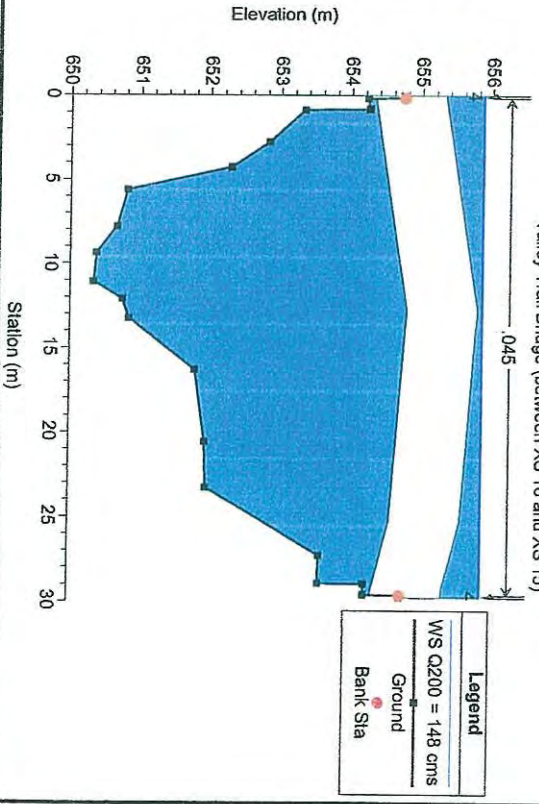
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 16



19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 17



19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

HEC-RAS Plan: 19 Mile #1 River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	636.23	0.014719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.86	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Dike River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.76	635.76	636.26	0.016496	3.22	57.08	70.09	0.92
1	114.33	Q200 = 148 cms	148.00	635.80	637.05	637.34	637.99	0.073567	4.30	34.40	55.03	1.74
1	176.96	Q200 = 148 cms	148.00	637.92	639.78	639.78	640.22	0.020166	2.95	55.13	69.69	0.98
1	259.26	Q200 = 148 cms	148.00	641.19	642.43	642.39	642.89	0.043190	4.47	79.79	90.66	1.43
1	307.58	Q200 = 148 cms	148.00	642.11	643.88	643.56	644.14	0.017445	3.43	99.93	76.46	0.93
1	375.26	Q200 = 148 cms	148.00	643.62	645.02	645.40	646.26	0.076470	6.30	56.69	87.52	1.93
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.66	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Avulsion River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	636.50	636.28	636.60	636.99	0.564036		39.74	67.61	0.00
1	114.33	Q200 = 148 cms	148.00	637.75	637.55	637.87	638.20	0.363042		41.59	54.17	0.00
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.59	0.004360	1.35	204.08	134.82	0.45
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.66	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile HSB River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.00069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	636.23	0.014719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.40	645.42	645.86	0.021643	4.08	91.44	95.04	1.08
1	473.47	Q200 = 148 cms	148.00	646.00	648.16	648.80	650.20	0.067341	6.34	23.35	19.46	1.85
1	487.09	Q200 = 148 cms	148.00	648.67	650.25	650.25	651.03	0.019516	3.92	37.74	24.31	1.00
1	493.36	Bridge	Bridge									
1	499.62	Q200 = 148 cms	148.00	648.67	652.11	650.27	652.28	0.001608	1.80	82.71	24.73	0.31
1	538.76	Q200 = 148 cms	148.00	648.48	652.16	650.96	652.36	0.002249	2.04	94.30	39.86	0.39
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40	Bridge	Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68	Bridge	Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Hwy Br River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000099	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	636.23	0.014719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.83	0.017865	4.03	36.71	22.11	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30		649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.75	649.42	650.29	0.009940	3.23	45.77	24.23	0.75
1	538.76	Q200 = 148 cms	148.00	648.48	650.23	650.96	652.58	0.082429	6.79	21.79	19.28	2.04
1	565.8	Q200 = 148 cms	148.00	650.91	652.34	653.04	654.06	0.071798	6.75	21.91	15.37	1.81
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	651.45	655.58	653.56	655.86	0.002913	2.33	63.60	15.43	0.37
1	592.96	Q200 = 148 cms	148.00	650.18	655.78		655.92	0.000888	1.71	106.46	28.49	0.26
1	605.89	Q200 = 148 cms	148.00	650.36	655.86		655.95	0.000644	1.29	114.79	29.75	0.21
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	655.95	653.10	656.03	0.000573	1.24	119.32	29.77	0.20
1	625.01	Q200 = 148 cms	148.00	650.95	655.98	653.58	656.04	0.000514	1.13	170.53	46.73	0.19
1	641.99	Q200 = 148 cms	148.00	651.30	655.98	654.18	656.06	0.000848	1.36	152.03	49.70	0.24

B6 - SCOUR DEPTH CALCULATIONS

SCOUR DEPTH CALCULATIONS

Method 1: Zeller Equation (Simons Li & Associates, 1985)

$$Y_{gs} = Y_{max} [(0.0685V_m^{0.8})/(Y_h^{0.4}S_e^{0.3}) - 1]$$

where

Q_{design}	=	Design flood flow, cfs
Y_{max}	=	Max depth of flow, ft
V_m	=	Average velocity of flow, fps
Y_h	=	Hydraulic depth of flow, ft
S_e	=	Energy slope (or bed slope for uniform flow)
Y_{gs}	=	General scour depth, ft

Method 2: Regime Equation by Blench (Pemberton & Lara, 1984)

$$Y_{f0} = q_f^{2/3}/F_{b0}^{1/3}$$

$$Y_s = ZY_{f0}$$

where

Q_{design}	=	Design flood flow, cfs
w	=	Channel top width, ft
q_f	=	Design discharge per unit width or Q_{design}/w
D_{50}	=	Median grain size of material, mm
F_{b0}	=	Blench's "zero bed factor" as a function of D_{50}
Y_{f0}	=	Water depth for zero bed sediment transport
Blench Z	=	A factor as a function of the degree of bend
Y_s	=	General scour depth below stream bed

Method 3: Regime Equation by Lacey (West Consultants Inc., 2003)

$$Y_m = 0.47(Q/f)^{1/3}$$

$$Y_s = ZY_m$$

where

Q	=	Design flood discharge, cfs
f	=	Lacey's silt factor
	=	$1.76(D_m)^{1/2}$
D_m	=	Mean grain size of material
Y_m	=	Mean water depth
Lacey Z	=	A factor as a function of the degree of bend
Y_s	=	General scour depth below stream bed

Result Summary for Scour Depth Calculations

XS No.	V _{ch} (m/s)	Y _s (m)	Min Chl Elev (m)	Scoured Elev (m)	Berm Crest (m)	Elev Diff (m)	Driveway Station	Berm Station
XS 7	6.3	0.6	643.62	642.97	645.72	2.75	190	-
XS 6	3.4	1.1	642.11	640.98	644.60	3.62	260	-
XS 5	4.5	1.1	641.19	640.12	643.24	3.12	300	-
XS 4	3.0	1.2	637.92	636.71	640.59	3.88	390	100
XS 3	4.4	1.3	635.80	634.52	638.03	3.51	-	170
XS 2	3.3	1.2	633.58	632.38	636.85	4.47	-	220

Assumptions:

1. Mean grain size of material in 19 Mile Creek = 0.6 mm as per exp sieve analysis dated May 20, 2016 for AH16-01 S6 @ 5.8 m Test No. 5

Comparison of Results from the 3 General Scour Depth Calculation Methods

XS No.	Method 1 Zeller ¹	Method 2 Blench	Method 3 Lacey	For Design ²
XS 7	0.3	1.1	0.6	0.6
XS 6	0.0	1.1	1.1	1.1
XS 5	0.0	1.0	1.1	1.1
XS 4	0.0	1.3	1.1	1.2
XS 3	0.0	1.4	1.1	1.3
XS 2	0.1	1.2	1.1	0.8

Note:

¹ It should be noted that in some cases, the Zeller method results in zero general scour depth.

² For design purposes, when Zeller method results in zero general scour depth, only results from the Blench and Lacey methods were used in calculating the average general scour depth value.



exp Services Inc.
275-3001 Waybume Drive
Burnaby, BC V5G 4W3
Telephone: (604)874-1245

RECORD OF AUGERHOLE : AH16-01

PAGE 1 OF 2

PROJECT NUMBER VAN-00226703-A0

PROJECT NAME White Glacier

DRILLING DATE 2016-04-13

DRILLING CONTRACTOR Uniwide Drilling Co. Ltd.

DRILLING METHOD Solid Stem Auger

EQUIPMENT TYPE Truck Mounted Auger Drill

LOGGED BY DGS CHECKED BY EGS

CLIENT Teck Yuen Lee

PROJECT LOCATION 8020 Alpine Way, Whistler, BC

AUGERHOLE LOCATION N: 5555190 E: 503201

ELEVATION _____

GROUND WATER LEVELS: ☒ AT TIME OF DRILLING 0.2m visible

☒ AT END OF DRILLING _____

☒ AFTER DRILLING _____

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT N VALUE BLOWS/0.3m ▲ DYNAMIC CONE BLOWS/0.3m ↘	POCKET PEN. (kPa) ● FIELD VANE SHEAR (kPa) Peak Remold	FINES CONTENT (%) □ PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
				NUMBER	TYPE	RECOVERY %			
0		ORGANIC SILT & PEAT, layered, trace rootlets, dark and light brown, wet, (very soft)		S1	AU		1		25.3
0.6		SAND & SILT to SILTY SAND, layers of silt, pockets of peat remnants, grey with light brown pockets, wet, (very soft) sand was medium to coarse grained	0.6	S2	AU		0		52
1.5		PEAT, fibrous, brown and dark brown, wet, (firm to stiff)	1.5	S3	AU		4		48.4
2.0		GRAVELLY SAND, some silt, pockets of peat, grey, wet, (loose to compact) sand was medium to coarse grained, gravel was angular	2.0	S4	AU		11 22 10		30
4.6		GRAVEL & SAND, trace to some silt, grey, wet, (loose)	4.6	S5	AU		16 14 9 5 8 6 5		
6		-occasional 100mm to 250mm thick layers of peat between 6m and end of hole		S6	AU		7 6 6 4 2 4 6		29
7.6		SAND, some gravel, trace to some silt, grey, wet, (loose to compact)	7.6	S7	AU		5 5 7 10 5 6 8 7		
				S8	AU				

(Continued Next Page)



exp Services Inc.
275-3001 Waybume Drive
Burnaby, BC V5G 4W3
Telephone: (604)874-1245

RECORD OF AUGERHOLE : AH16-01

PAGE 2 OF 2

PROJECT NUMBER VAN-00226703-A0
PROJECT NAME White Glacier
DRILLING DATE 2016-04-13
DRILLING CONTRACTOR Uniwide Drilling Co. Ltd.
DRILLING METHOD Solid Stem Auger
EQUIPMENT TYPE Truck Mounted Auger Drill
LOGGED BY DGS CHECKED BY EGS

CLIENT Teck Yuen Lee
PROJECT LOCATION 8020 Alpine Way, Whistler, BC
AUGERHOLE LOCATION N: 5555190 E: 503201
ELEVATION _____
GROUND WATER LEVELS: ☒ AT TIME OF DRILLING 0.2m visible
☒ AT END OF DRILLING _____
☒ AFTER DRILLING _____

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT N VALUE BLOWS/0.3m ▲	POCKET PEN. (kPa) ⊙	FINES CONTENT (%) □
				NUMBER	TYPE	RECOVERY %			
							20 40 60 80	100 200 300 400	20 40 60 80
							DYNAMIC CONE BLOWS/0.3m └─┐	FIELD VANE SHEAR (kPa) Peak ● Remold ○	PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL ┌─┴─┐
		SAND, some gravel, trace to some silt, grey, wet, (loose to compact) (continued)		S9	AU		20 40 60 80	100 200 300 400	20 40 60 80
							4		63

Bottom of hole at 10.7m.

9
9
10
12
17
16
20
15
13

APPENDIX C – LCI FINAL BERM DESIGN DRAWINGS

CLIENT:

WHITE GLACIER INTERNATIONAL
LAMOREUX ARCHITECT INCORPORATED

PROJECT:

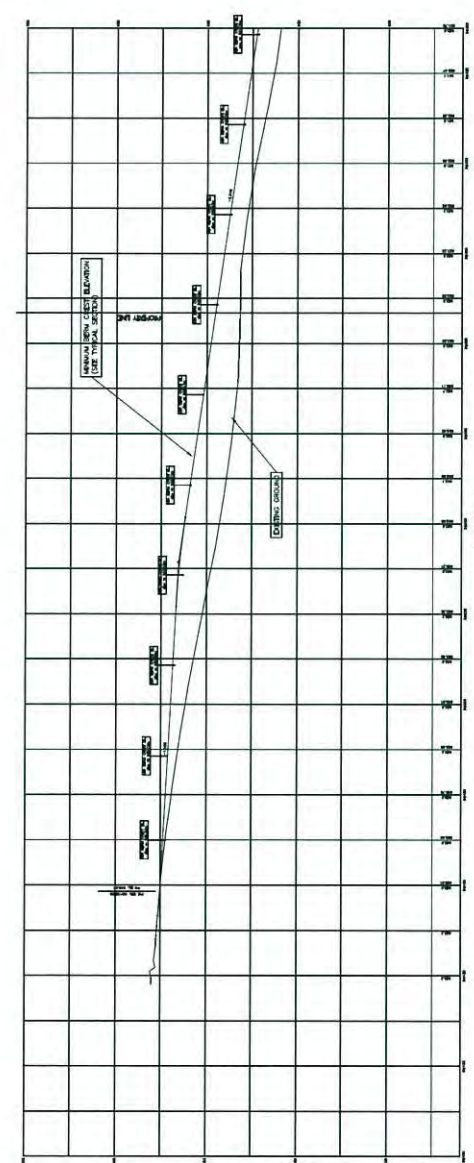
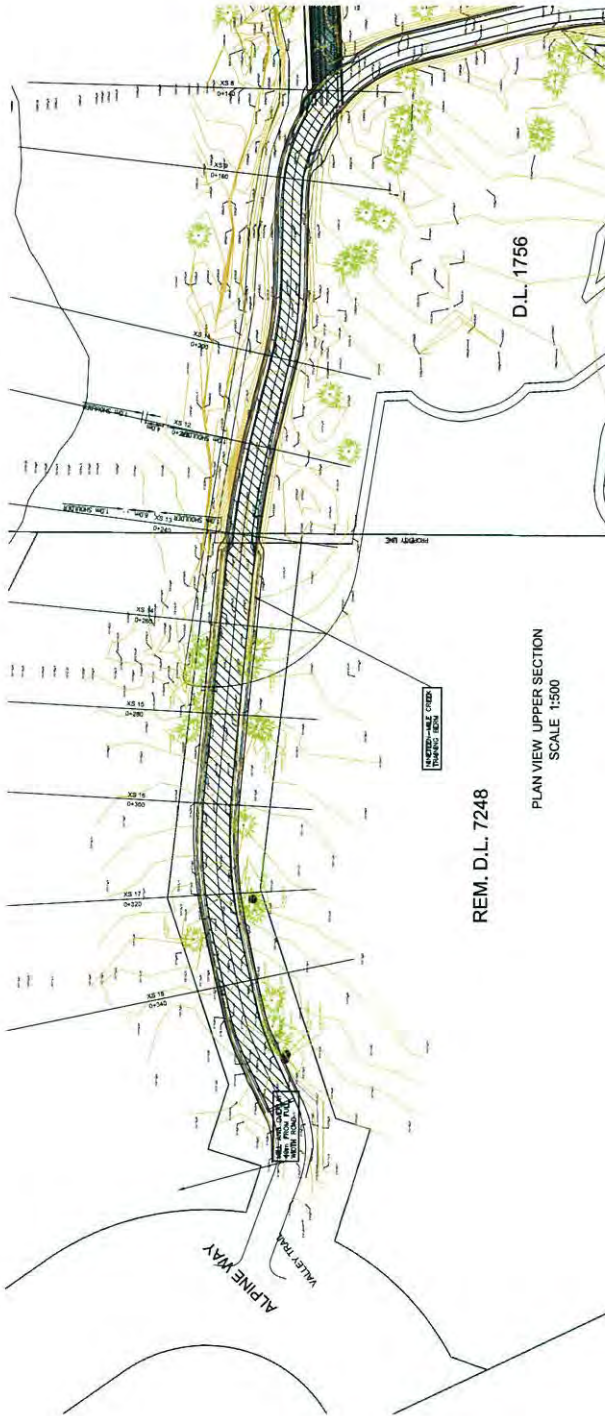
NINETEEN-MILE CREEK TRAINING BERM & FLOOD WALL (PRIVATE DIKE)
8030 ALPINE WAY, WHISTLER, B.C.

SHEET #	DRAWING No.	TITLE
SHEET 1	15-10-000	COVER SHEET
SHEET 2	15-10-001	PLAN VIEW, PROFILE AND TYPICAL SECTION FOR TRAINING BERM (UPPER SECTION)
SHEET 3	15-10-002	PLAN VIEW, PROFILE AND TYPICAL SECTION FOR TRAINING BERM & FLOOD WALL (LOWER SECTION)
SHEET 4	15-10-003	NINETEEN-MILE CREEK TRAINING BERM FLOOD WALL SECTION



1:2000

DOUG BUSH SURVEY SERVICES Ltd. Douglas & Bush, ASCT, RSIS Applied Science Technological (Geomatics) Unit 11, 11000 Highway 1, Whistler, B.C. V0N 1B1 Phone 932-3314 / Fax 932-3079 E-mail: doug@dbss.ca / http://dbss.ca	LCI Water Resources Group LeCae Consultants Inc. Since 1991 11000 Highway 1, Whistler, B.C. V0N 1B1 Phone 932-3314 / Fax 932-3079 E-mail: info@lciwaterresources.com / www.lciwaterresources.com	Title: COVER SHEET	Date: December 20, 2016 File: J16031	Client: Project: WHITE GLACIER INTERNATIONAL NINETEEN-MILE CREEK TRAINING BERM 8030 ALPINE WAY, WHISTLER, B.C.	SCALE: JOB NO.: J16031 DWG.: 15-10-000
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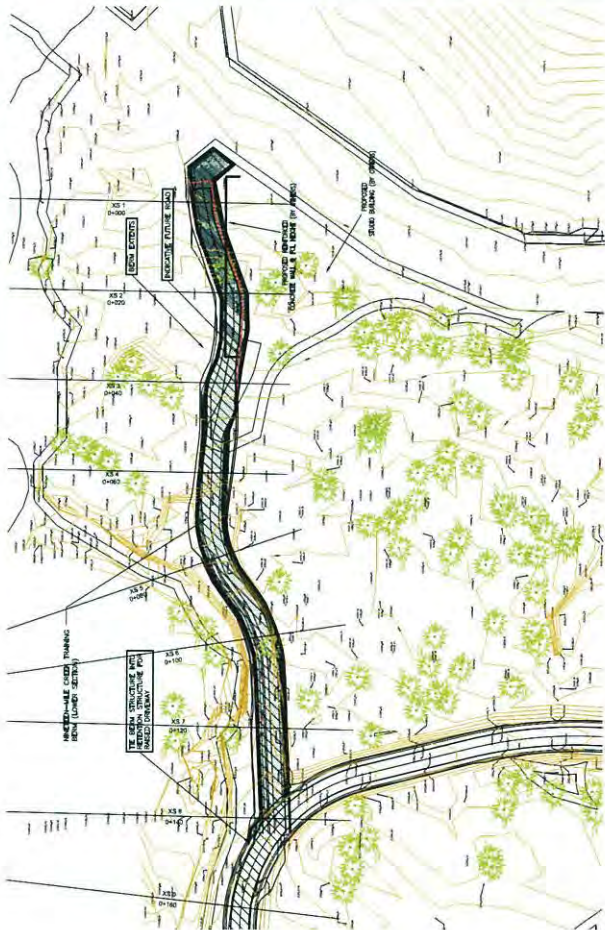
NOTES

1. SEE LCI WATER-USE STUDY, TRAINING BERM, FINAL DESIGN REPORT #01, DATED DECEMBER 19, 2018, REGARDING BERM DESIGN DETAILS.
2. LATERAL EROSION BY EDP SERVICES INC.
3. LATERAL EROSION BY CREUS ENGINEERING LTD.
4. ENVIRONMENTAL SERVICES BY CASCADE ENVIRONMENTAL RESOURCE GROUP.
5. SUBJECT TO LAND CONSULTANTS INC. TERMS AND CONDITIONS.

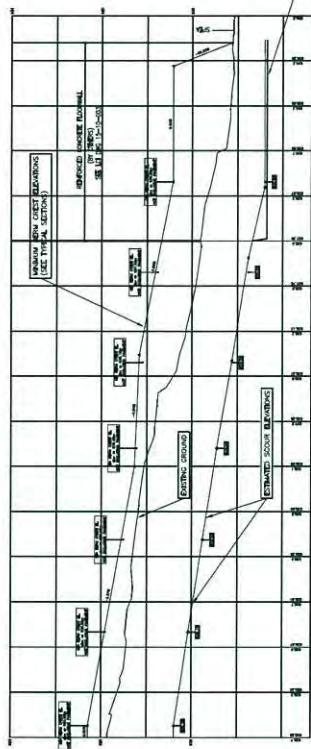
DOUG BUSH SURVEY SERVICES LTD. Douglas J. Bush, ASCT, RSIS Applied Science Technologists (Geomatics) Unit 18, 3701 West 10th Avenue, B.C. V6M 1B1 Phone: 604-231-4444 or 604-231-4445 djbush@bss.ca / http://bss.ca	LCI Water Resources Group LeCais Consultants Inc., Since 1991 1000 West 10th Avenue, Suite 100 Vancouver, B.C. V6M 1B1 Phone: 604-231-4444 or 604-231-4445 lci@waterresources.ca / http://waterresources.ca	Title: PLAN VIEW, PROFILE AND TYPICAL SECTION FOR TRAINING BERM (UPPER SECTION)	Client: WHITE GLACIER INTERNATIONAL Project: NINETEEN-MILE CREEK TRAINING BERM 8030 ALPINE WAY, WHISTLER, B.C.	Scale: AS SHOWN Job No.: J16031 DWG.: 15-10-001	Sheet: 2

BEAM NOTES

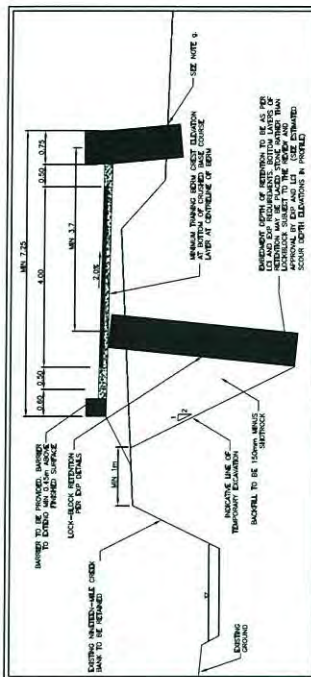
1. LCI SHALL GARY OUT BEAM CONSTRUCTION DETAILS AT EXISTING EXISTING CONSTRUCTION INCLUDING SCOUR AND EXISTING INTERFERING CONSTRUCTION.
2. PRIOR TO FINAL CONSTRUCTION OF THE BEAM, LCI SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
3. ALL PLANNING AND DESIGN CONSIDERATIONS ON THE BEAM SHALL BE BASED ON THE DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
4. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
5. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
6. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
7. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
8. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
9. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.
10. THE BEAM SHALL BE DESIGNED TO BE UNDERPINNED WITHOUT THE BEAM DESIGNER'S DESIGN AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER AND THE DESIGNER SHALL REVIEW THE BEAM DESIGN WITH THE DESIGNER.



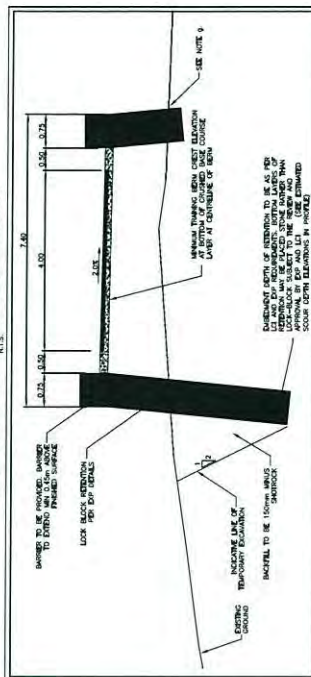
PLAN VIEW
LOWER SECTION
SCALE 1:500



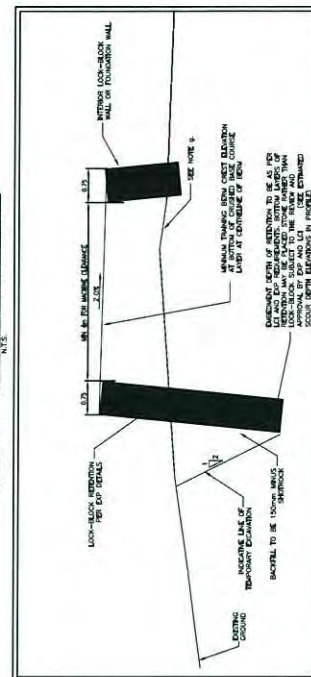
PROFILE
SCALE 1:500



TYPICAL SECTION BEAM - STA 04+100 - 04+105 (CHSUS)



TYPICAL SECTION BEAM - STA 04+105 - 04+200 (CHSUS)



TYPICAL SECTION BEAM - STA 04+200 - 04+209 (CHSUS)

DOUG BUSH SURVEY SERVICES LTD.
18101 181st Avenue, Suite 100, Edmonton, Alberta T5A 3P1
Phone 932-3314 / Fax 932-3329 E-mail: doush@bss.ca / http://bss.ca

LCI Water Resources Group
Leica Consultants Inc. Since 1991
18101 181st Avenue, Suite 100, Edmonton, Alberta T5A 3P1
Phone 932-3314 / Fax 932-3329 E-mail: doush@bss.ca / http://bss.ca

TITLE:
PLAN VIEW, PROFILE AND TYPICAL SECTIONS FOR
TRAINING BEAM AND FLOOD WALL (LOWER SECTION)

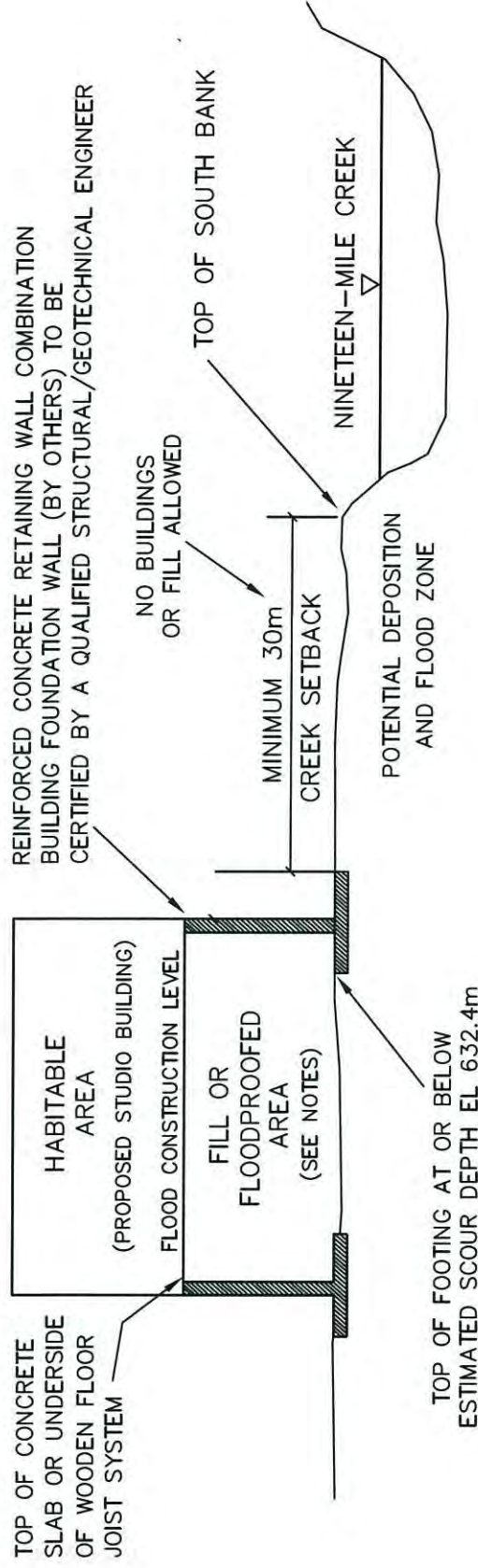
Date:
December 20, 2018

Client:
Project

WHITE GLACIER INTERNATIONAL
NINETEEN-MILE CREEK TRAINING BEAM
8030 ALPINE WAY, WHISTLER, B.C.

SCALE: AS SHOWN
JOB NO.: J16031
DWG.: 15-10-002

NINETEEN-MILE CREEK TRAINING BERM FLOOD WALL SECTION



TYPICAL CROSS SECTION

N.T.S.

NOTES:

1. A PROPERLY FLOODPROOFED AREA CAN BE USED AS HABITABLE AREA PENDING APPROVAL BY A QUALIFIED PROFESSIONAL ENGINEER.
2. REFER TO RIPARIAN AREA REGULATIONS FOR DETAILS.
3. SEE LCI'S REPORT: WHITE GLACIER – FLOOD CONSTRUCTION LEVEL REPORT – DEC 19, 2016.

DOUG BUSH SURVEY SERVICES LTD.
Unit 18, 1370 Alpha Lake Rd., Whistler, B.C. VON 1B1
Phone 932-3314 / Fax 932-3039 doughb@dbss.ca

LCI Water Resources Group

LaCas Consultants Inc., Since 1991
Suite 900 - 1021 West Hastings
Vancouver, B.C. Canada V6S 0C3
Tel (604) 689-2335 Fax (604) 689-3688
E-mail: info@lciwatergroup.com Web: www.lciwatergroup.com

DECEMBER 19, 2016.

FILE NO. J16031

PLAN NO. 15-10-003

Form 2 - Additional QEP Form
Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Table of Contents for Assessment Report

Number	Page
1. Description of Fisheries Resources Values	3
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4. Measures to Protect and Maintain the SPEA (detailed methodology only).	
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2. Windthrow.....	28
3. Slope Stability.....	28
4. Protection of Trees.....	28
5. Encroachment	29
6. Sediment and Erosion Control.....	29
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8. Floodplain.....	30
5. Environmental Monitoring	31
6. Photos	32
7. Assessment Report Professional Opinion	36

Section 1. Description of Fisheries Resources Values and a Description of the Development proposal

(Provide as a minimum: Species present, type of fish habitat present, description of current riparian vegetation condition, connectivity to downstream habitats, nature of development, specific activities proposed, timelines)

The subject property is located on the western shores of Green Lake. Green Lake is an ungauged lake. Water level fluctuates throughout the year from flow changes from its tributaries (Fitzsimmons Creek, 19 Mile Creek, and Alta Creek). Green Lake flows into Green River and eventually to the ocean via the Fraser River. Green Lake is inhabited by resident populations of prickly sculpin (*Cottus asper*), bull trout/Dolly Varden (*Salvelinus confluentus/malma*), kokanee (*Oncorhynchus nerka*), rainbow trout (*Oncorhynchus mykiss*), in both summer and winter (FISS, 2015). Bull trout (*Salvelinus confluentus*) are also known to occur in Green Lake and Fitzsimmons Creek (Cascade, 2005). Anadromous fish do not inhabit Green Lake due to the fish barrier at Nairn Falls on the Green River. Green Lake is approximately 40 m in depth and is characterized by its opacity and green colour caused by silt carried into the lake from Fitzsimmons and 19 Mile Creeks. The lakebed substrate is composed of silts, sands and gravels. The shallow, wetland areas around the lake are vegetated by emergent aquatic vegetation such as sedges (*Carex sp.*), grasses, and rushes. These areas are littered with wood debris and have a high habitat potential for amphibians, and juvenile fish.

19 Mile Creek flows into Green Lake through the northern section of the property, where the channel becomes highly mobile and anastomosing. There is an existing training berm on the south side of 19 Mile Creek (right bank). As such, the creek was not assessed and was designated the maximum RAR setback from the high water mark of the southern-most branch of the watercourse (see RAR Assessment map). 19 Mile Creek is a known fish-bearing watercourse. According to the FISS database, populations of Dolly Varden (*Salvelinus malma*) and rainbow trout have been observed in the creek. 19 Mile Creek flows into Green Lake.

Alta Creek (a.k.a. River of Golden Dreams), flows into Green Lake along the southern border of the property. It is hemmed by houses, roads and the valley trail. The River of Golden Dreams is popular for recreational paddlers and is used extensively by individual canoers, kayakers, stand up paddle (SUP) boards, as well as commercial tour operators. According to the FISS database, the River of Golden Dreams is known to contain rainbow trout and Sockeye (Kokanee) Salmon. According to the FISS database, populations of Dolly Varden (*Salvelinus malma*), rainbow trout, Kokanee, cutthroat trout (*Oncorhynchus clarkii*), prickly sculpin, and threespine stickleback (*Gasterosteus sp.*) have been observed in the creek. This creek was also designated the maximum RAR setback from the high watermark in lieu of assessment.

The subject property also contains multiple ditches, streams and wetlands that are connected to 19 Mile Creek, Alta Creek or Green Lake. Bed substrate in the streams and ditches varies between organic material and mineral alluvium, and flow is typically stagnant but these waterbodies may convey significant flows during a rain event. The wetlands are all classified as swamp wetlands, with significant groundwater inflow and elevated microsites allowing the growth of large trees. Wetland 4 also contains open areas of graminoid plants.

The RAR assessment map included below in Section 3 (p27) shows the location of the ditches, streams and wetlands. All waterbodies are labelled on the map as they are in Section 2, and flow direction is also indicated.

The distinction between streams and ditches was determined by whether a watercourse is natural, or following its natural course, or was constructed to facilitate drainage. On the subject property, the watercourses identified as ditches (Ditches 1-4 as identified on the attached map) were excavated to drain the land and collect water to re-direct into Alta Creek or Green Lake. The ditches are typically uniform in width and straight, whereas the streams vary more in width

and meander.

The following vegetation was observed:

- Sitka spruce (*Picea sitchensis*)
- Red alder (*Alnus rubra*)
- Willow spp (*Salix spp*)
- Red osier dogwood (*Cornus stolonifera*)
- Salmonberry (*Rubus spectabilis*)
- Thimbleberry (*Rubus parviflorus*)
- Red elderberry (*Sambucus racemosa*)
- Oval-leaved blueberry (*Vaccinium ovalifolium*)
- Hard hack (*Spiraea douglasii ssp douglasii*)
- Sweet gale (*Myrica gale*)
- Nootka rose (*Rosa nutkana*)
- High bush cranberry (*Viburnum edule*)
- Burdock (*Arctium minus*)
- Devil's club (*Oplopanax horridus*)
- False azalea (*Menziesia ferruginea*)
- Skunk cabbage (*Lysichiton americanus*)
- Wild ginger (*Asarum caudatum*)
- Bunchberry (*Cornus canadensis*)
- Rattlesnake plantain (*Goodyera oblongifolia*)
- Labrador-tea (*Rhododendron neoglandulosum*)
- Wintergreen (*Pyrola asarifolia*)
- Fire weed (*Chamerion angustifolium*)
- Lady fern (*Athyrium filix-femina*)
- Shield fern (*Polystichum setiferum*)
- Sedge spp (*Carex spp*)
- Rush spp (*Artemisia spp*)
- Horsetail (*Equisetum arvense*)
- Red-stemmed feathermoss (*Pleurozium schreberi*)
- Step moss (*Hylocomium splendens*)

Development proposed for the subject property includes removal of the existing lodge, part of the driveway and outbuildings, and construction of a single family home, auxiliary sheds/buildings and additional landscaping and trailbuilding. The existing caretaker home located within the SPEA of Green Lake, will be preserved and renovated on its existing foundations. All other buildings are located outside the delineated SPEAs. The existing training berm will be upgraded (design attached) to reflect the new hydrology assessment.

Section 2. Results of Riparian Assessment (SPEA width)

2. Results of Detailed Riparian Assessment

Refer to Chapter 3 of Assessment Methodology

Date: 2015-09-09

Description of Water bodies involved (number, type)

Lake, stream, ditch, wetland

Stream	6
Wetland	5
Lake	1
Ditch	6
Number of waterbodies	18
Stream #	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	3.06		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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.	
	1.81	<1		
	2.48			
	1.84			
	2.19			
downstream	2.44			
	2.28			
	1.78			
	3.35			
	2.34	<1		
Total: minus high /low mean	1.91			
	20.35			
	2.3			
		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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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.	

Form 2 - Additional QEP Form

Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

Polygon No:

LC SH TR

SPVT Type

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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					
Litter fall and insect drop ZOS (m)	10					
Shade ZOS (m) max	6.9	South bank	Yes	X	No	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report	
SPEA maximum	10	(For ditch use table3-7)				

Comments

Stream #

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	2.92		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	1.97	<1	
	4.28		
	3.75		
	4.64		
	6.12		
downstream	2.16		
	2.25		
	5.43		
	3.29	<1	
	2.62		
Total: minus high /low	31.34		
mean	3.5		
Channel Type	R/P C/P S/P		
	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

LC	SH	TR
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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)	10.5						
Litter fall and insect drop ZOS (m)	10.5						
Shade ZOS (m) max	10.5	South bank	Yes	<input checked="" type="checkbox"/>	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	If non-fish bearing insert no fish bearing status report		
SPEA maximum	10.5	(For ditch use table3-7)					

Comments

Stream # 3

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	1.80	I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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> ;
upstream	2.85	
	3.65	
	4.79	
	2.47	
	<1	

Form 2 - Additional QEP Form
Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

downstream	2.21		b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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.
	1.82		
	5.69		
	2.32		
	2.47	<1	
	0.79		
	24.38		
	2.7		
Total: minus high /low mean			
Channel Type	R/P	C/P	S/P
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Tech Yuen Lee</u> (<i>name of developer</i>) ; 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

SPVT Type LC SH TR

 X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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						
Litter fall and insect drop ZOS (m)	10						
Shade ZOS (m) max	8.1	South bank	Yes	X	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10	(For ditch use table3-7)					

Comments

Stream # 4

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	2.42		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	2.14	<1		
	1.94			
	1.68			
	1.82			
	1.71			
downstream	1.55			
	1.43			
	2.50			
	4.24	<1		
	1.47			
Total: minus high /low	17.23			
mean	1.9			
	R/P	C/P		S/P
Channel Type	X			

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons	<input type="checkbox"/>	X	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

SPVT Type LC SH TR

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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				
Litter fall and insect drop ZOS (m)	10				
Shade ZOS (m) max	5.7	South bank	Yes	X	No

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Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)				
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report
SPEA maximum	10	(For ditch use table3-7)			

Comments

Stream # 5

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	2.70		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	3.74	<1		
	5.69			
	3.65			
	3.52			
	3.35			
downstream	3.48			
	3.62			
	3.34			
	2.32	<1		
	1.89			
Total: minus high /low	29.72			
mean	3.3			
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

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	LC	SH	TR
SPVT Type			X

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Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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						
Litter fall and insect drop ZOS (m)	10						
Shade ZOS (m) max	9.9	South bank	Yes	X	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10	(For ditch use table3-7)					

Comments

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Stream # 6

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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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.
starting point	7.17		
upstream	3.88	<1	
	4.08		
	4.56		
	4.70		
	4.98		
downstream	8.11		
	4.07		
	6.21		
	5.66	<1	
	3.91		
Total: minus high /low	45.34		
mean	5.0		
	R/P	C/P	
Channel Type	X		

Site Potential Vegetation Type (SPVT)

	Yes	No	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes
SPVT Polygons		X	
			I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:

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- 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 Teck Yuen Lee (*name of developer*) ;
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

LC	SH	TR
		X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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	15					
South bank	Yes	X	No			
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report	
SPEA maximum	15	(For ditch use table3-7)				

Comments

Wetland #

1

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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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:
LC SH TR
SPVT Type

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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	30	South bank	Yes	X	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	30	(For ditch use table3-7)					

Comments

Wetland #

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>Dave Williamson (name of qualified environmental professional)</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>Teck Yuen Lee (name of developer)</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.
		X	
Polygon No:	<input type="text" value="1"/>		Method employed if other than TR
SPVT Type	LC	SH	
	<input type="text"/>	<input type="text"/>	<input checked="" type="text"/>

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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	30						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	30	(For ditch use table3-7)					

Comments

Wetland # 3

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
			<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and</p> <p>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.</p>

Polygon No: 1

SPVT Type

LC	SH	TR
		X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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	30						
		South bank	Yes	X	No		

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Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)				
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report
SPEA maximum	30	(For ditch use table3-7)			

Comments

Wetland # 4

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
			<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b) I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c) I have carried out an assessment of the development proposal and my assessment is set out in this Assessment Report; and</p> <p>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.</p>

Polygon No: 1

SPVT Type

LC	SH	TR
		X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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	30	South bank	Yes	X	No	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report	
SPEA maximum	30	(For ditch use table3-7)				

Comments

Proposed flood control training berm is located within the SPEA of Wetland #4. It is designed to fit in the footprint of the existing access driveway.

Wetland #

5

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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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

LC

SH

TR

SPVT Type

X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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		30	South bank	Yes	X	No	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	30	(For ditch use table3-7)					

Comments

Lake # 1

Site Potential Vegetation Type (SPVT)

	Yes	No	
SPVT Polygons	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Tick yes only if multiple polygons, if No then fill in one set of SPVT data boxes I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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

LC SH TR

SPVT Type X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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	30	South bank	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	If non-fish bearing insert no fish bearing status report		
SPEA maximum	30	(For ditch use table3-7)					

Comments

Ditch # 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)	
starting point	4.60
upstream	2.40
	1.60

Gradient (%)	
	I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:
	a) I am a qualified environmental professional, as

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downstream	2.00		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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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.
	2.20		
	1.60		
	1.60		
	1.50		
	1.60		
	1.70		
	1.50		
Total: minus high /low mean	16.2		
	1.8		
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; 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

SPVT Type

LC	SH	TR
		X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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)	5						
Litter fall and insect drop ZOS (m)	5						
Shade ZOS (m) max	5	South bank	Yes	X	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					manmade	
Ditch Fish Bearing	Yes	X	No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	5	(For ditch use table3-7)					

Comments

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Ditch #

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 (%)		
starting point	1.80		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	1.50			
	1.50			
	1.60			
	2.20			
	2.70			
downstream	2.50			
	2.40			
	1.10			
	2.60			
	1.50			
Total: minus high /low	17.6			
mean	2.0			
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

LC

SH

TR

SPVT Type

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X

Method employed if other than TR

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Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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)	5									
Litter fall and insect drop ZOS (m)	5									
Shade ZOS (m) max	5									
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)								manmade	
Ditch Fish Bearing	Yes	X	No	If non-fish bearing insert no fish bearing status report						
SPEA maximum	5		(For ditch use table3-7)							

Comments

Ditch #

3

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	1.40		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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.		
	1.60				
	2.00				
	2.20				
	1.60				
downstream	2.90				
	3.50				
	2.70				
	1.90				
	3.00				
Total: minus high /low mean	2.40				
	20.3				
	2.3				
		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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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

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development proposal made by the developer <u>Teck Yuen Lee</u> <i>(name of developer)</i> ; 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:	<u>1</u>
	LC SH TR
SPVT Type	<u> </u> <u> </u> <u>X</u>

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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)	<u>5</u>						
Litter fall and insect drop ZOS (m)	<u>5</u>						
Shade ZOS (m) max	<u>5</u>	South bank	Yes	<u> </u>	No	<u>X</u>	
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					manmade	
Ditch Fish Bearing	Yes	<u>X</u>	No	<u> </u>	If non-fish bearing insert no fish bearing status report		
SPEA maximum	5	(For ditch use table3-7)					

Comments

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Ditch # 4

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	<u>1.00</u>		I, <u>Dave Williamson</u> <i>(name of qualified environmental professional)</i> , 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>Teck Yuen Lee</u> <i>(name of developer)</i> ; 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
upstream	<u>1.00</u>		
	<u>1.00</u>		
	<u>1.10</u>		
	<u>1.60</u>		
	<u>1.80</u>		
downstream	<u>1.30</u>		
	<u>1.30</u>		
	<u>1.50</u>		
	<u>0.80</u>		
	<u>1.00</u>		
Total: minus high /low	<u>10.8</u>		
mean	<u>1.2</u>		
R/P	C/P	S/P	

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Channel Type	X			set out in the Schedule to the Riparian Areas Regulation.
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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>Dave Williamson (name of qualified environmental professional)</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>Teck Yuen Lee (name of developer)</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
	LC SH TR
SPVT Type	<div style="display: flex; justify-content: space-around; width: 100%;"> X </div>

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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)	5						
Litter fall and insect drop ZOS (m)	5						
Shade ZOS (m) max	5						
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)					manmade	
Ditch Fish Bearing	Yes	X	No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	5	(For ditch use table3-7)					

Comments

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Channelised Stream # 1 (VolleyDitch)

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	0.98		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	1.16			
	0.97			
	1.15			
	1.90			
	0.75			
downstream	1.27			
	6.83			
	5.72			
	5.15			
	2.76			
Total: minus high /low	21.06			
mean	2.34			
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

SPVT Type

LC	SH	TR
		X

Method employed if other than TR

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:		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				
Litter fall and insect drop ZOS (m)	10				
Shade ZOS (m) max	7	South bank	Yes	X	No

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Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)				
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report
SPEA maximum	10	(For ditch use table3-7)			

Comments

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Channelised stream # 2 (Green Bay Ditch)

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	1.15		I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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	5.00			
	0.90			
	1.70			
	1.40			
	1.40			
downstream	1.07			
	2.10			
	1.20			
	1.05			
	0.95			
Total: minus high /low	11.97			
mean	1.33			
	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>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>); 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

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Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report

	LC	SH	TR
SPVT Type			X

Zone of Sensitivity (ZOS) and resultant SPEA

Segment No:	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						
Litter fall and insect drop ZOS (m)	10						
Shade ZOS (m) max	4	South bank	Yes	X	No		
Ditch	Justification description for classifying as a ditch (manmade, no significant headwaters or springs, seasonal flow)						
Ditch Fish Bearing	Yes		No		If non-fish bearing insert no fish bearing status report		
SPEA maximum	10	(For ditch use table3-7)					

Comments

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Section 3. Site Plan

(see attached)

Section 4. Measures to Protect and Maintain the SPEA

This section is required for detailed assessments. Attach text or document files, as need, for each element discussed in chapter 1.1.3 of Assessment Methodology. It is suggested that documents be converted to PDF *before* inserting into the assessment report. Use your "return" button on your keyboard after each line. You must address and sign off each measure. If a specific measure is not being recommended a justification must be provided.

1. Danger Trees	A tree assessment was conducted on September 14, 2015 by Ruth Begg of Cascade Environmental (Danger Tree Assessor # P1567). The assessor walked the areas to be developed on the property assessing trees for dangerous characteristics and wildlife value. There are up to 16 danger trees that may need to be removed to ensure worker safety.
I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; c) 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	
2. Windthrow	A windthrow assessment was included as part of the danger tree assessment above, with an expected 40-65 km/hr wind speed. There were no windthrow issues identified.
I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; c. 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	
3. Slope Stability	Field indicators of slope instability (i.e. curved tree trunks) were not observed during the field visit. Slope stability is not a concern at this site.
I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), 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>Teck Yuen Lee</u> (<i>name of developer</i>) ; c. 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	
4. Protection of Trees	Protection of trees in the SPEA can be achieved by placement of construction fence on the boundary of the SPEA. As trees that occur within the SPEA may have root systems that extend beyond the SPEA boundary, the following additional measures will be adopted to protect the roots of SPEA trees: no trenching will occur through the roots of SPEA trees, no paving will occur around SPEA trees, the ground level shall not be changed around SPEA

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	trees, no parking will occur under SPEA trees, and no pollutants will contaminate the soil around SPEA trees..
<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c. 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</p>	
5. Encroachment	Encroachment in the SPEA can be prevented by placement of construction fence on the SPEA boundary. Once development is complete, a medium height wooden fence or a vegetative barrier will demarcate the SPEA. Additional protection is provided by an additional 2 m buffer between all buildings and the SPEA (see RAR Assessment map, QEP Measures – 2m).
<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c. 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</p>	
6. Sediment and Erosion Control	Sediment fencing should be installed where necessary (as determined by the Environmental Monitor) to prevent discharge of sediment laden water into the SPEA during development. Stockpile of excavated material will be covered by plastic tarps and surrounded by silt fence.
<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c. 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</p>	
7. Stormwater Management	The proposed development will result in a marginal increase in the total impervious area of the property from surfaces such as roof tops and driveways. Minimizing the impervious area of the development (i.e. permeable driveways, maintaining greenspace and vegetated swales) will effectively decrease the stormwater impacts. Stormwater will be captured in a vegetated margin outside of the SPEA, where it will infiltrate the ground.
<p>I, <u>Dave Williamson</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>) ;</p> <p>c. 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,</p>	

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I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation	
8. Floodplain Concerns (highly mobile channel)	The subject property is located on the shore of Green Lake, between the 19 Mile Creek and River of Golden Dreams river deltas. 19 Mile Creek is considered a debris flow channel and the property is protected by a training berm. The potential for flooding in this area is high, and is mitigated by design measures detailed in the Flood Control Plan designed by the Professional Engineer (attached).
<p>I, <u>Brian LaCas</u> (<i>name of qualified environmental professional</i>), hereby certify that:</p> <p>a. I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the <i>Fish Protection Act</i>;</p> <p>b. I am qualified to carry out this part of the assessment of the development proposal made by the developer <u>Teck Yuen Lee</u> (<i>name of developer</i>);</p> <p>c. 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</p>	

Section 5. Environmental Monitoring

Attach text or document files explaining the monitoring regimen Use your “return” button on your keyboard after each line. It is suggested that all document be converted to PDF *before* inserting into the PDF version of the assessment report.

Include actions required, monitoring schedule, communications plan, and requirement for a post development report.

The monitoring schedule for the development will include a site visit at the start of the construction phase of the project to ensure that there are no construction impacts to the SPEA. Additional site visits are required to be made by the QEP (Qualified Environmental Professional) periodically throughout construction to ensure that the measures to protect the SPEA are implemented and maintained. A follow-up visit will be made at the completion of the construction so that the QEP can prepare a report to submit to the BC MOE RAR website database. It is the responsibility of the client to notify the QEP prior to commencement of construction and upon completion of construction.

Section 6. Photos



Photo 1: View of Stream 3. March 11, 2015.



Photo 2: View of Stream 3. March 11, 2015.



Photo 3: View of Ditch 3. March 11, 2015.



Photo 4: View of Ditch 3. March 11, 2015.



Photo 5: View of Wetland 5. March 11, 2015.



Photo 6: View of Wetland 5. March 11, 2015.

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Riparian Areas Regulation - Qualified Environmental Professional - Assessment Report



Photo 7: View of Wetland 2. March 11, 2015.



Photo 8: View of Wetland 2. March 11, 2015.



Photo 9: View of Wetland 1. March 13, 2015.



Photo 10: View of Wetland 1. March 13, 2015.



Photo 11: View of the pond tributary to Volley Ditch.
March 13, 2015.



Photo 12: View of the pond tributary to Volley Ditch.
March 13, 2015.

Form 2 - Additional QEP Form
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Photo 13: View of the Volley Ditch tributary.
March 13, 2015.



Photo 14: View of the Volley Ditch tributary.
March 13, 2015.



Photo 15: View of the Green Bay Ditch.
March 24, 2015.



Photo 16: View of the Green Bay Ditch.
March 24, 2015.

Section 7. Professional Opinion

Assessment Report Professional Opinion on the Development Proposal's riparian area.

Date 2016-11-10

1. I/We Dave Williamson

Please list name(s) of qualified environmental professional(s) and their professional designation that are involved in assessment.)

hereby certify that:

- a) I am/We are qualified environmental professional(s), as defined in the Riparian Areas Regulation made under the *Fish Protection Act*;
- b) I am/We are qualified to carry out the assessment of the proposal made by the developer Teck Yuen Lee (*name of developer*), which proposal is described in section 3 of this Assessment Report (the "development proposal");
- c) I have/We have carried out an assessment of the development proposal and my/our assessment is set out in this Assessment Report; and
- d) In carrying out my/our assessment of the development proposal, I have/We have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation; AND

2. As qualified environmental professional(s), I/we hereby provide my/our professional opinion that:

- a) ☒ if the development is implemented as proposed by the development proposal there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area in which the development is proposed, **OR**
(Note: include local government flex letter, DFO Letter of Advice, or description of how DFO local variance protocol is being addressed)
- b) ☐ if the streamside protection and enhancement areas identified in this Assessment Report are protected from the development proposed by the development proposal and the measures identified in this Assessment Report as necessary to protect the integrity of those areas from the effects of the development are implemented by the developer, there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area in which the development is proposed.

[NOTE: "qualified environmental professional" means an applied scientist or technologist, acting alone or together with another qualified environmental professional, if
(a) the individual is registered and in good standing in British Columbia with an appropriate professional organization constituted under an Act, acting under that association's code of ethics and subject to disciplinary action by that association,
(b) the individual's area of expertise is recognized in the assessment methods as one that is acceptable for the purpose of providing all or part of an assessment report in respect of that development proposal, and
(c) the individual is acting within that individual's area of expertise.]

**Riparian Areas Regulation – Qualified Environmental Professional – Assessment Report
RAR-QEP-AR**

Forms you will need to complete are

- Form 1 which has the database information, the description of the fisheries resources, development site plan, measures to protect and maintain the SPEA, and environmental monitoring.
- Form 2, if more QEPs are part of the project team.
- Either Form 3 the detailed assessment form(s) or Form 4 simple assessment form(s) which is for the results of the riparian assessment (SPEA width). Use enough copies of the form to complete the assessment of the site.
- Form 5 is the photo form(s). Duplicate for additional photos.

NB: See the Guidelines and the Assessment Methods for detailed instructions on the information required for completing the Assessment Report.

A complete Riparian Assessment Report based on the template forms must be converted to a *single* Portable Document Format PDF file prior to uploading onto the Notification System.

The Assessment Report must be complete, by submitting the information specified, and posted to provide notification to the local government, Ministry of Water, Land and Air Protection and the Department of Fisheries and Oceans Canada.

Tips for working with MS Word Template Forms

Using the forms

- Before beginning, print a hard copy of the form and the guidance files for reference
- Open the template
- Enter data into the shaded fields on the form
- Use TAB to move from one field to another; SHIFT-TAB to go in reverse
- Text and digital photos may be inserted from other applications
- The amount of text that can be entered in each box is limited and cannot be changed by the user; boxes with date information, for example, require input like: yyyy-mm-dd.

Saving the completed form

- Assign name to the completed form
- Save a word document (*.doc file)
- Do not overwrite the Template (*.dot file) with your completed form
- If you do overwrite the template, you can download a new copy from this web site

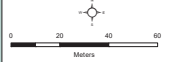
RAR Assessment

8030 Alpine Way
Whistler, British Columbia

- Subject Site
- RMOW - Cadastre
- Proposed Building development
- Historic Road
- Horse Trail
- RAR High Water Mark
- LFI ZOS
- LWD ZOS
- Shade ZOS
- QEP Measures - 2m

Water Type

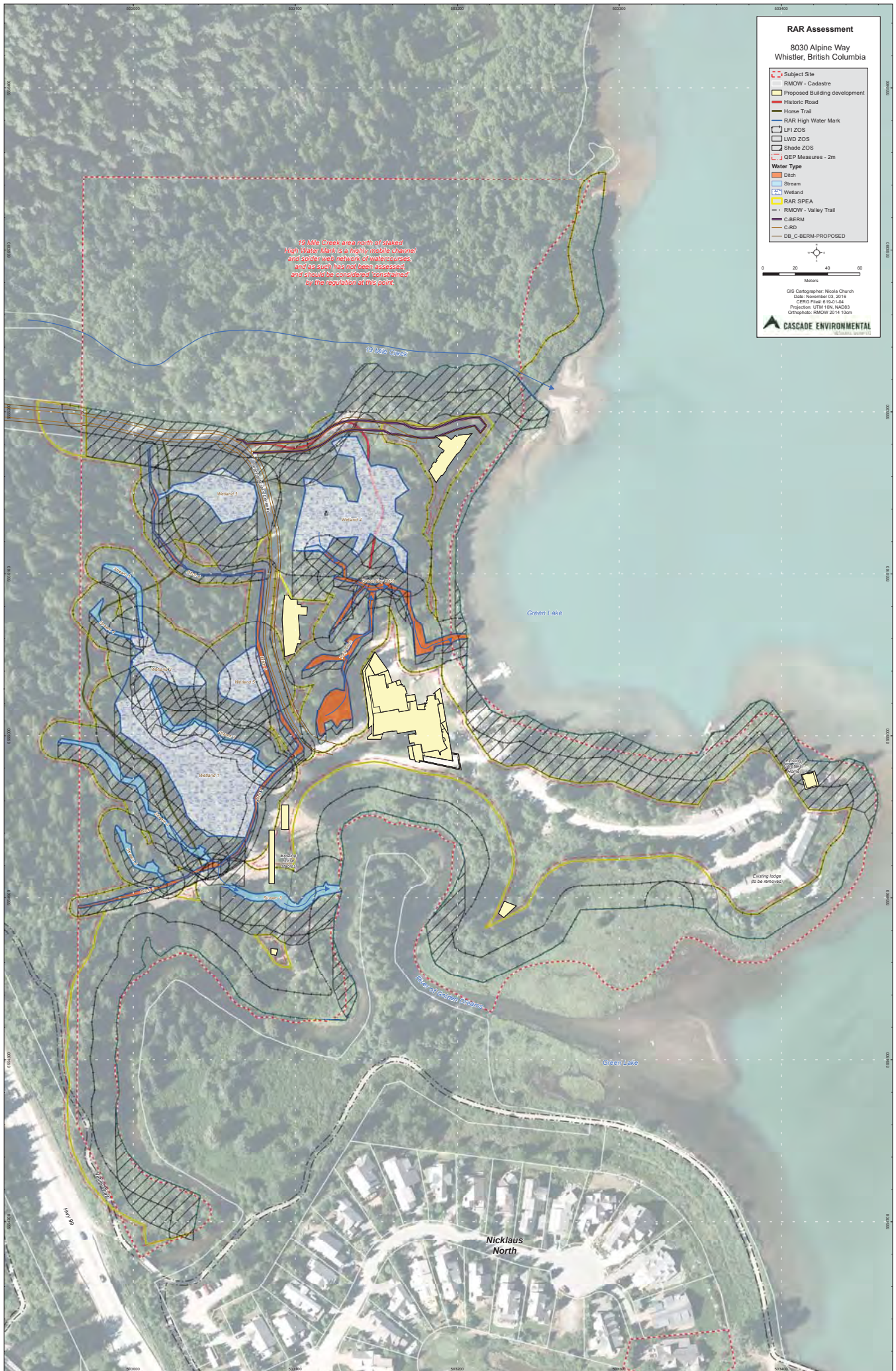
- Ditch
- Stream
- Wetland
- RAR SPEA
- RMOW - Valley Trail
- C-BERM
- C-ROD
- DB_C-BERM-PROPOSED



GIS Cartographer: Nicole Church
Date: November 03, 2018
CSD File: 8/18-1-04
Projection: UTM 10N, NAD83
Orthophoto: RMOW 2014 10cm



35 Mils Creek area north of stated
High Water Mark is highly erodible stream
and contains network of watercourses,
and as such has not been assessed
and should be considered constrained
by the regulation of this point



WHITE GLACIER INTERNATIONAL LAMOUREUX ARCHITECT INCORPORATED

FLOOD CONSTRUCTION LEVEL REPORT FINAL DESIGN REPORT

**8030 ALPINE WAY, WHISTLER, BC
RESORT MUNICIPALITY OF WHISTLER**

ISSUED FOR USE – November 3, 2016

FILE: 15-10

NOTES TO THE READER

This Issued for Use Report dated November 3, 2016 supersedes all previous LaCas Consultants Inc. Flood Construction Level Reports prepared for the White Glacier Project, 8030 Alpine Way, Whistler, BC. Once the "Issued for Use Report" has been released by LaCas Consultants Inc. then all the drafts hardcopies or electronic media shall all be destroyed or erased.



LCI Water Resources Group

LaCas Consultants Inc., Suite 900, 1021 West Hastings Street, Vancouver, BC, Canada
T: 604-688-2535 E: info@thelcigroup.com W: thelcigroup.com

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LIST OF APPENDICES

Appendix A – Habitable Area Locations

Appendix B – Design Information

Appendix C – 2-D Floodplain Mapping

1. INTRODUCTION

This report was prepared by LaCas Consultants Inc. (LCI) for Lamoureux Architect Incorporated (LAI) acting on behalf of Mr. Teck Yuen Lee, of White Glacier International Ltd, Singapore; herein below referred to as “the Client” relating to: District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114, Whistler, BC (the Property). See Appendix A- Figure 1 Location Map.

The Property is subject to flooding from Nineteen-Mile Creek. This report describes the hydrological analysis and hydraulic modeling carried out for the proposed extension and raising of the existing road and berm referred to in this report as the Nineteen-Mile Creek Training Berm. The purpose of this report is to be a design brief for the Nineteen-Mile Creek Training Berm. Final design parameters including depth of scour and minimum berm crest elevations are discussed in Section 8, Conclusions and Recommendation of this report and shown in LCI Drawings found in Appendix C (15-10-000/001/002, dated November 3, 2016. This final design parameters report dated November 3, 2016, for the proposed Nineteen-Mile Creek Training Berm supersedes any previous training berm design reports by LaCas Consultants Inc. for the Property.

A “dike” is defined as an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land, therefore the Nineteen-Mile Creek Training Berm is a dike.

The Nineteen-Mile Training Berm is defined as a “private dike” which is a dike built on private property without public funds to protect only the Property (District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114) of a person owning the private dike. The Property is only 1 lot and it understood by LCI that there is no planned subdivision in the future.

The Nineteen-Mile Creek Training berm alignment is generally setback about 30m from the main stem of Nineteen-Mile Creek along the right overbank floodplain (looking downstream). A small stream was identified that would flow adjacent to the proposed Nineteen-Mile Creek Training Berm, however, due to typical channel avulsion processes on the alluvial fan the main channel in the future could conceivably change flow paths and flow adjacent to the proposed Nineteen-Mile Creek Training Berm.

2. DOCUMENTS REVIEWED OR REFERENCED

- Ministry of Environment, Lands and Parks, Water Management Division, A Design Brief on the Floodplain Mapping Study, Whistler Area, June 1992;
- Sigma Engineering Ltd., Proposed Subdivision of DL 1756 (Garland Holding Ltd.) Flood Protection from Nineteen-Mile Creek, Green Lake and River of Golden Dreams (Alta Creek), June 1996;
- Dike Design Guidelines – Best Management Practices for British Columbia, Flood Hazard Management Section Environmental Protection Division Province of British Columbia, Ministry of Water, Land and Air Protection, July 2003;
- Simons, Li & Associates, Inc., 1985. Design Manual for Engineering Analysis of Fluvial Systems, Prepared for Arizona Department of Water Resources;
- Pemberton, E.L., and Lara, J.M., 1984. Computing Degradation and Local Scour, prepared for the U.S. Department of the Interior, Bureau of Reclamation, Publication Number 7-2090;
- West Consultants Inc., 2003. Predicting Bed Scour for Toe Protection Design in Bank Stabilization Projects;
- Ministry of Sustainable Resource Management, Streamflow in the Lower Mainland and Vancouver Island, April 2003;
- Ministry of Environment, Land and Parks, Water Management Division, A Design Brief on the Floodplain Mapping Study, Whistler Area, June 1992; and
- Ministry of Environment, Water Management Branch, Whistler Area Peak Flows, September 1989.

3. SCOPE OF WORK

The following is the scope of work for this report:

- site visit to the Property to obtain site information such as existing channel conditions and watershed characteristics;
- provide instructions to Doug Bush Survey Services Ltd. (DBSS) for the channel cross section survey along Nineteen-Mile Creek;
- compilation of all available information obtained from site visit (notes/maps/photos);
- search and collect relevant mapping information for hydrological analysis;
- determination of required catchment areas for the study;
- hydrological analysis to determine design flood flows for Nineteen-Mile Creek;
- hydraulic model development for the study reach of Nineteen-Mile Creek based on survey data provided by DBSS, dated June 2015;
- sensitivity analysis of the hydraulic models and preparation of result summary;
- carry out 1-D hydraulic water surface profile modeling of Nineteen-Mile Creek in order to determine the water surface profiles of the 2, 5, 10, 20, 50, 100 and 200-year floods and the interaction with the 200-year Green Lake level;
- applying climate change factors to the Nineteen-Mile Creek hydrological analysis and hydraulic modeling;
- carry out a flood and erosion transfer of risk assessment;
- determination of minimum berm crest recommendations for the proposed Nineteen-Mile Creek Training berm;
- carry out reviews of berm alignment for Stream Protection Environmental Area and discussions with the project environmental consultant;
- carry out discussions with LAI, project team, RMOW, and the Province of British Columbia regarding the private dike issues and regulation;
- carry out review of sheetpile and lock-block revetment applications suggested by geotechnical engineer;
- carry out review of environmental concerns with respect to the tributary channel adjacent to the berm and alternative methods for providing erosion/scour protection;
- review of augerhole data provided by Exp Services Inc. and determination of scour elevation along the berm;
- discuss with RMOW the requirements for maintenance ROW setback for berm and operation and maintenance issues;
- preparation of LCI final design drawings for the Nineteen-Mile Creek Training;
- review of civil engineering road/berm construction drawings with respect to flood control;
- provide recommendations for the design and construction of the Nineteen-Mile Creek Training Berm; and
- provide a final berm design report sealed by a Professional Engineer qualified in flood control for the Client, project environmental consultant, and the Resort Municipality of Whistler.

4. HYDROLOGICAL ANALYSIS

Watershed Characteristics

The Property is located within the floodplain of Nineteen-Mile Creek, which flows along the northern boundary of the Property. Nineteen-Mile Creek has a total catchment area of about 15 km². The elevation of the watershed ranges from EL. 2,260 m to EL. 740 m. The total main channel length of Nineteen-Mile Creek is about 7 km.

Hydrometric Data

The regional hydrometric stations used in this study are listed in Table 1. There is no long-term historical streamflow record available on Nineteen-Mile Creek. Historical hydrometric data was obtained from the Water Survey of Canada to characterize the hydrology of the study area. A total of 15 stations were selected in the study in view of their proximity to site, relatively long period of record and comparable range of drainage area size. The floods on Nineteen-Mile Creek may occur in autumn (October and November) due to intense rainstorms (also rain-on-snow) or in the summer (usually July) due to snowmelt.

Table 1: Regional Hydrometric Stations

STATION ID	STATION NAME	DRAINAGE AREA (KM ²)
08GA023	RUBBLE CREEK NEAR GARIBALDI	74.1
08GA024	CHEAKAMUS RIVER NEAR MONS	287
08GA054	MAMQUAM RIVER ABOVE MASHITER CREEK	334
08GA056	SENTINEL CREEK ABOVE GARIBALDI LAKE	5.7
08GA057	MASHITER CREEK NEAR SQUAMISH	38.9
08GA064	STAWAMUS RIVER BELOW RAY CREEK	40.4
08GA071	ELAHO RIVER NEAR THE MOUTH	1200
08GA072	CHEAKAMUS RIVER ABOVE MILLAR CREEK	297
08GA075	MAMQUAM RIVER ABOVE RING CREEK	284
08MG003	GREEN RIVER NEAR PEMBERTON	855
08MG004	GREEN RIVER NEAR RAINBOW	195
08MG006	RUTHERFORD CREEK NEAR PEMBERTON	179
08MG007	SOO RIVER NEAR PEMBERTON	283
08MG021	TWENTYONE MILE CREEK AT 670 M CONTOUR	28.2
08MG026	FITZSIMMONS CREEK BELOW BLACKCOMB CREEK	89.7

Design Flood Flow Estimation

A regional analysis was performed to determine the design flood flows for Nineteen-Mile Creek. The regional analysis involves frequency analyses of regional hydrometric data and determination of the relationship between the unit peak discharge and the size of drainage area. The regional analysis in this case involves the application of an index flood method. Refer to Appendix B Design Information.

Flood frequency analyses were conducted for the selected regional hydrometric stations using HYFRAN. To make use of all available peak flow data, the maximum instantaneous flow records were extended by applying an average maximum instantaneous to maximum daily flows for the three largest floods at the stations. The distributions providing the best fit to the extended data records were selected in estimating the floods for various return periods at the stations. Results of the frequency analyses were then used in the index flood method, which determines a relationship between the unit mean annual discharge, usually with a return period of 2.33 years, and drainage area.

An envelope curve was then drawn to determine the unit mean annual discharge at site. In this case, one envelope curve was developed using maximum instantaneous data, and a second envelope curve was developed using maximum daily data. Both curves were considered in the determination of the flood flows. The median ratios of floods for various return periods to the mean annual flood were calculated from the regional flood frequency analysis. A regional maximum instantaneous to maximum daily flow ratio of 2 was applied to the flood flows estimated using the second envelope curve.

As part of the flood flow estimation, a station frequency analysis using the peak flow data at the Twenty-One Mile Creek station with 8 years of record and Fitzsimmons Creek station with 17 years of record was performed. These two stations are located relatively close to the project site. However, it should be noted that estimated flood flows from the Fitzsimmons Creek peak flow data were relatively low compared to other methods applied, likely due to the fact that the dataset is lack of data for years with larger floods. The Fitzsimmons Creek station was established in 1993, and it is a relatively new station compared to other regional stations. Large floods prior to 1993 and the 1997 flood event were not recorded. Therefore, results from the Fitzsimmons Creek station were not considered in the final peak flow estimation.

As an overall check of the flood flow estimates calculated from the above methods, two other references were used for comparison purposes: 2003 Streamflow in the Lower Mainland (for hydrologic zone 26/27) and Vancouver Island and 1989 Whistler Area Regional Study. The 2003 regional streamflow study was prepared by the Ministry of Sustainable Resource Management for the south coastal area of the Province (hydrologic

zones 25 to 29). In particular, the 10-year peak flow curves were derived in the form of a log-log graph with plots of unit annual peak discharge (L/s/km^2) versus drainage area (km^2).

The 1989 Whistler Area Regional Study carried out by the Ministry of Environment was used in the 1992 Floodplain Mapping Study for the Whistler Area prepared by the Water Management Division of the Ministry of Environment, Lands and Parks. Frequency analyses using regional streamflow data was performed as part of the 1989 study and the associated results are the 20-year and 200-year peak flows at various locations along Millar Creek and Alta Creek. Such peak flow estimates were transposed to the project site for comparison purposes.

Results of the flood flow estimation using the above methods were compared and analyzed. It was determined that Envelope Curve 1 and Envelope Curve 2 developed in the current study, station frequency analysis using the Twenty-One Mile Creek station, the 2003 streamflow analysis and the 1989 Whistler Area regional study should be considered in the development of the peak flows at the project site. Where applicable, the average of the estimated flood flows derived from these various methods were used as the recommended flood estimates for the current study.

In view of the likelihood of a debris flood on Nineteen-Mile Creek, a common bulking factor of 2 times was applied to the estimated 200-year maximum instantaneous flood flow of Nineteen-Mile Creek clear-water flood to account for a debris flood. Debris floods are characterized by a combination of bedload movement, suspended sediment load, and floating organic debris. The movement is part of the flood process in which the flow behaves as a water flood rather than a hill slope process such as a debris flow or/channelized landslide. Bulking factors could range from 2 to 5 times the clear-water flood, however a bulking factor of 2 is representative of the expected debris flood generated on Nineteen-Mile Creek.

The resulting recommended 200-year design flood flow is $148 \text{ m}^3/\text{s}$ (without climate change factors).

The peak flood estimates for various return periods in the vicinity of the Property are tabulated in Table 2. See Appendix B for detailed support information.

Table 2: Nineteen-Mile Creek Flood Return Periods

RETURN PERIOD (YEARS)	NINETEEN-MILE CREEK
2	57
5	78
10	91
20	102
50	116
100	128
200	148

*A bulking factor of 2 was applied to take into account debris floods on Nineteen-Mile Creek.

The risk of at least one occurrence of the 200-year flood on Nineteen-Mile Creek in the next 5 years is 2.5%, in the next 10 years is 4.9% and the in next 30 years is 14%.

5. HYDRAULIC MODEL

Hydraulic Model Development

The HEC-RAS water surface profile model, Version 4.1.0, developed by the Hydrologic Engineering Center was used for the hydraulic analysis of Nineteen-Mile Creek.

A total of 18 channel cross sections were surveyed and provided by the Doug Bush Survey Services Ltd. dated June 2015. This survey information included bridge deck elevations at three locations: Valley Trail Bridge, Highway Bridge and High School Bridge. The total length of the study reach is approximately 640 m, with the most upstream cross section located about 465 m upstream of the Property and the most downstream cross section located at Green Lake. For the training berm design sections 2 through 7 were used.

The upstream boundary condition was defined as the normal depth associated with the channel slope. The downstream boundary condition was specified as the 200-year water level in Green Lake of El. 635.6 m, which is the same elevation applied in the flood maintenance management of Fitzsimmons Creek. Based on site observations, available references and results of a sensitivity analysis, a main channel roughness of 0.045 was applied in this case while a roughness of 0.14 was applied for the forested floodplain area.

Five model scenarios were analyzed for Nineteen-Mile Creek:

- existing conditions;
- proposed training berm along the Nineteen-Mile Creek and extended to Green Lake (30 m setback);

- avulsion occurred downstream of Alpine Way;
- 50% blockage at the High School Bridge; and
- 50% blockage at the Highway Bridge.

In particular, a summary of the hydraulic model results at the Property for the proposed training berm scenario is provided in Table 3. It should be noted that the Flood Construction Level (FCL) was determined at each cross section based on the 200-year water surface elevation plus 0.6 m of freeboard for model uncertainties and 0.1 m of additional freeboard to take into account climate change. The design flow was increased by 10%, in accordance with APEGBC guidelines which resulted in which resulted in a corresponding increase in water level about 0.1 m.

The proposed training berm, which extends from modeled channel cross section 7 to modeled channel cross section 2, should have a minimum berm crest elevation equal to the FCLs determined along Nineteen-Mile Creek or 1.5 m above the existing adjacent grade (in the case of the existing entrance road and historical fill materials), whichever is the greater.

Table 3: Results of Hydraulic Analysis for Nineteen-Mile Creek (148 m³/s)

Modeling Channel Section	Water Surface Elevation	Average Channel Velocity	Minimum Berm Crest Elevation
No.	EL. (m)	(m/s)	(m)
XS 7	645.0	6.3	645.7
XS 6	643.9	3.4	644.6
XS 5	642.4	4.5	643.2
XS 4	639.8	3.0	640.6
XS 3	637.0	4.4	638.0
XS 2	635.7	3.3	636.9

6. SCOUR AND EROSION PROTECTION

As part of the current assignment, a general scour analysis for Nineteen-Mile Creek was performed using three scour depth analysis methods. The equations used in the three methods are found in Appendix B. Results from the HEC-RAS hydraulic model of Nineteen-Mile Creek such as the mean channel velocity, flow depth, energy slope, flow area and channel top width were extracted and applied to the above general scour equations. In particular, the design flood discharge equivalent to the 200-year flood of 148 m³/s was used in the scour depth calculations. The mean grain size of material in Nineteen-Mile Creek was determined to be 0.6 mm based on available information provided in the geotechnical report prepared by EXP Services Inc. dated May 2016. The average scour depths calculated

using the three methods at each modelled channel cross section in the vicinity of the proposed training berm were determined and summarized in Table 4.

Table 4: Nineteen-Mile Creek Estimated Scour Elevation

Modeling Channel Section	V_{chl}	Y_s	Min. Chl. Elev.	Estimated Scour Elevation ¹	Min. Berm Crest Elev.	Elev. Diff. ²
No.	(m/s)	(m)	(m)	(m)	(m)	(m)
XS 7	6.3	0.6	643.6	643.0	645.7	2.8
XS 6	3.4	1.1	642.1	641.0	644.6	3.6
XS 5	4.5	1.1	641.2	640.1	643.2	3.1
XS 4	3.0	1.2	637.9	636.7	640.6	3.9
XS 3	4.4	1.3	635.8	634.5	638.0	3.5
XS 2	3.3	0.8	633.6	632.8	636.9	4.1

1. Mean grain size of material used in the scour depth analysis = 0.6 mm as per EXP Services Inc. sieve analysis dated May 20, 2016 for AH16-01 S6 @ 5.8 m Test No. 5. (Appendix B).
2. Elevation difference between the minimum berm crest elevation and the scoured bed elevation.

7. TRANSFER OF FLOOD AND EROSION RISK

The “transfer of risk” is defined as the scenario when changes are made at one location on a watercourse and/or floodplain that results in a measurable increase in flood or erosion risk elsewhere during the design flood. The transfer of risk of flood with and without the Nineteen-Mile Creek Training berm is limited to its existing floodplain within the Property therefore there is no transfer of flood risk or erosion from the proposed Nineteen-Mile Creek Training Berm to third party properties.

8. CONCLUSIONS AND RECOMMENDATIONS

1. This report is based on the existing topographic conditions for Nineteen-Mile Creek provided by Doug Bush Survey Services Ltd., 2015 land/creek survey, civil engineering information from Creus Engineering Ltd. dated June 23, 2016, and augerhole information from EXP Services Inc. dated April 13, 2016.
2. The purpose of the Nineteen-Mile Creek Training Berm is to train 200-year peak flood flows in Nineteen-Mile Creek past the development area of the Property into Green Lake. The risk of at least one occurrence of the 200-year flood on Nineteen-Mile Creek in the next 5 years is 2.5%, in the next 10 years is 4.9% and the in next 30 years is 14%.

3. The proposed Nineteen-Mile Creek Training Berm is defined as a Private Dike owned by the Property owner. The operation and maintenance and upkeep of the Private Dike will be the sole responsibility of the landowner. If the property is subdivided or is transferred to public lands in the future, then the berm would require adjudication pursuant to the BC Dike Maintenance Act.
4. The proposed Nineteen-Mile Creek Training Berm crest elevations including the access road raising are based on 200-year flood levels plus a climate change factor and freeboard. A total freeboard of 0.7 m was applied to the 200-year water surface profile resulting from the hydraulic modeling. The recommended minimum Nineteen-Mile Creek Training berm crest elevations are illustrated in Table 3 and on the berm profile found in Appendix C, LCI Final Design Berm Drawings, dated November 3, 2016.
5. The existing Nineteen-Mile Creek Training Berm upstream of the Highway 99 Bridge shall be maintained adequately and any debris blocking the waterway opening of the Highway 99 Bridge, and/or the High School Bridge on Nineteen-Mile Creek shall be cleared immediately in an environmentally responsible manner with approval by the appropriate concerned government agencies. Any logjams within Nineteen-Mile Creek located on the Property, shall be removed immediately by the owner of the Property, in an environmentally responsible manner with approval by the appropriate concerned government agencies.
6. No area used for habitation or any structures shall be located on the river side of the Nineteen-Mile Creek Training Berm.
7. There shall be no bridges, dams or any other hydraulic structures installed on Nineteen-Mile Creek without the certification by a Professional Engineer (Hydrotechnical).
8. The minimum recommended crest of the Nineteen-Mile Creek Training Berm above the surrounding ground shall be 1.5 m.
9. The recommended minimum Nineteen-Mile Creek Training Berm estimated scour elevations are illustrated in Table 4 and on the berm profile found in Appendix C, LCI Final Design Berm Drawings dated November 3, 2016.
10. It is recommended that the Nineteen-Mile Creek Training Berm be designed for seismic forces by a qualified Professional Engineer (Geotechnical). The training berm would be subject to earthquake damage and any damage to the berm shall be repaired immediately to provide the design flood protection.
11. A rock stack wall or Lock-Block arrangement shall be designed by a qualified Professional Engineer (Geotechnical) is proposed for both the river side and land side of the training

- berm. This revetment shall be designed by a qualified Professional Engineer (Geotechnical) to provide adequate stability to the berm as well as seepage control.
12. A minimum crest width of the Nineteen-Mile Creek Training Berm of 4 m not including river side bank protection works is recommended to provide long-term access for construction, inspection and maintenance. A vertical clearance shall be maintained therefore, building overhangs will not be allowed within this 4 m machinery access clearance. All adjacent building foundations shall be designed by a Professional Engineer (Structural) to withstand forces relating to the movement or working of heavy construction equipment within the 4 m clearance for machinery access.
 13. The Estimated Scour Elevation has been applied to the proposed extension of the berm not the existing entrance road which has existing rock riprap erosion and scour protection works to protect the roadway. The current condition of the existing rock riprap was inspected and deemed acceptable to LaCas Consultants Inc., however inspections of the berm, and berm bank protection works shall be carried out and reported on by a qualified Professional Engineer (Hydrotechnical) annually and after any significant flood event on Nineteen-Mile Creek.
 14. The crest of the Nineteen-Mile Creek Training Berm shall be sloped or cambered to promote drainage and minimize surface ponding. All services should be located prior to final design and construction. If services are required to be installed within the training berm a qualified Professional Engineer (Geotechnical) shall certify that the Nineteen-Mile Creek Training Berm is stable with installed services and meets the original design specifications discussed in this report and shown in LCI Drawings found in Appendix C (15-10-000/001/002, dated November 3, 2016).
 15. A qualified Professional Engineer (Geotechnical) shall certify that the existing ground under the proposed training berm alignment is adequate for the foundation of the berm, otherwise the qualified Professional Engineer (Geotechnical) shall recommend proper engineering solutions for the training berm foundation.
 16. All plantings and vegetation configurations on the berm shall be in accordance with the "Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (MELP, DFO, 1999). A qualified Professional Biologist shall approve all plantings. No future planting of trees or shrubs is to be undertaken without the written approval of a qualified Professional Engineer (Hydrotechnical) and qualified Professional Biologist.
 17. The Nineteen-Mile Creek Training Berm crest shall be constructed higher to account for estimated settlement in the next 30 years, to be confirmed by a qualified Professional Engineer (Geotechnical) prior to completion of construction. Notwithstanding, settlement

should be periodically inspected by a qualified Professional Engineer (Geotechnical) and rectified by the Property owner as soon as possible.

18. Interior drainage ditch adjacent to the land side of berm should be lined with 150 mm thick clean gravel or non-woven geo-textile filter fabric overlain with 10kg Class Rock Riprap (0.35 m thick) at direction of a qualified Professional Engineer (Geotechnical). The interior ditch shall be setback from the toe of the interior slope of the berm at the direction of a qualified Professional Engineer (Geotechnical). This ditch location shall also be reviewed by the qualified Professional Biologist.
19. A qualified Professional Engineer (Geotechnical) shall certify that the berm is constructed adequately to handle anticipated seepage through the Nineteen-Mile Creek Training Berm.
20. The constructed scour protection will be subject to review by LaCas Consultants Inc. based on the recommendations by EXP Services Inc. with respect to subsurface soil conditions during construction. If subsurface soil conditions change from EXP Services Inc.'s, Augerhole AH16-01 then scour protection will be altered to suit the conditions with LaCas Consultants Inc.'s and EXP Services Inc.'s written permission. The contractor shall not bury the scour protection without LaCas Consultants Inc.'s and EXP Services Inc.'s permission.
21. To ensure a safe design, LaCas Consultants Inc. must be able to confirm design assumptions and revise the Nineteen-Mile Creek Training Berm design if unanticipated conditions are encountered. Construction review is mandatory by LaCas Consultants Inc. in order to ensure that the construction work complies with the plans and specifications and meets standards of good workmanship. Therefore, construction inspection of a Nineteen-Mile Creek Training Berm design is required by LaCas Consultants Inc. at critical construction periods of the berm construction. Final certification of the Nineteen-Mile Creek Training Berm by LaCas Consultants Inc. is mandatory, otherwise LaCas Consultants Inc. will not accept responsibility for the completed construction of the berm.
22. There shall be no structures constructed within the berm boundaries of the Nineteen-Mile Creek Training Berm without prior approval by a qualified Professional Engineer (Hydrotechnical), and shown in LCI Drawings found in Appendix C (15-10-000/001/002, dated November 3, 2016).
23. Construction of habitable areas above the foundation of the habitable areas, (including any space or room within a building or structure, including a manufactured home or unit and a modular home or unit, which is used or is capable of being used for human occupancy or industrial, business or commercial use, or storage of goods, including equipment and furnaces), which is susceptible to damage by floodwaters, shall be not constructed on the

land side the Nineteen-Mile Creek Training Berm until the Nineteen-Mile Creek Training Berm has been completed and approved by LaCas Consultants Inc. in writing.

24. Final certification of the Nineteen-Mile Creek Training Berm by LaCas Consultants Inc. is mandatory prior to occupancy of any habitable areas on the Property.
25. Workers, site works, services, excavations, foundations, construction equipment, and/or construction offices/facilities on the Property, shall be adequately protected against floodwaters, and is the responsibility of the construction contractor.
26. An Operation and Maintenance manual for the Nineteen-Mile Creek Training Berm shall be prepared and sealed by a Professional Engineer (Hydrotechnical).
27. Construction of the Nineteen-Mile Creek Training berm will be subject to all environmental laws and subject to pertinent environmental approvals. All work in and about a stream shall not detrimentally affect the environment or fish & wildlife values.
28. The original sealed hardcopy of this report shall be submitted to the Resort Municipality of Whistler.

All elevations are metres above sea level, based on the Geodetic NAD83 derived from Monument No. 95HA141 located on NW Highway Bridge abutment over the River of Golden Dreams (Alta Creek) (Elevation = 636.339 m).

9. CLOSURE AND LIMITATIONS

This document has been prepared by LaCas Consultants Inc. for the Property described as 8030 Alpine Way, Whistler, BC, District Lot 1756, Group 1, N.W.D., except portions in plans 12579 and 13114, Whistler, BC, Canada only; under its Standard Terms and Conditions for the exclusive use of the Client. LaCas Consultants Inc. is only responsible for the hydrotechnical engineering relating to the Nineteen-Mile Creek Training Berm (Private Dike).

No other party other than White Glacier International, Lamoureux Architect Incorporated, Doug Bush Survey Services Ltd., EXP Services Inc., EVR-Fine Homes, Creus Engineering Ltd., and the Province of British Columbia, Resort Municipality of Whistler is entitled to rely on any of the conclusions, data, opinions, or any other information in whole or in part which is contained in this document for this project only and no other project.

In order to properly understand the suggestions, recommendations and opinions expressed in this document, reference must be made to the whole of the document. LaCas Consultants Inc.

cannot be responsible for use by any party of portions of the document without reference to the whole document.

This document is the intellectual property of LaCas Consultants Inc. LaCas Consultants Inc. upon discovery of an unauthorized party using or anyone unauthorized to distribute this document in whole or in part, reserves the right to seek damages through the full extent of the law.

This document represents LaCas Consultants Inc.'s best professional judgment based on the information available at the time of its completion and as appropriate for the project scope of work.

Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by members of the engineering profession currently practising under similar conditions.

In accepting this report, the Client (Property owner: Mr. Teck Yuen Lee, of White Glacier International Ltd., 1890 Ocean Drive, Singapore, 098454), and any future owner of the Property or future owner of any subdivision of the Property agrees notwithstanding the availability of any insurance, the Client agrees that any and all claims which the Client may have against LaCas Consultants Inc., its employees, officers, agents, representatives, and sub-consultants in respect of the services in howsoever arising, whether in contract, tort, breach of statutory duty or based on any other cause of action, shall be absolutely limited, individually and in the aggregate, to an amount equal to the amount of fees paid to LaCas Consultants Inc. for the White Glacier project, Whistler, BC, Canada. This provision survives performance and termination of this agreement. Use of this report is subject to LaCas Consultants Inc.'s Standard Terms and Conditions.

The Client and any future purchaser agrees that the liability of LaCas Consultants Inc. shall expire 2 years after the date of substantial completion of the Nineteen-Mile Creek Training Berm project. The Client further agrees that the employees, shareholders, officers and directors of LaCas Consultants Inc. shall have no personal liability to the Client in respect to any claim, accordingly the Client agrees that it will bring no proceedings and take no action in any court of law against such individuals and their personal capacity.

When LaCas Consultants Inc. submits both electronic file and hardcopies of this document including drawings and other documents and deliverables (LaCas Consultants Inc.'s instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by LaCas Consultants Inc. with an original red ink stamp BC Registered Professional Engineering Seal (not electronically scanned) shall be the original documents of record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over

the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by LaCas Consultants Inc. shall be deemed to be the overall original for the project. LaCas Consultants Inc. agrees to ensure that the Client has a sealed copy of the overall original archived report and drawings for the project and no changes will be made to the archived version of this report dated November 3, 2016 unless permission is received in writing by the Client or the Client's representative.

Prepared by:



Brian LaCas, P.Eng, Senior Hydrotechnical Engineer
LaCas Consultants Inc.

APPENDIX A – LOCATION MAP

FIGURE 1 Location Map



APPENDIX B – DESIGN INFORMATION

B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 1)

B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT

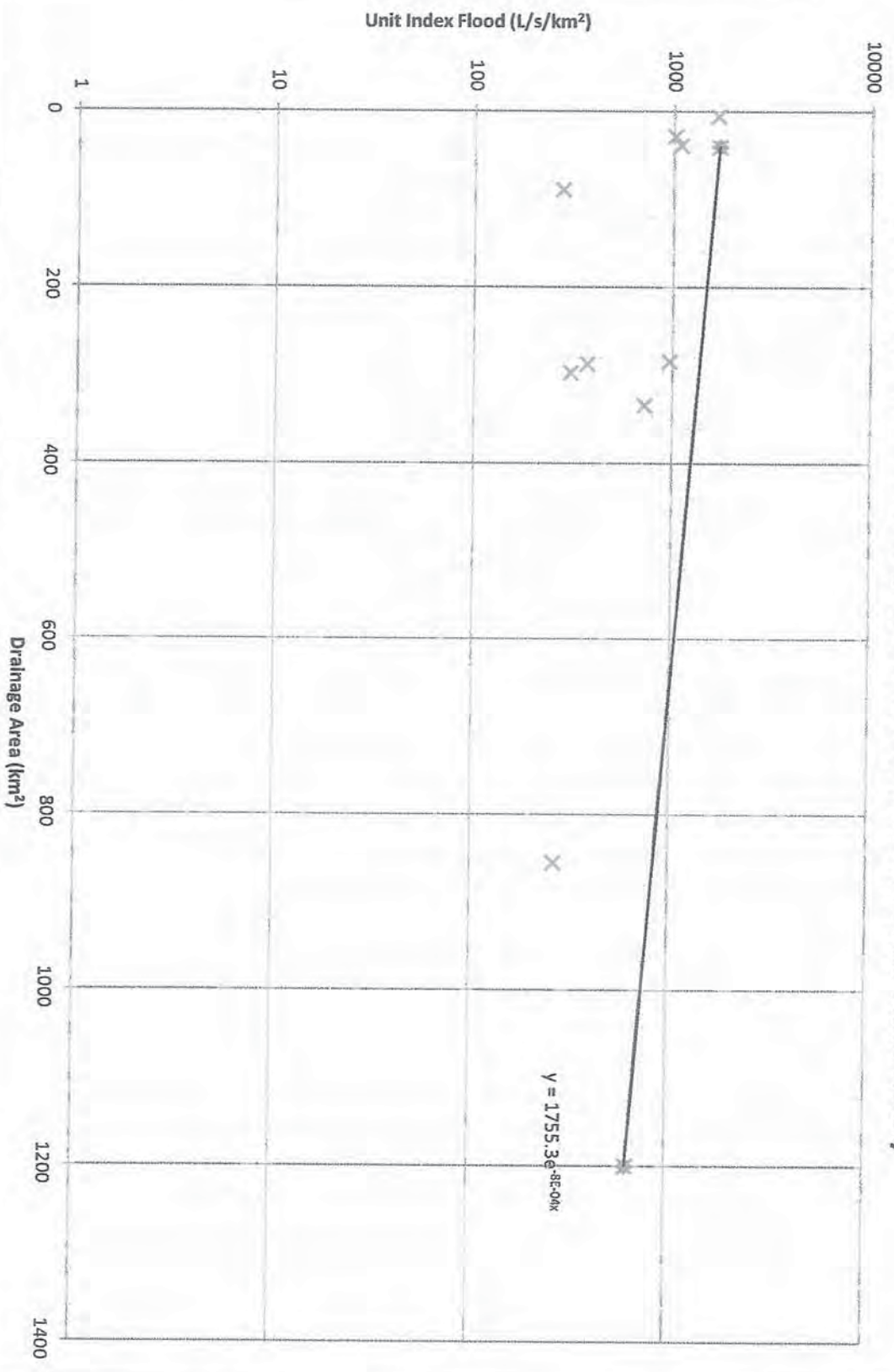
B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

B6 - SCOUR DEPTH CALCULATIONS

B7 - EXP SERVICES INC. AUGERHOLE: AH16-01

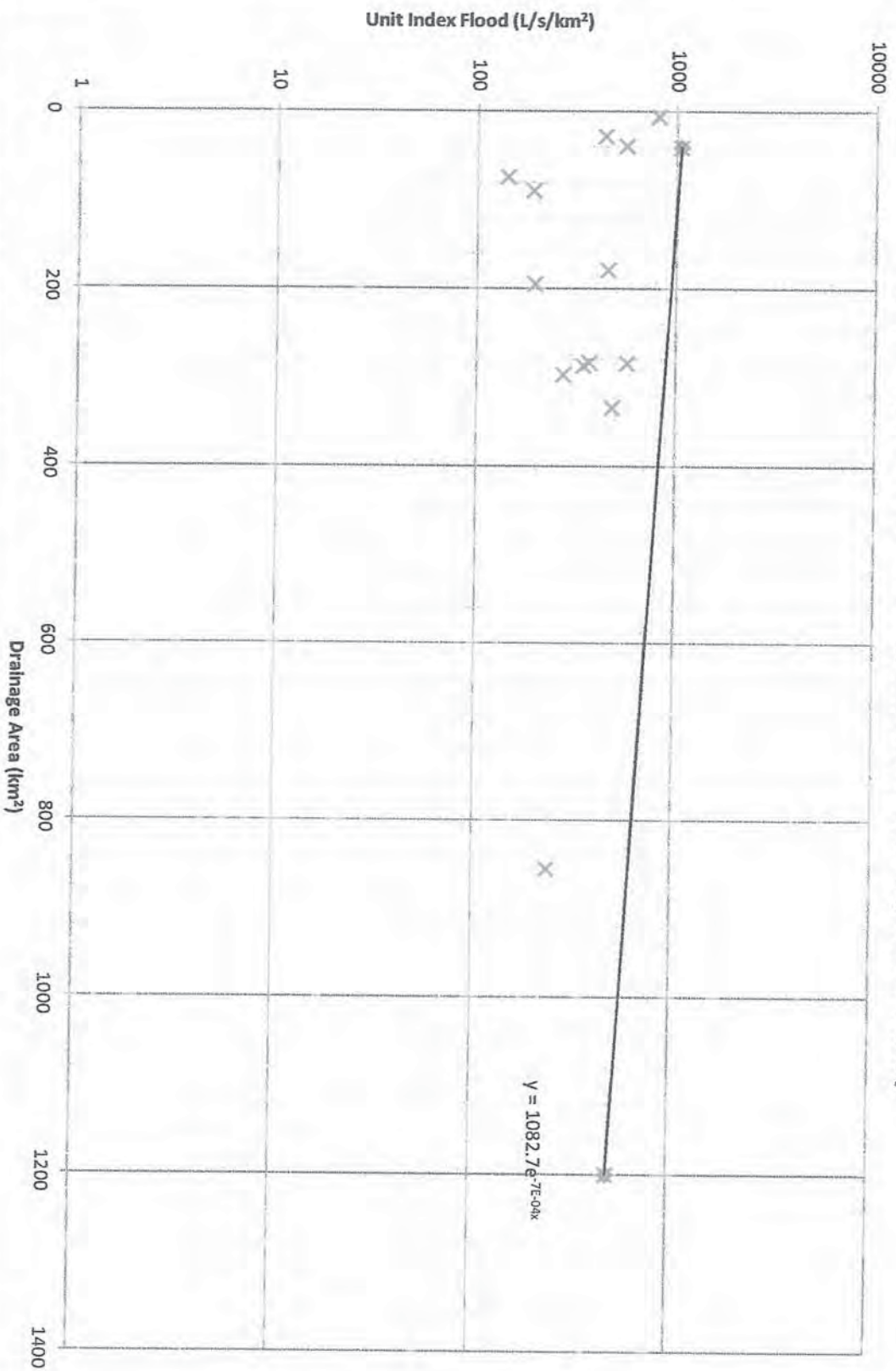
B1 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE)

Unit Index Flood vs. Drainage Area (Envelope Curve 1 Using Maximum Instantaneous Flow Data)



B2 - UNIT INDEX FLOOD VS DRAINAGE AREA (ENVELOPE CURVE 2)

Unit Index Flood vs. Drainage Area (Envelope Curve 2 Using Maximum Daily Flow Data)



B3 - PEAK FLOW IN THE LOWER MAINLAND DIVISION

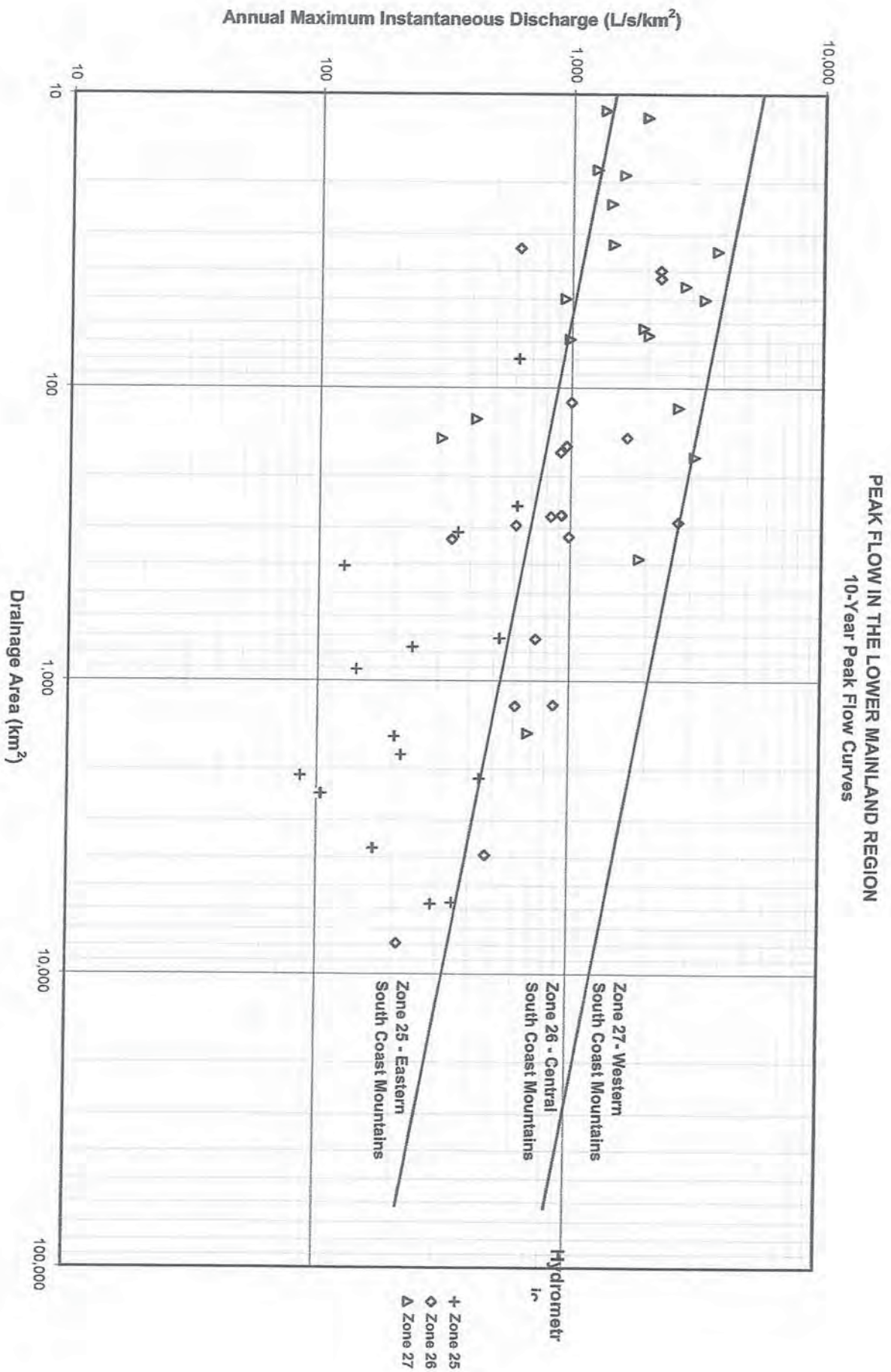
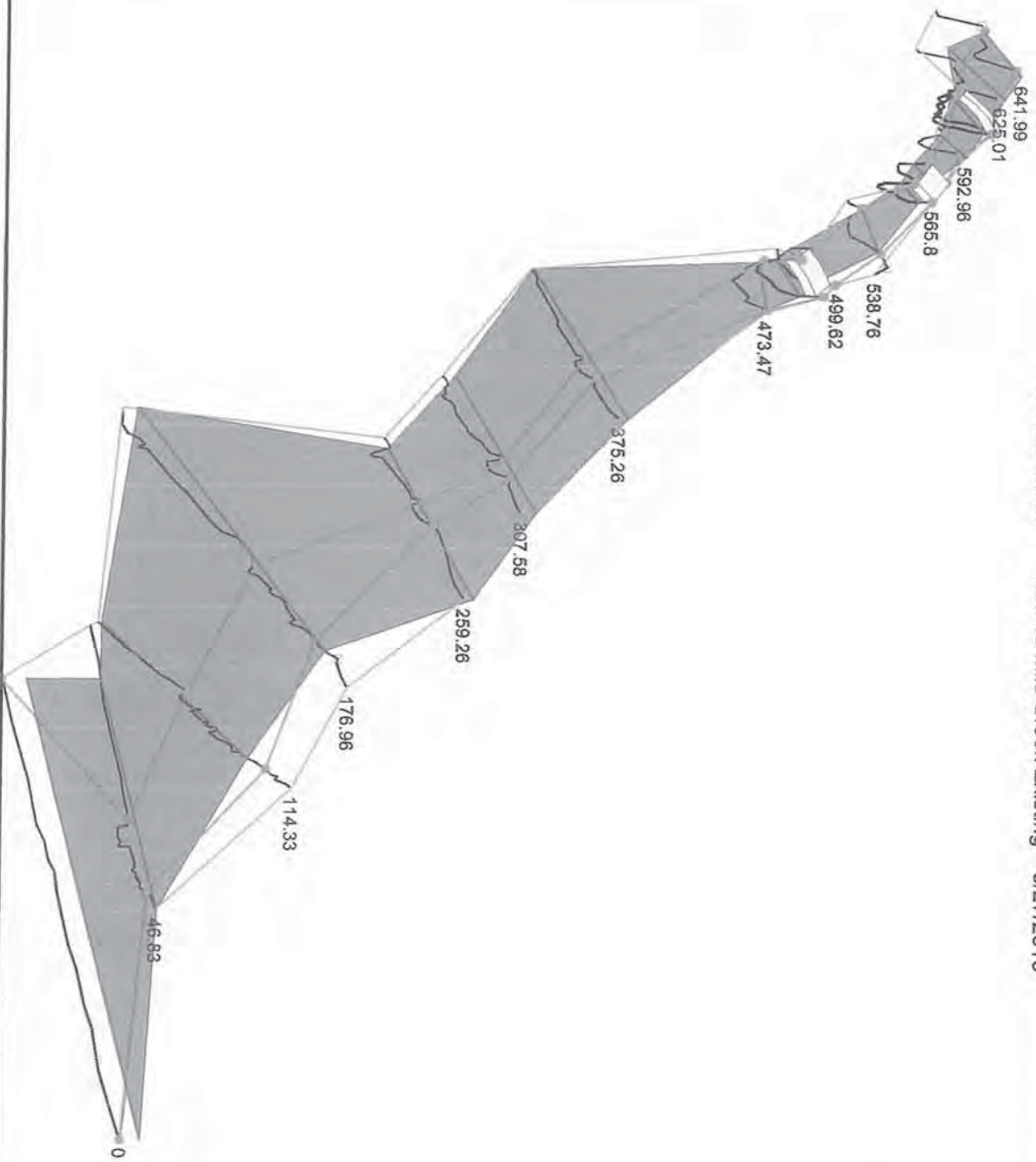






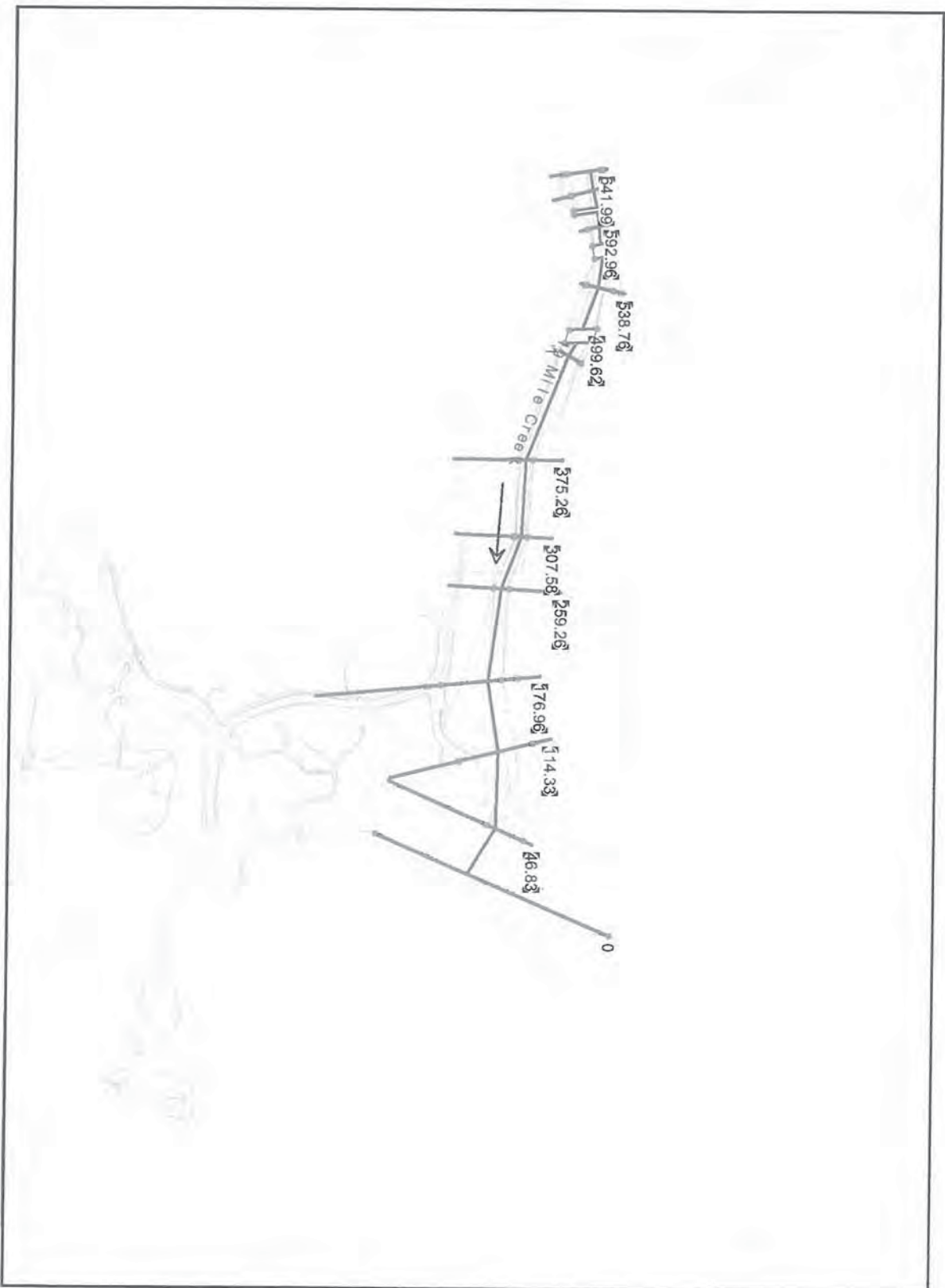
Figure 3 Watershed Peak Flow (page 1 of 2)

B4 - HEC-RAS 1-D MODEL SCENARIOS AND OUTPUT

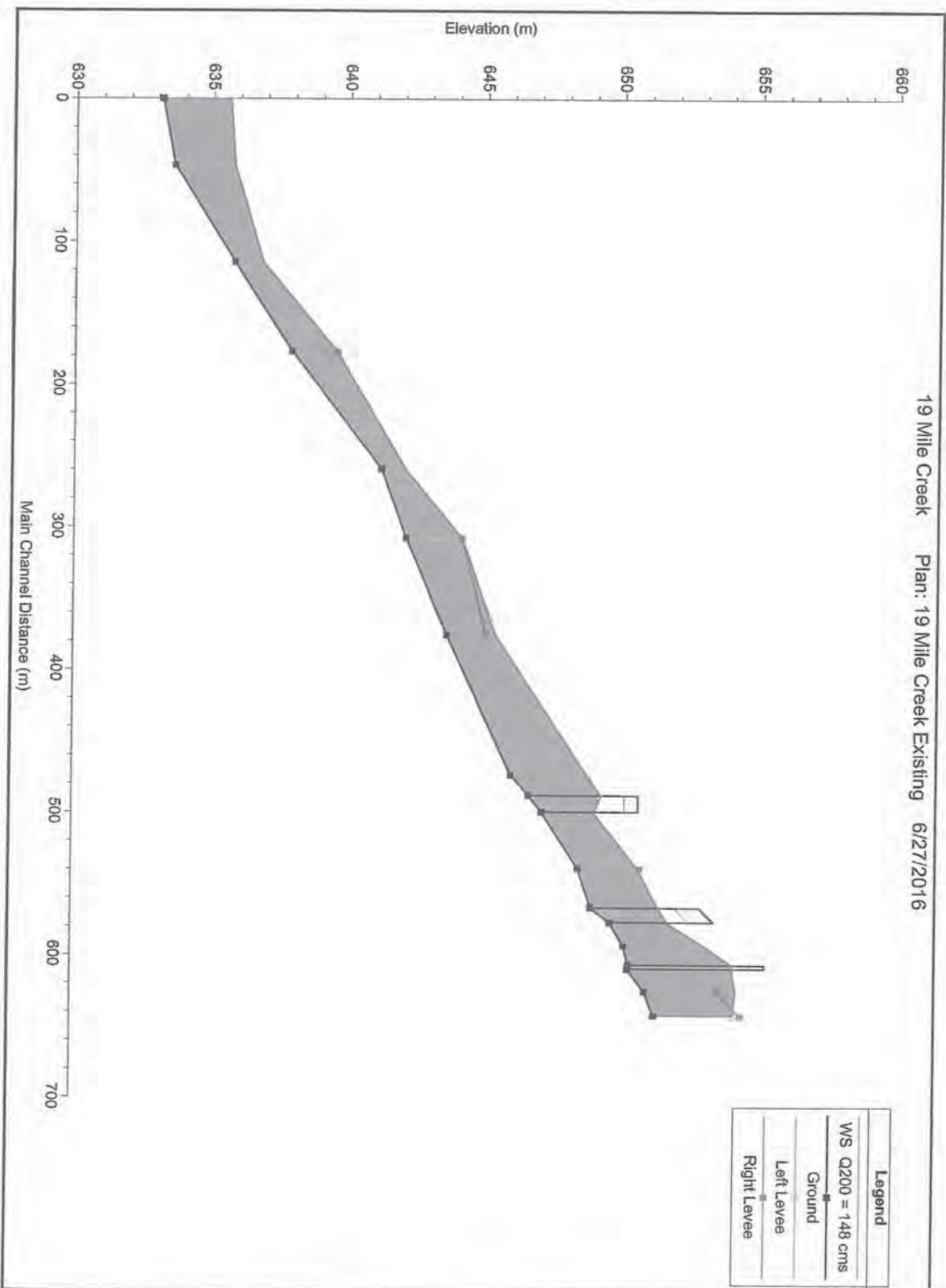
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016



Legend	
	W/S Q200 = 148 cms
	Ground
	Levee
	Bank Sta

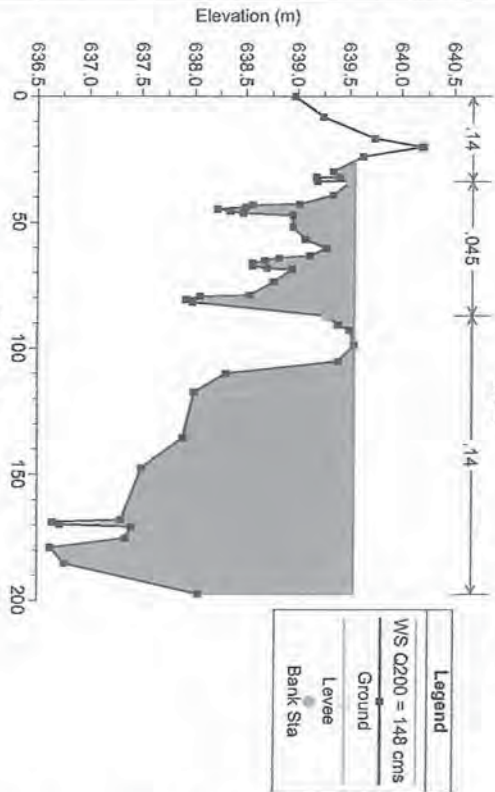


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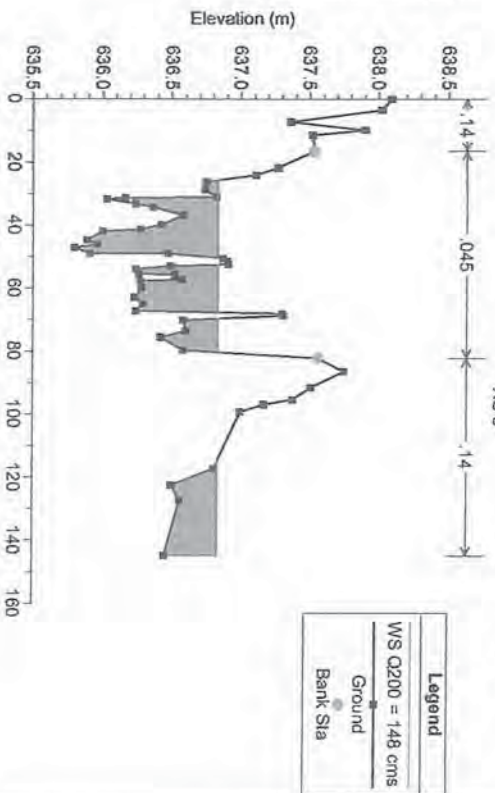
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016

XS 4



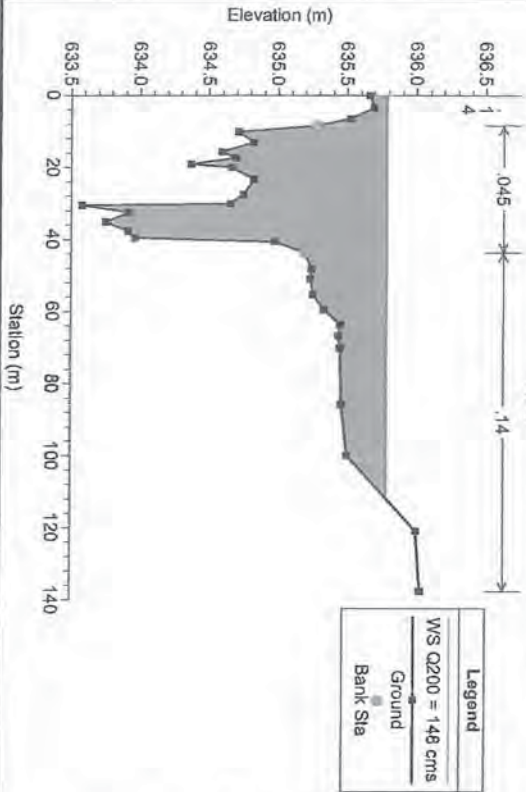
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016

XS 3



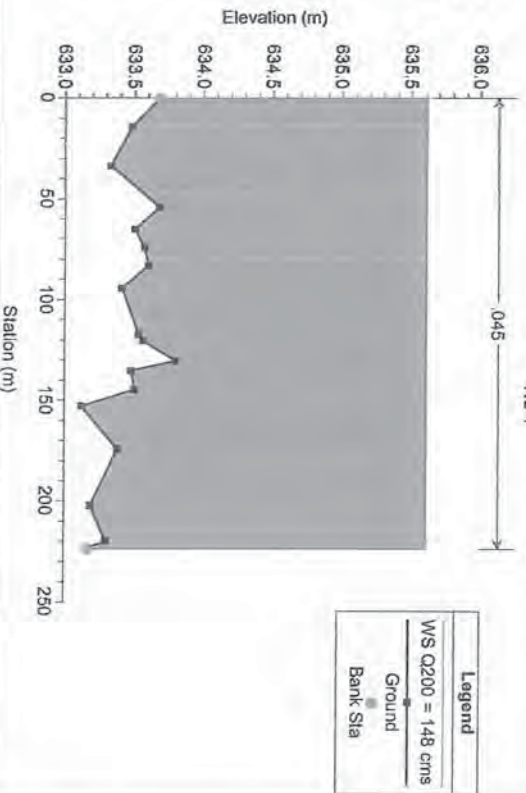
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016

XS 2

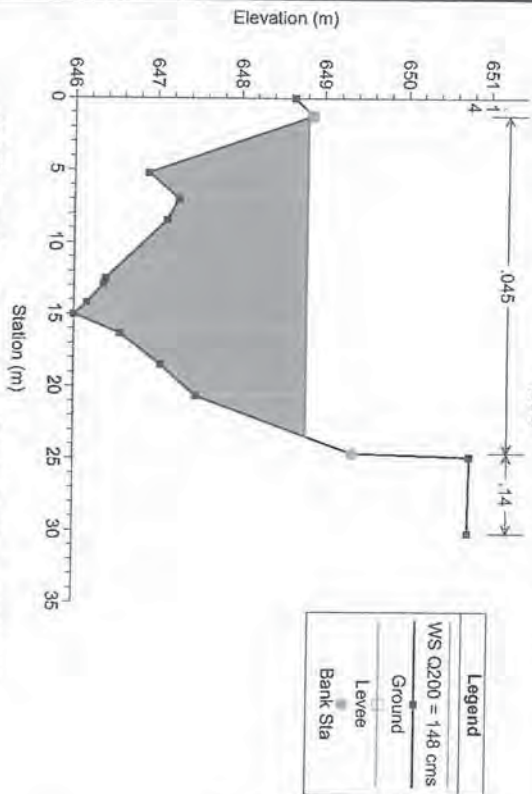


19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016

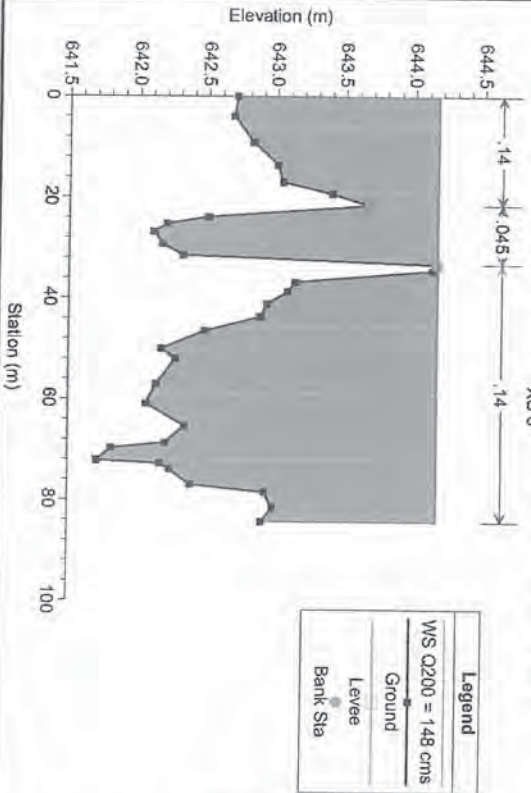
XS 1



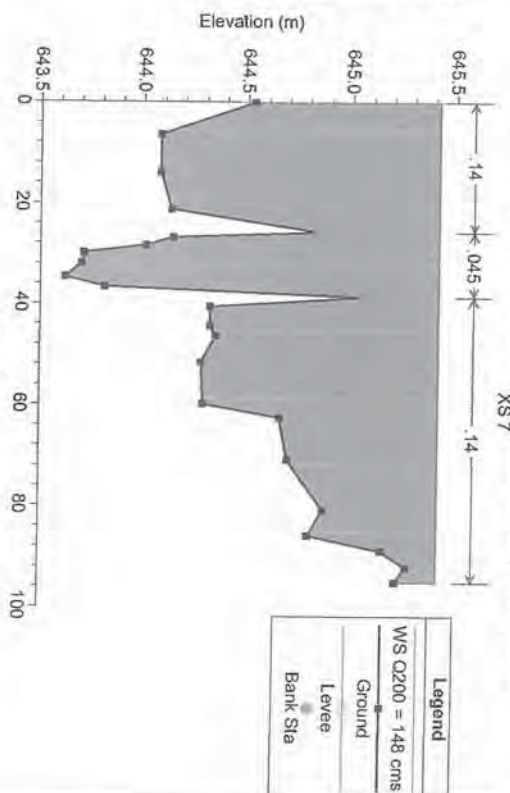
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 8



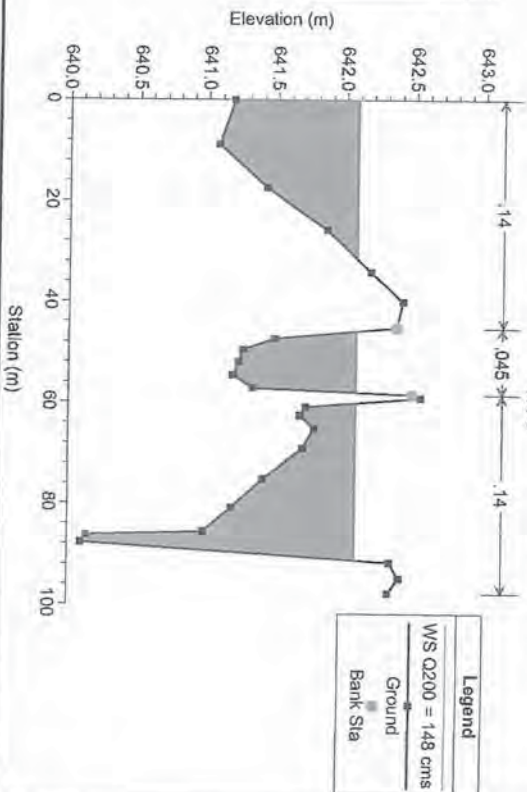
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 6



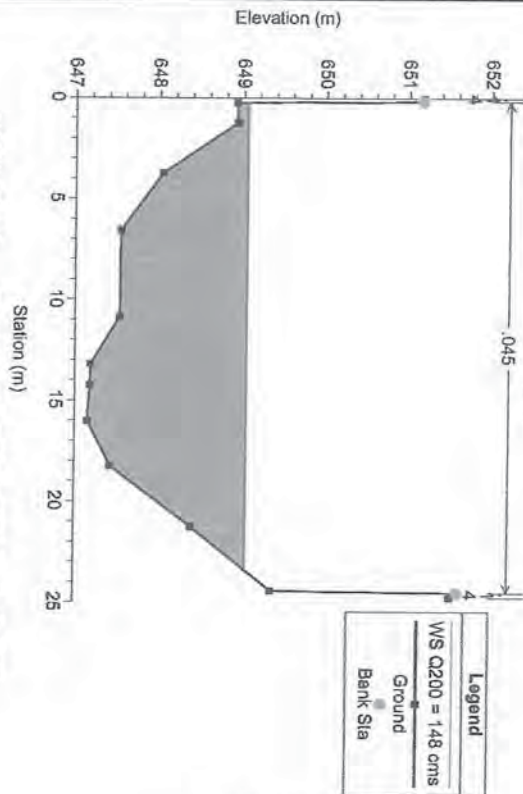
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 7



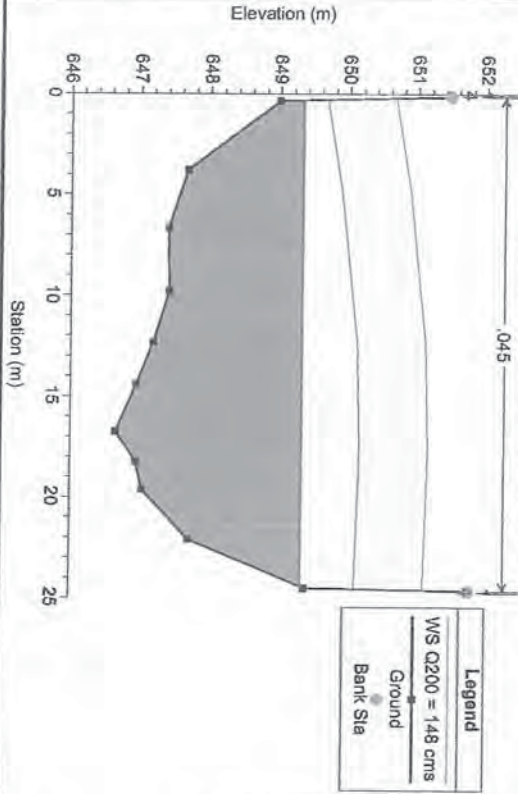
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016 XS 5



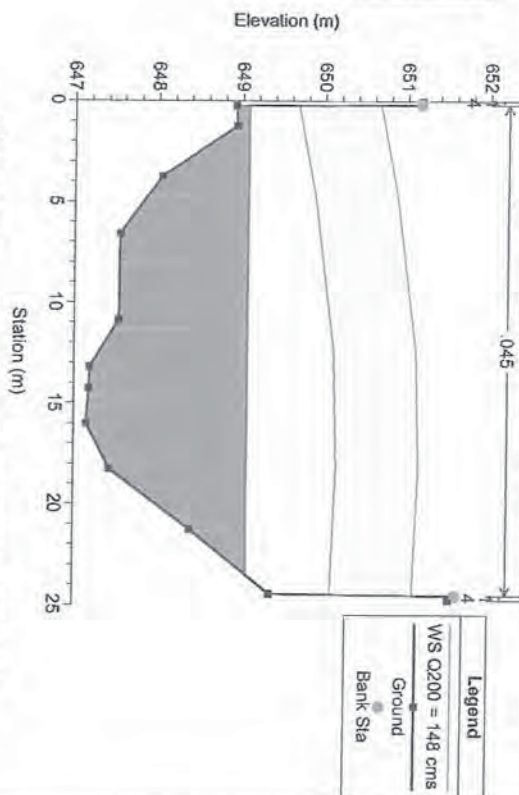
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 10



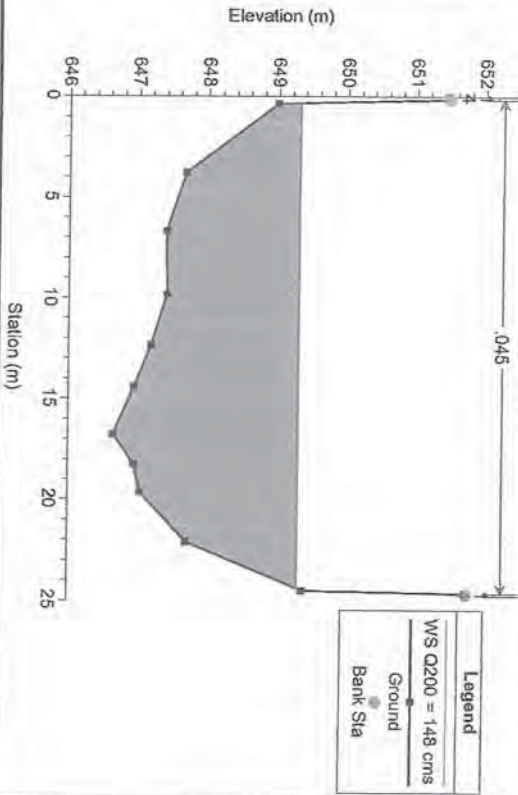
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
High School Bridge (between XS 10 and XS 9)



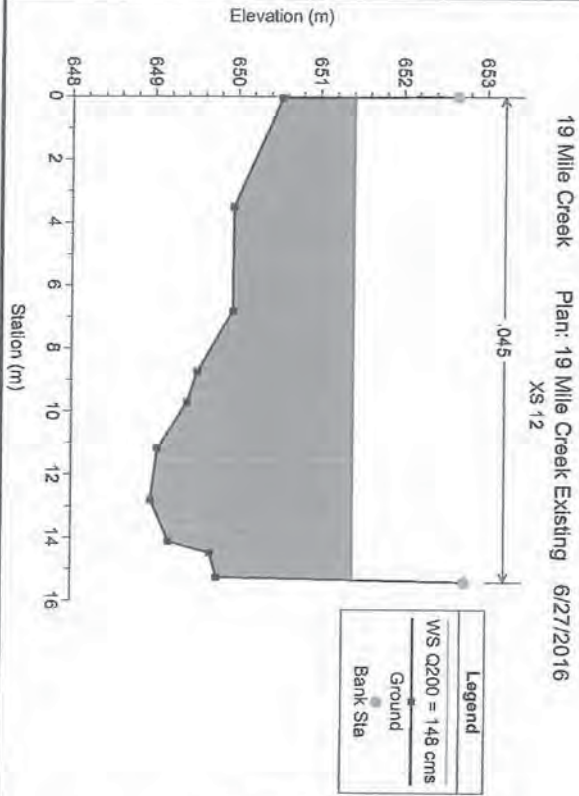
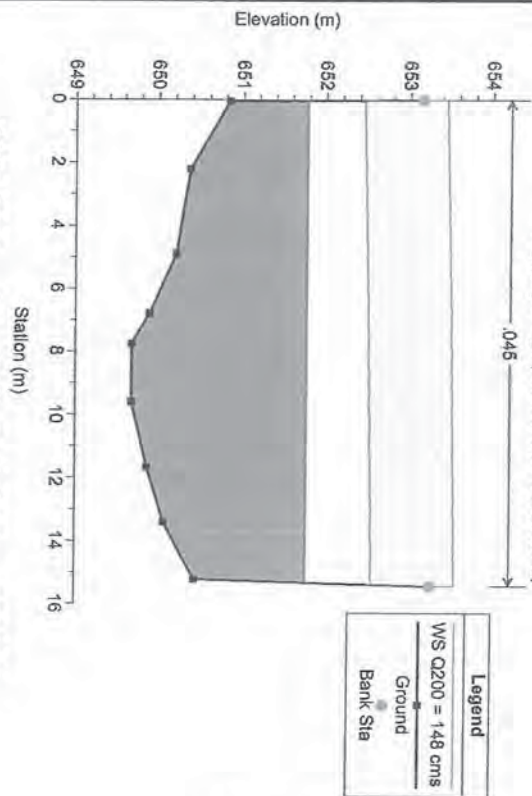
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
High School Bridge (between XS 10 and XS 9)



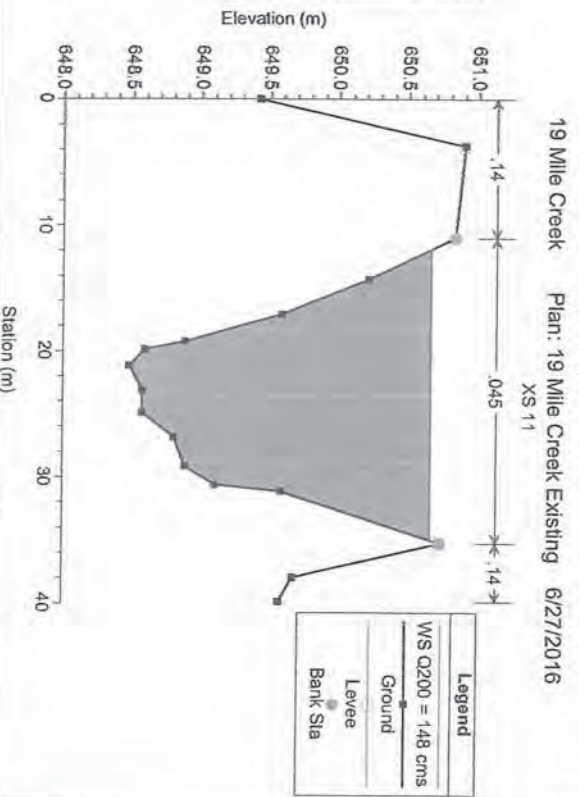
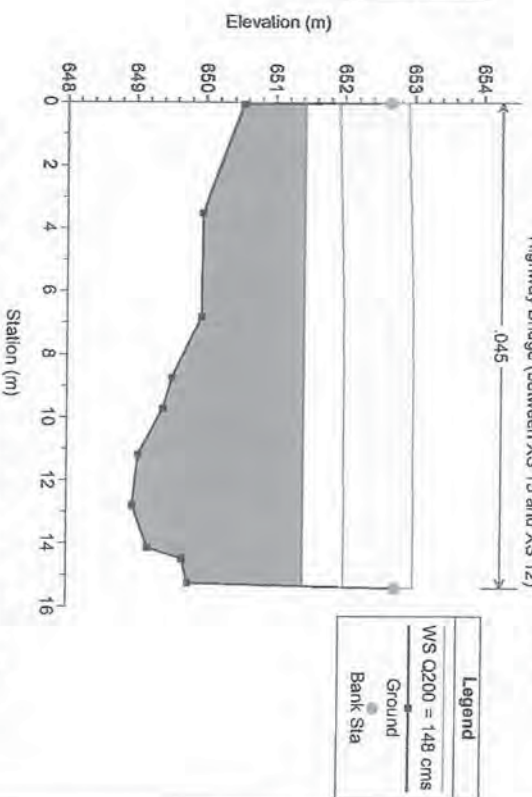
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 9



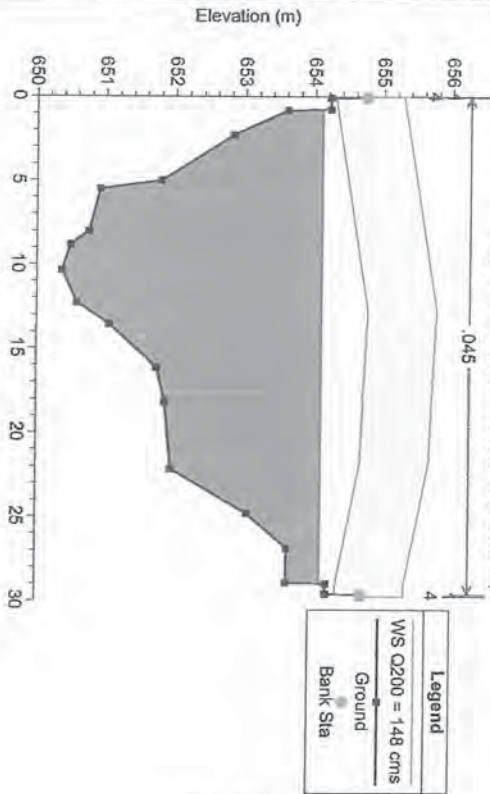
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Highway Bridge (between XS 13 and XS 12)



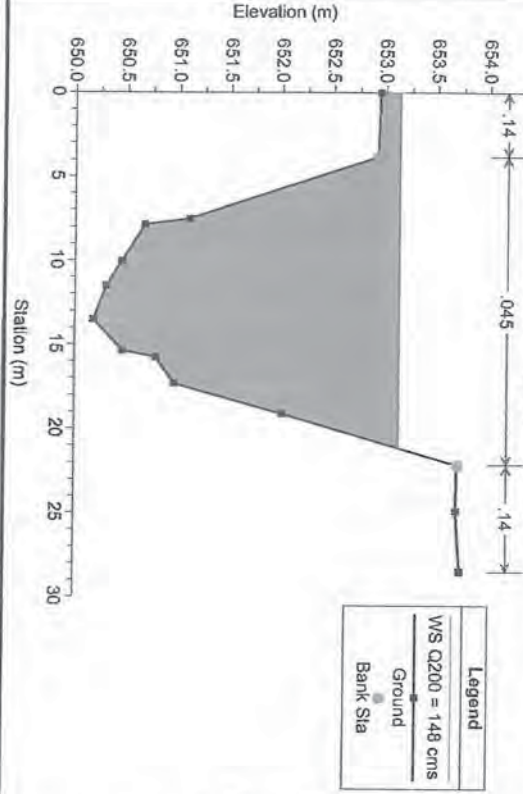
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Highway Bridge (between XS 13 and XS 12)



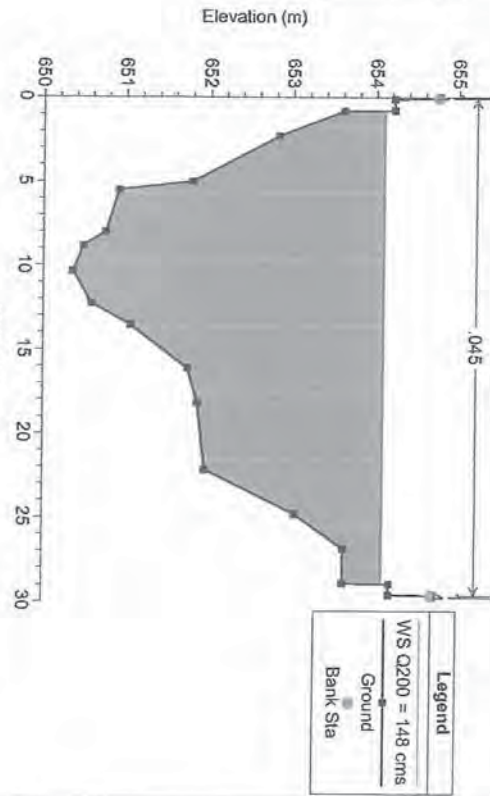
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



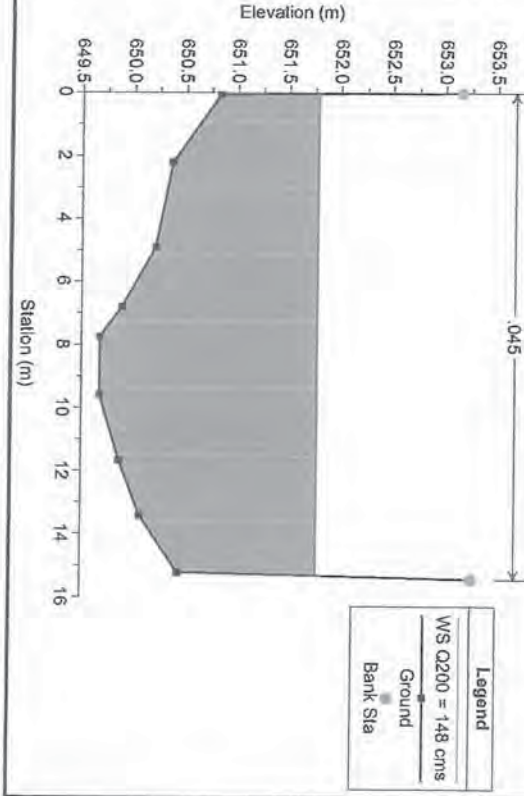
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 14



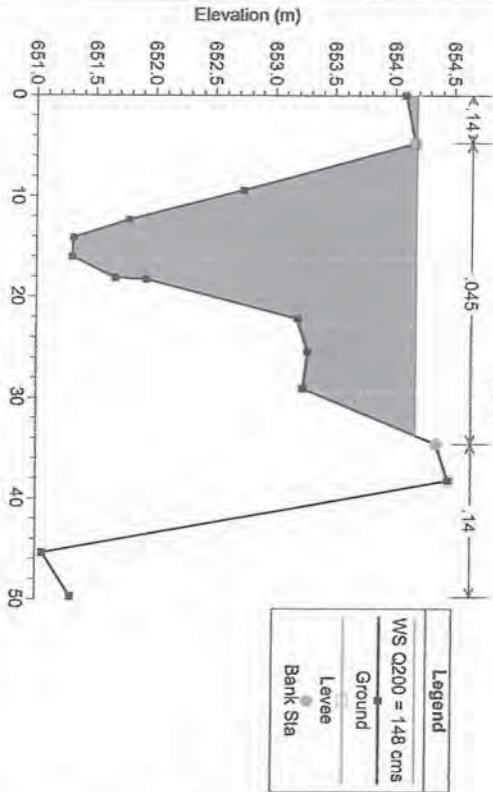
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 15



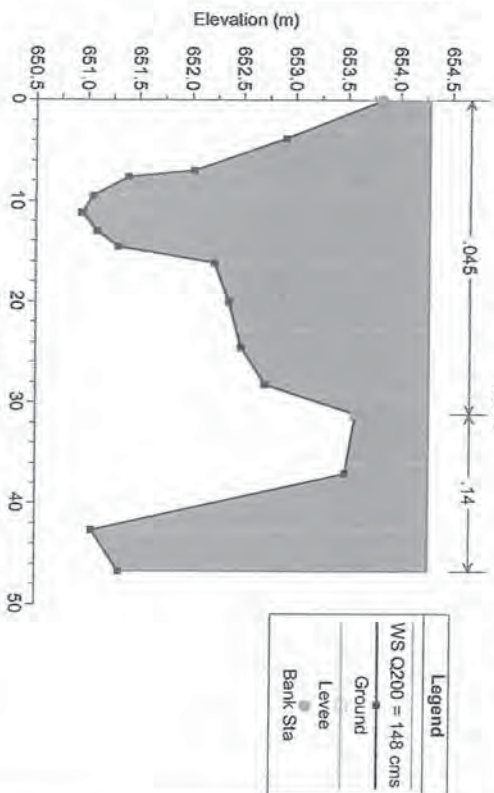
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 13



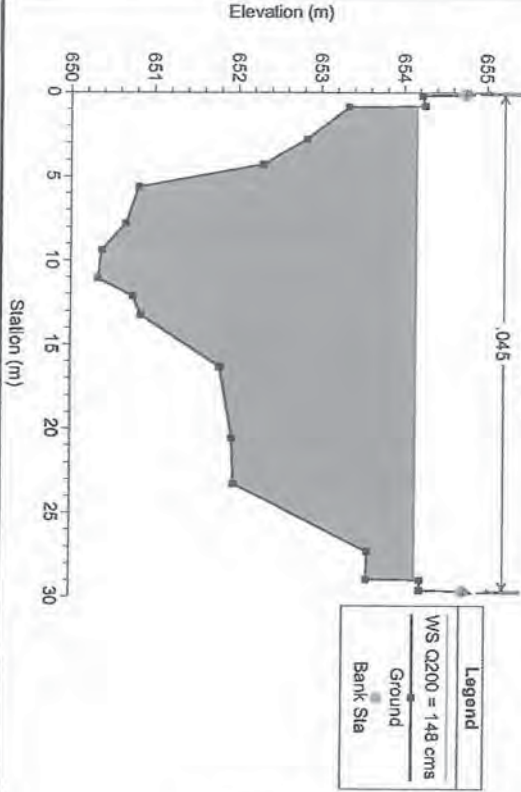
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 18



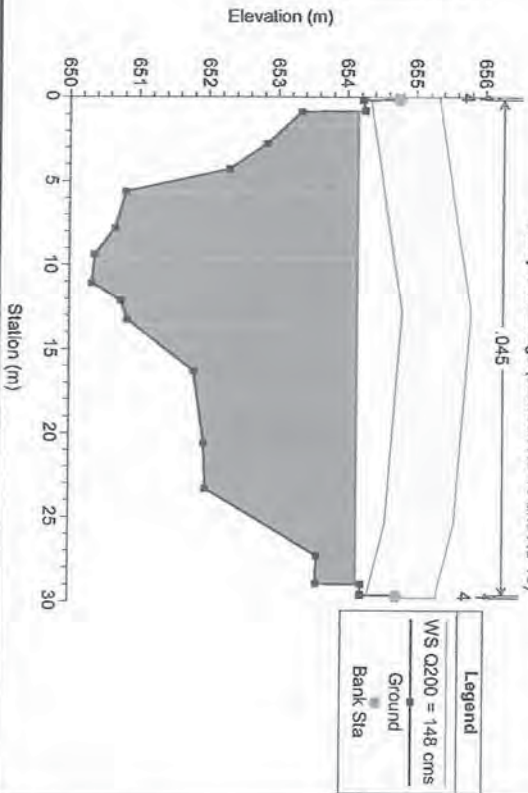
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 17



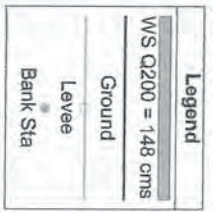
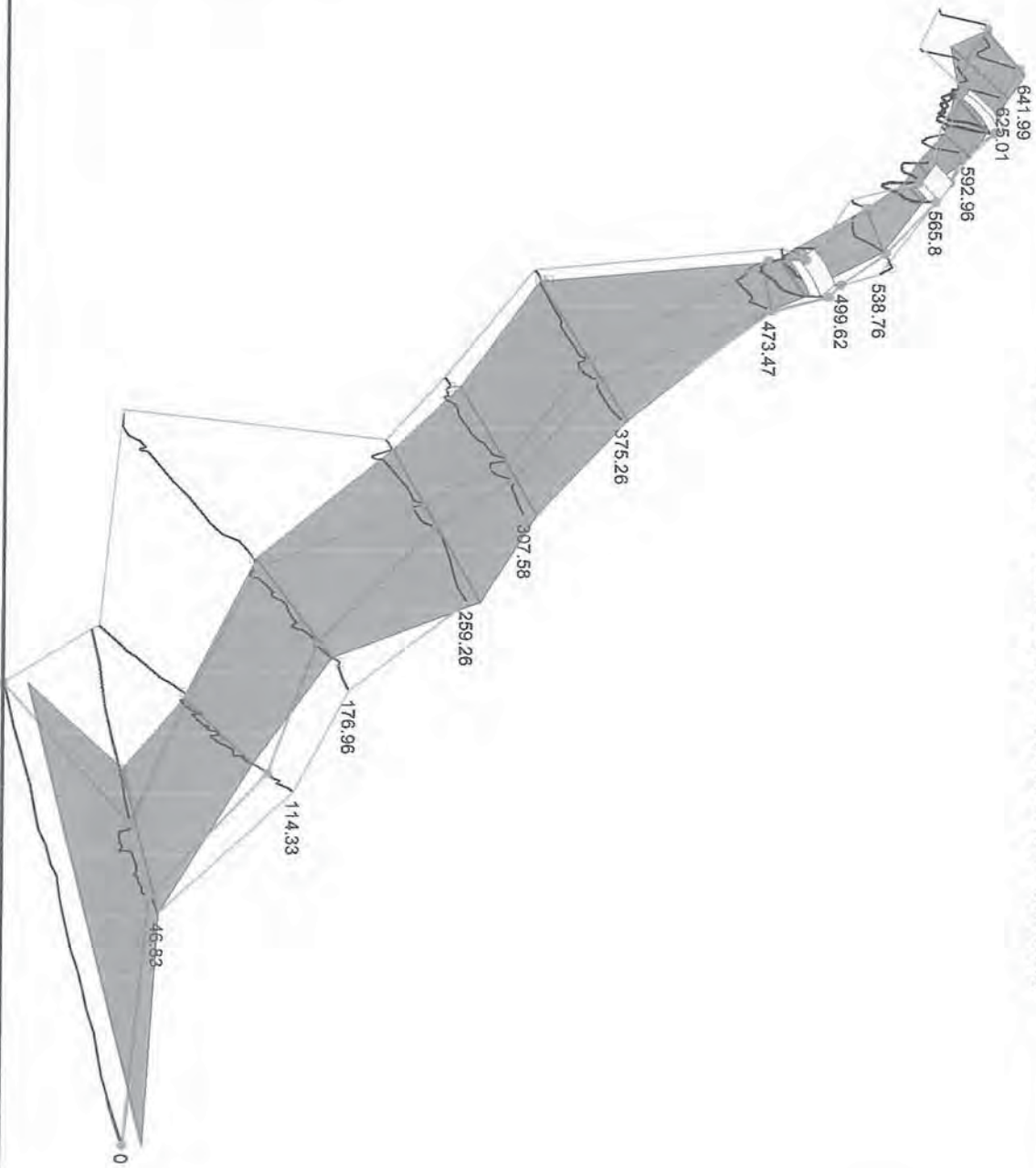
19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
XS 16

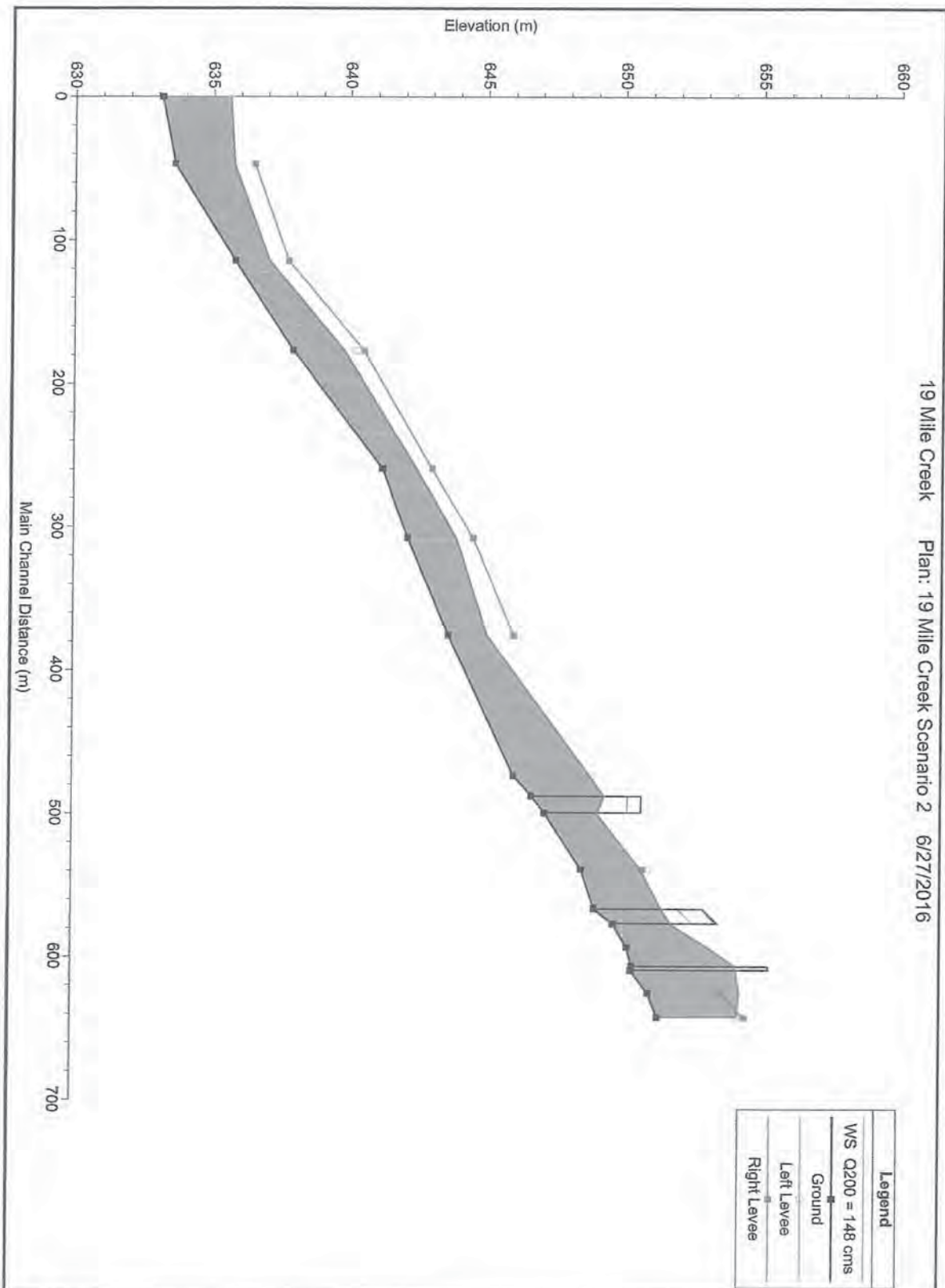


19 Mile Creek Plan: 19 Mile Creek Existing 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)

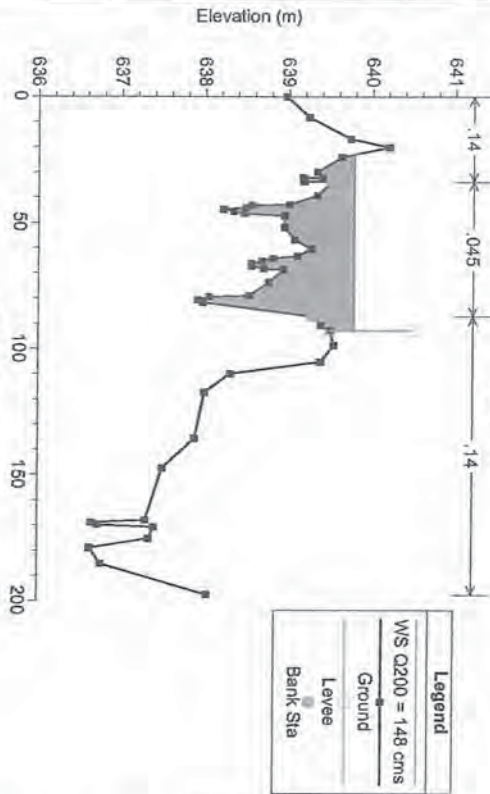


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

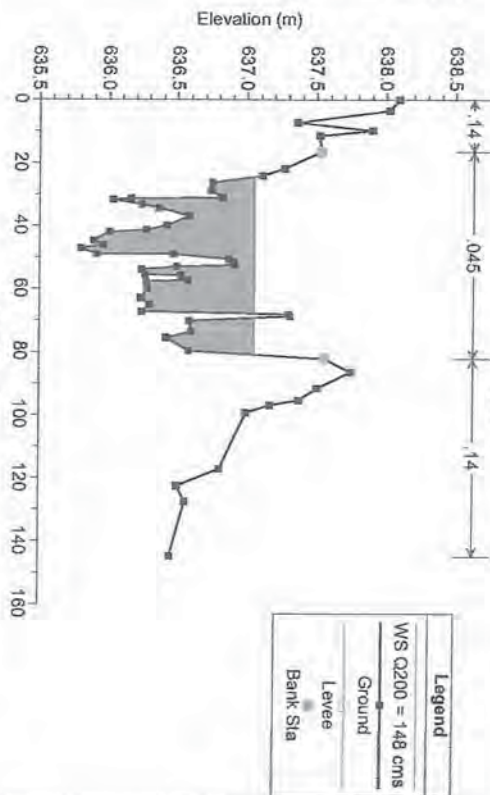




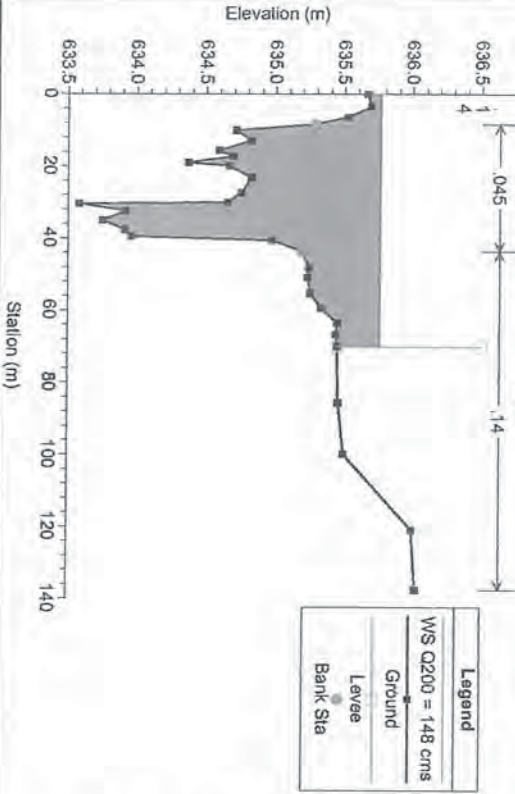
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 4



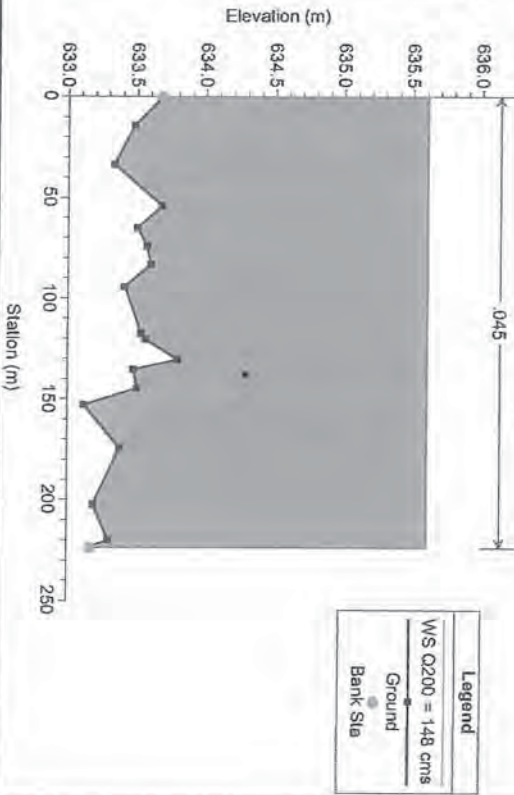
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 3



19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 2

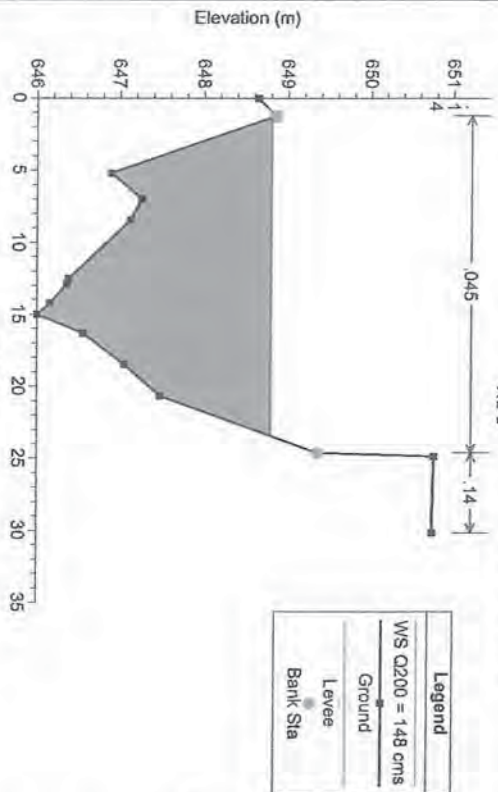


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 1



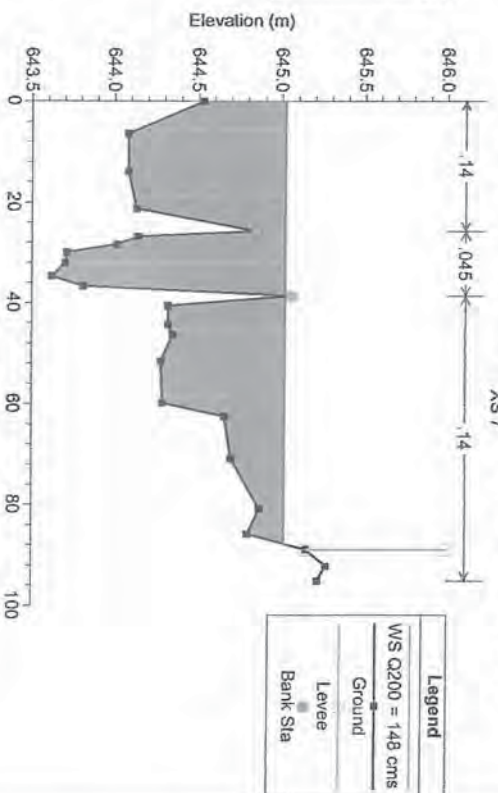
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 8



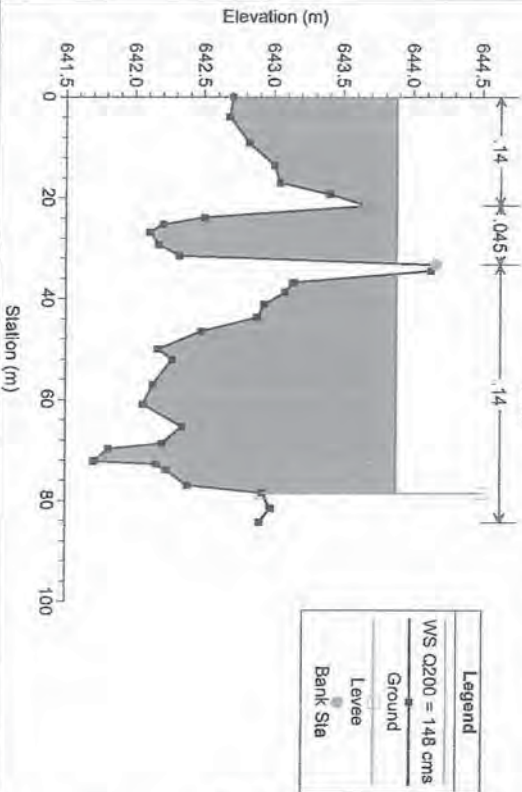
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 7



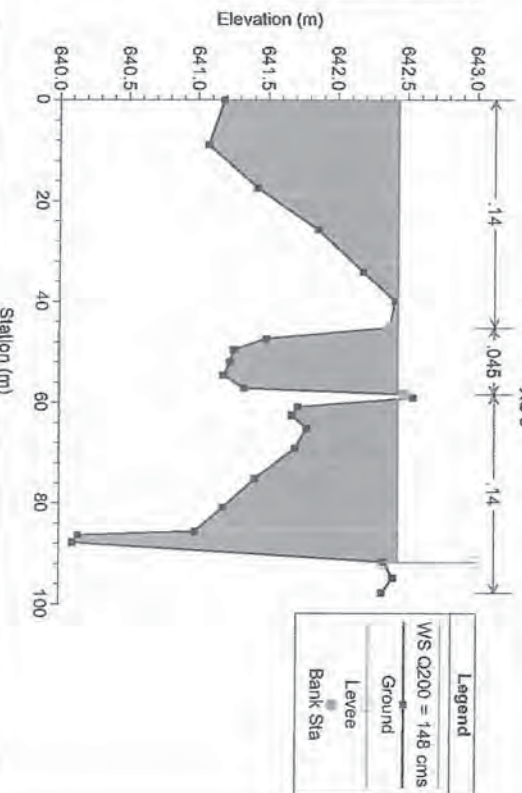
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 6

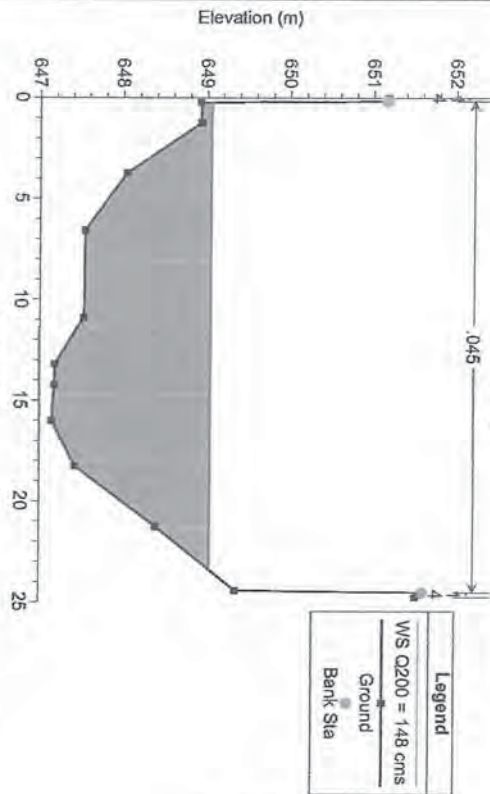


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

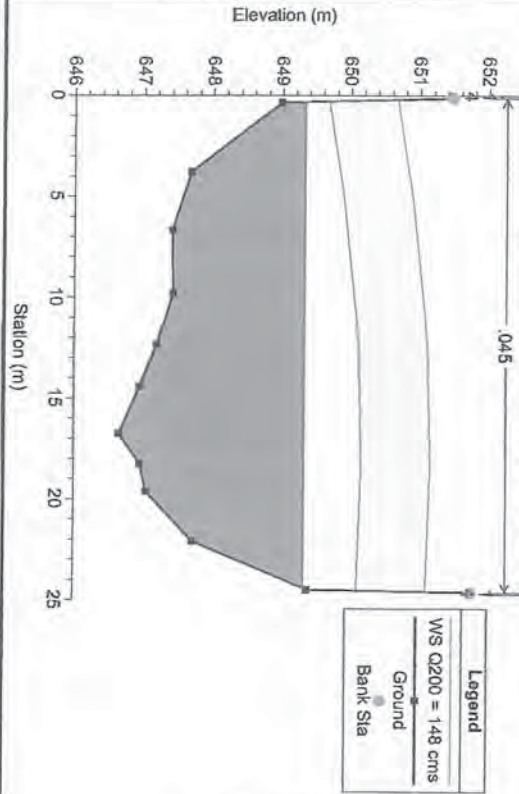
XS 5



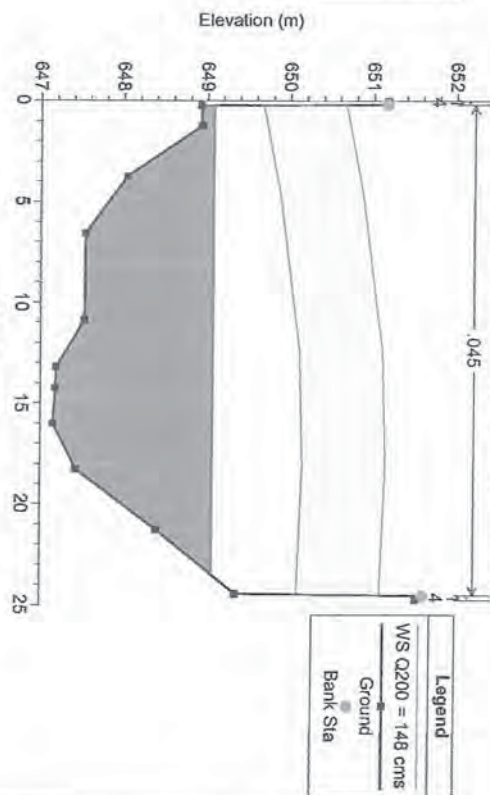
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 10



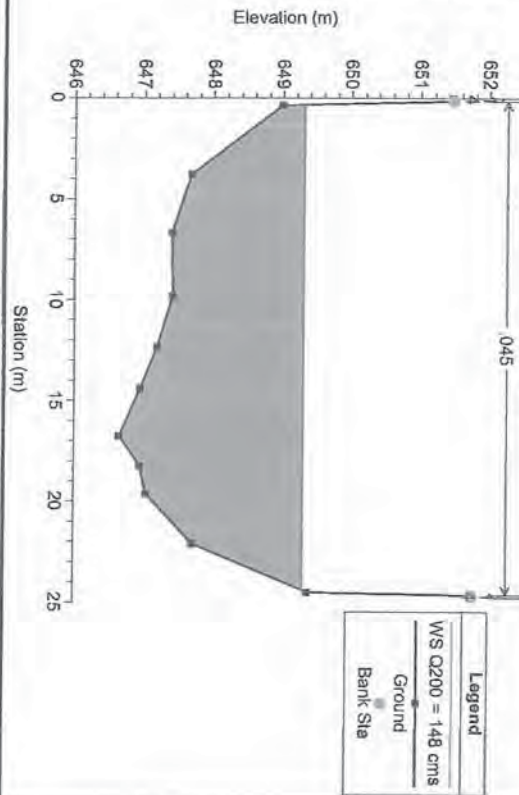
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
High School Bridge (between XS 10 and XS 9)



19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
High School Bridge (between XS 10 and XS 9)

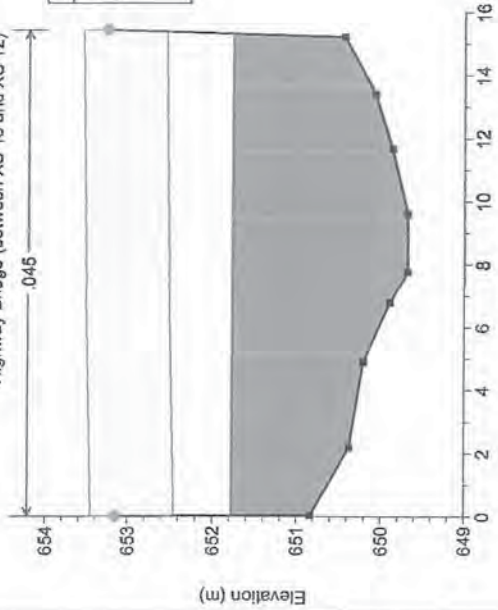


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016
XS 9



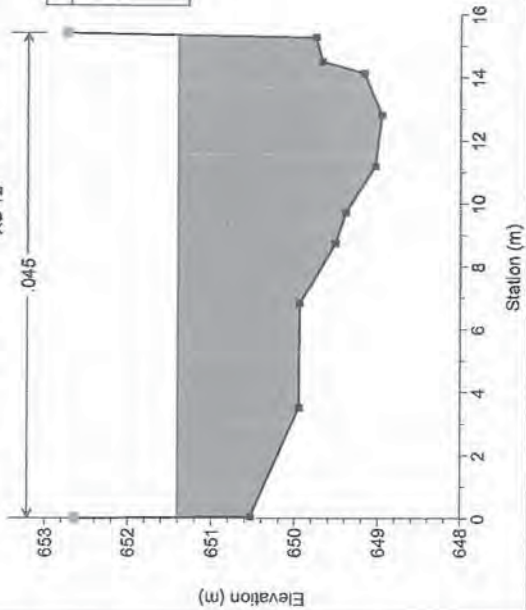
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

Highway Bridge (between XS 13 and XS 12)



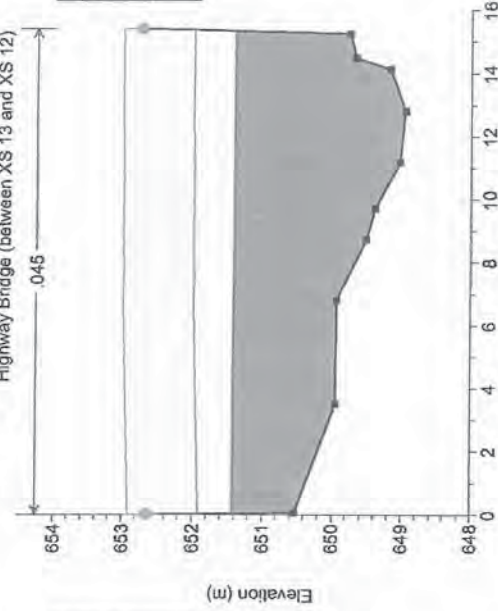
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 12



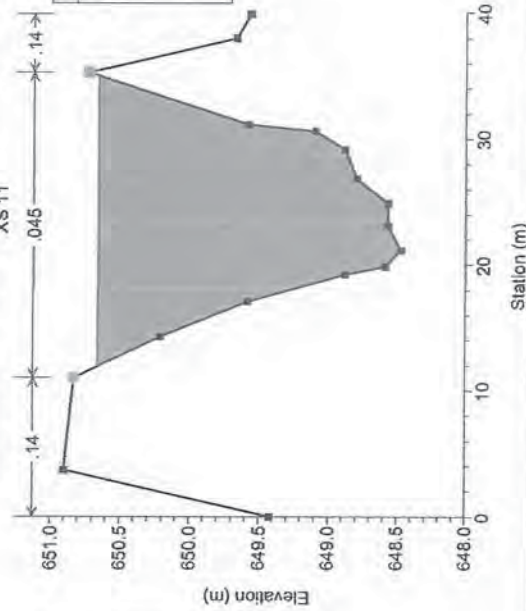
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

Highway Bridge (between XS 13 and XS 12)



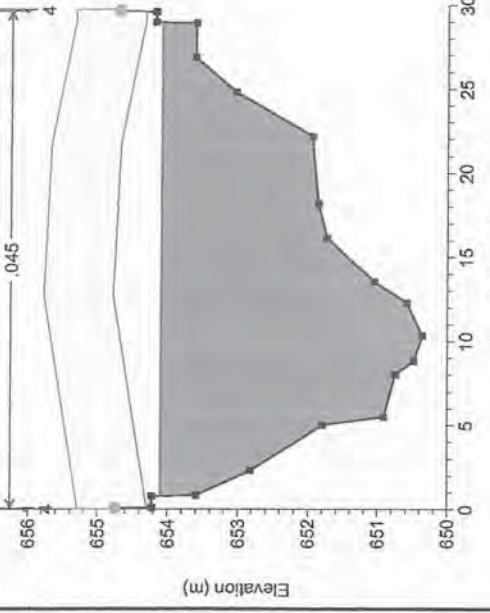
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 11



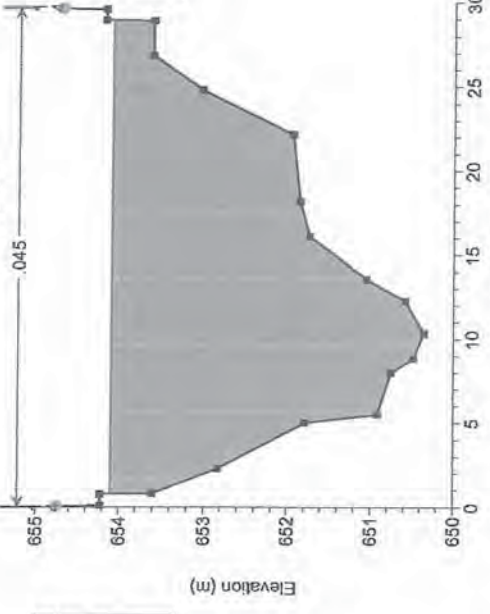
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

Valley Trail Bridge (between XS 16 and XS 15)



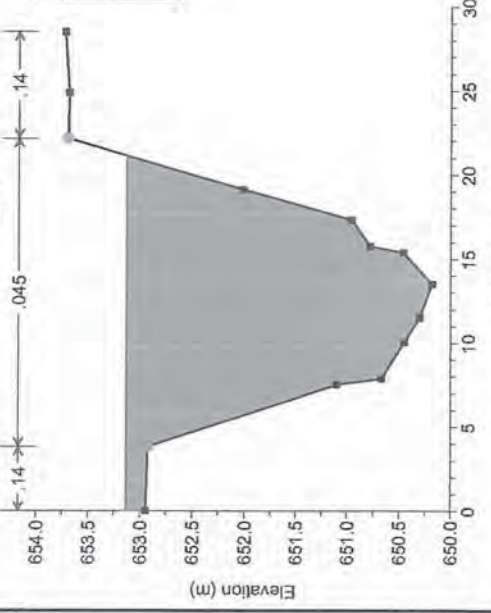
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 15



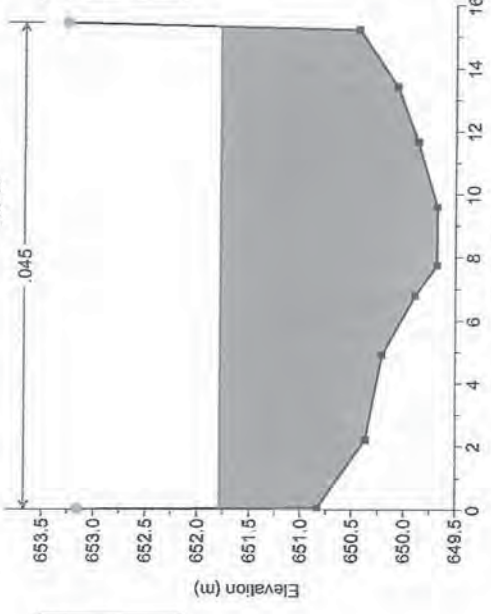
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

XS 14

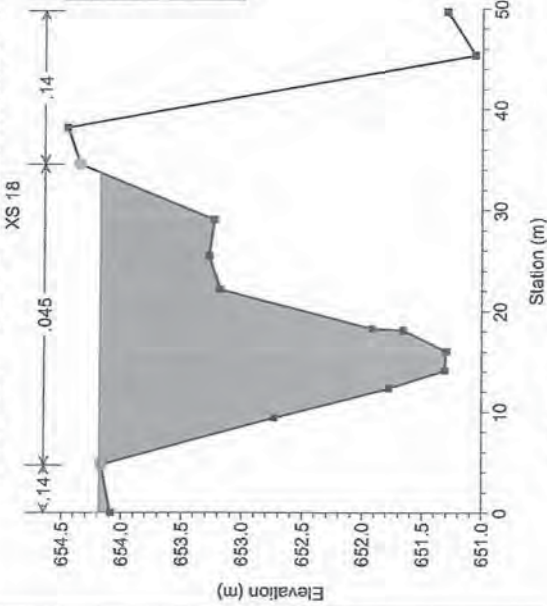


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

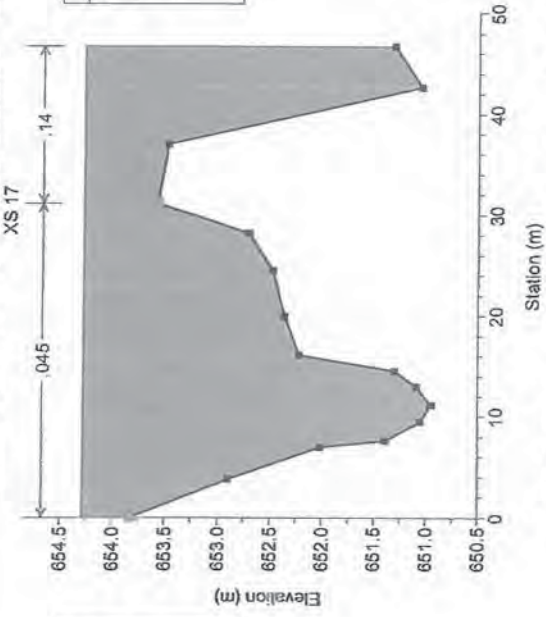
XS 13



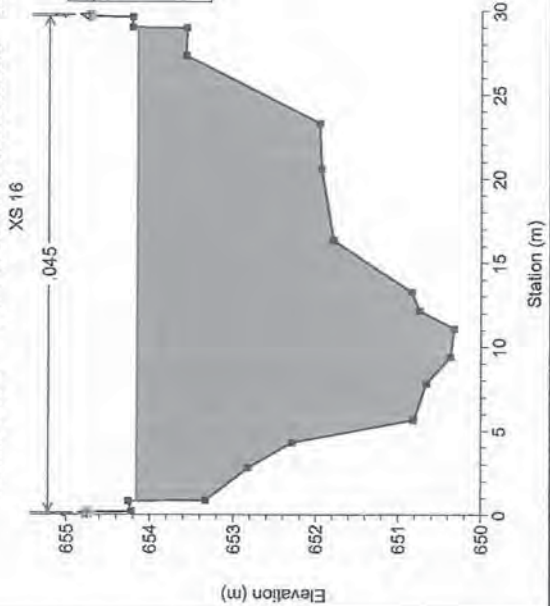
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



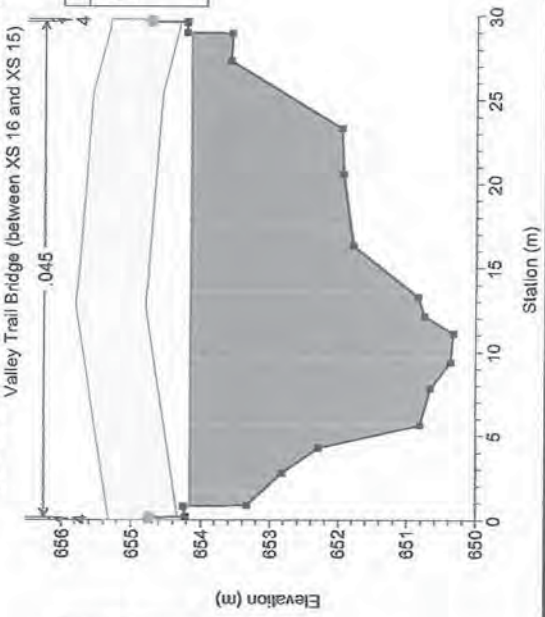
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



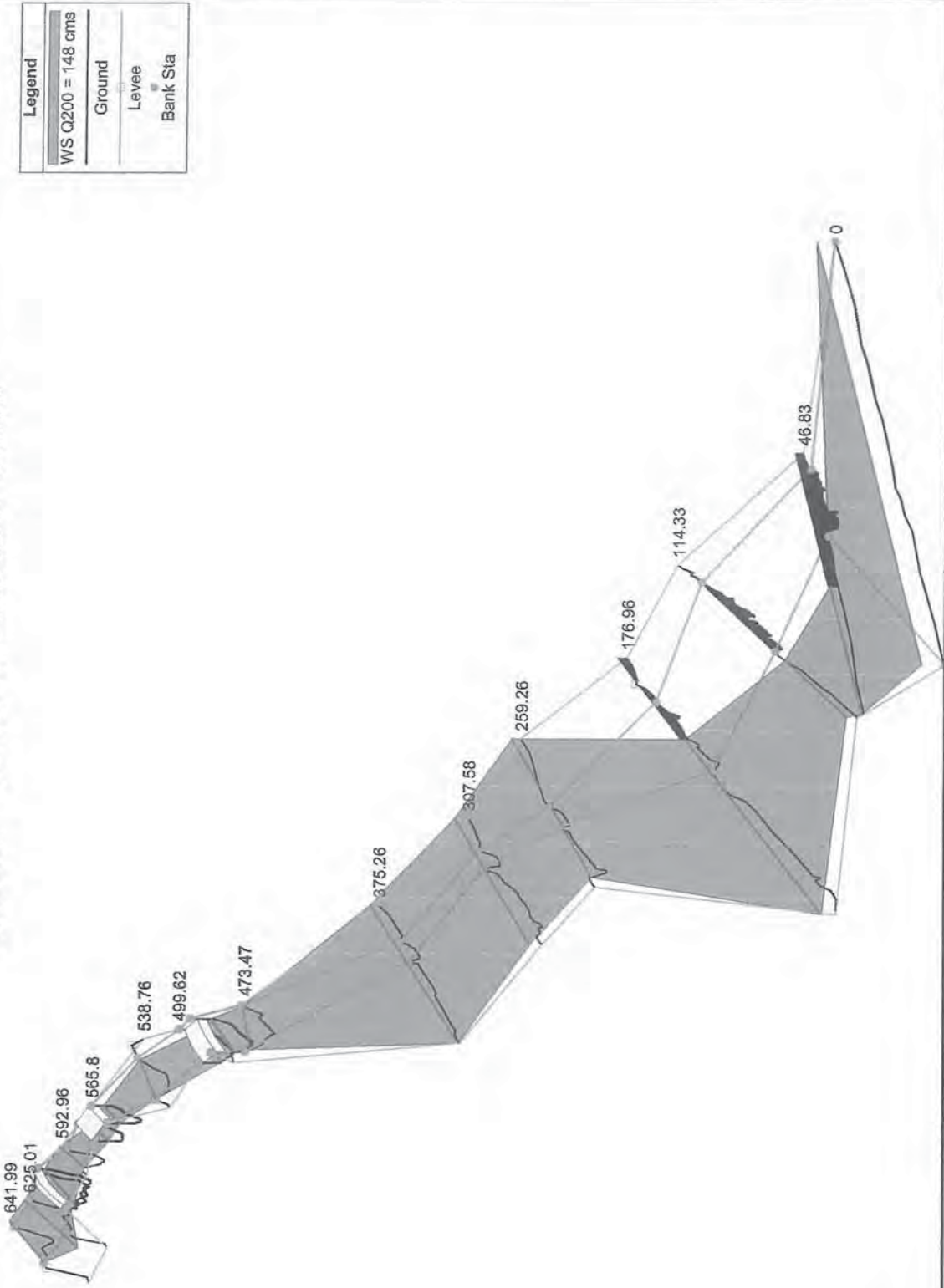
19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016

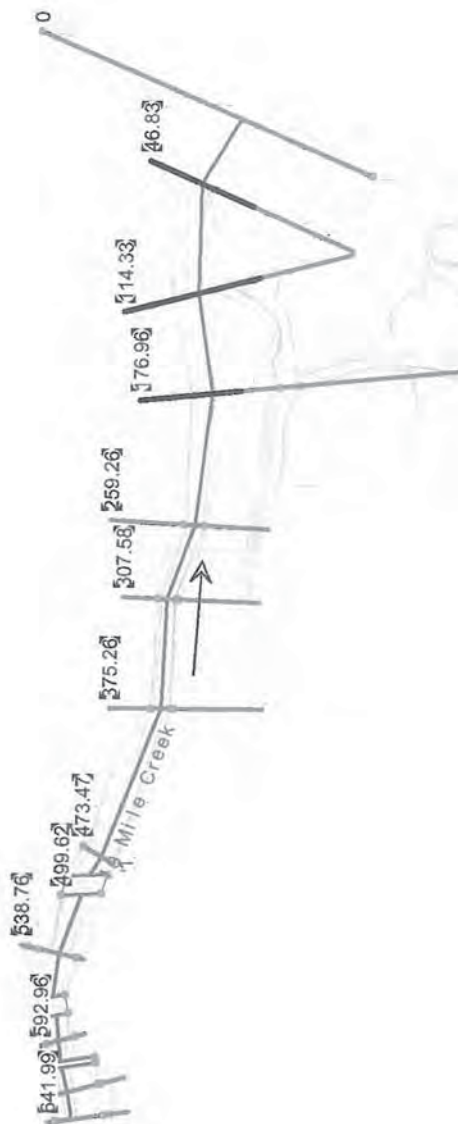


19 Mile Creek Plan: 19 Mile Creek Scenario 2 6/27/2016



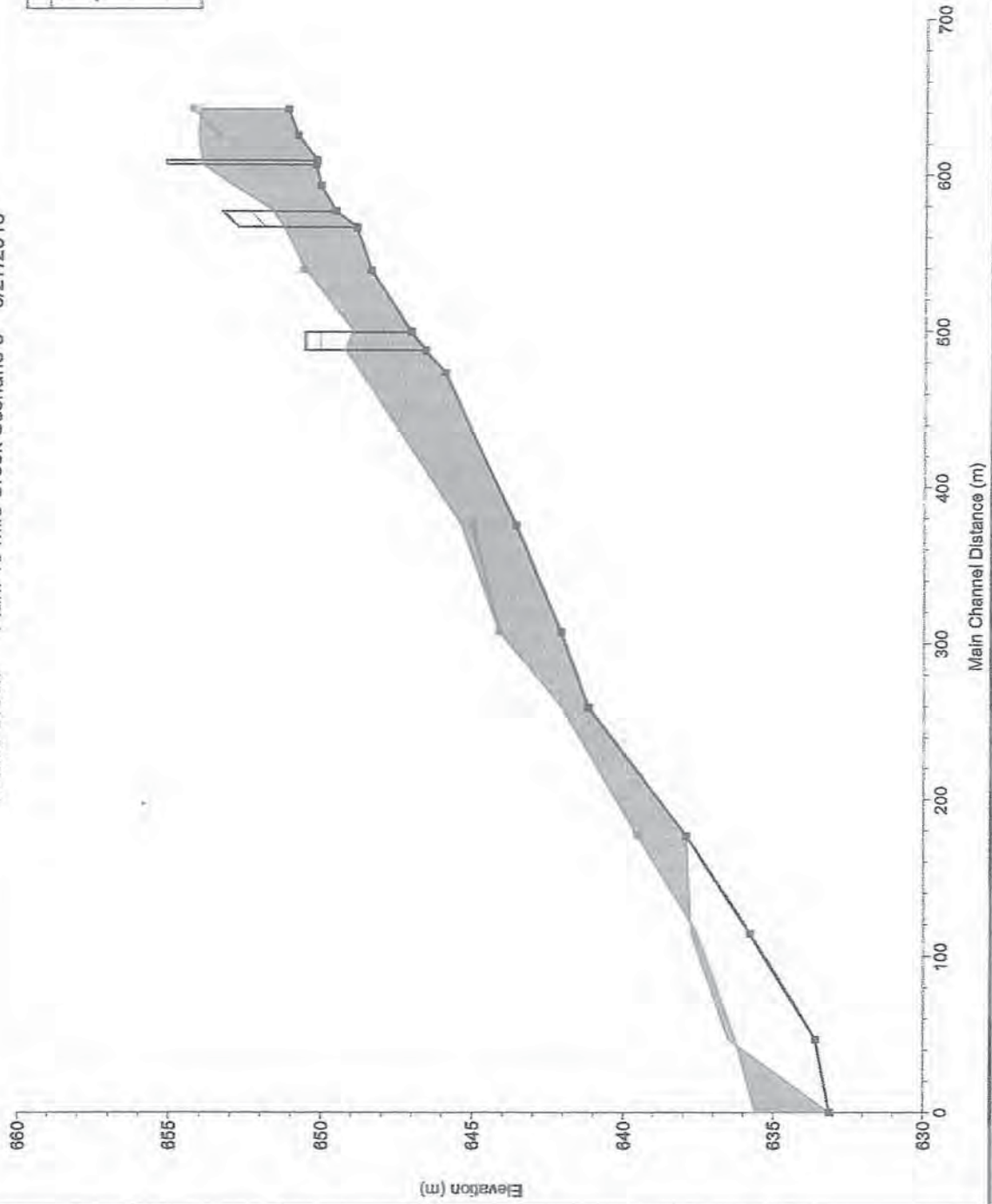
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

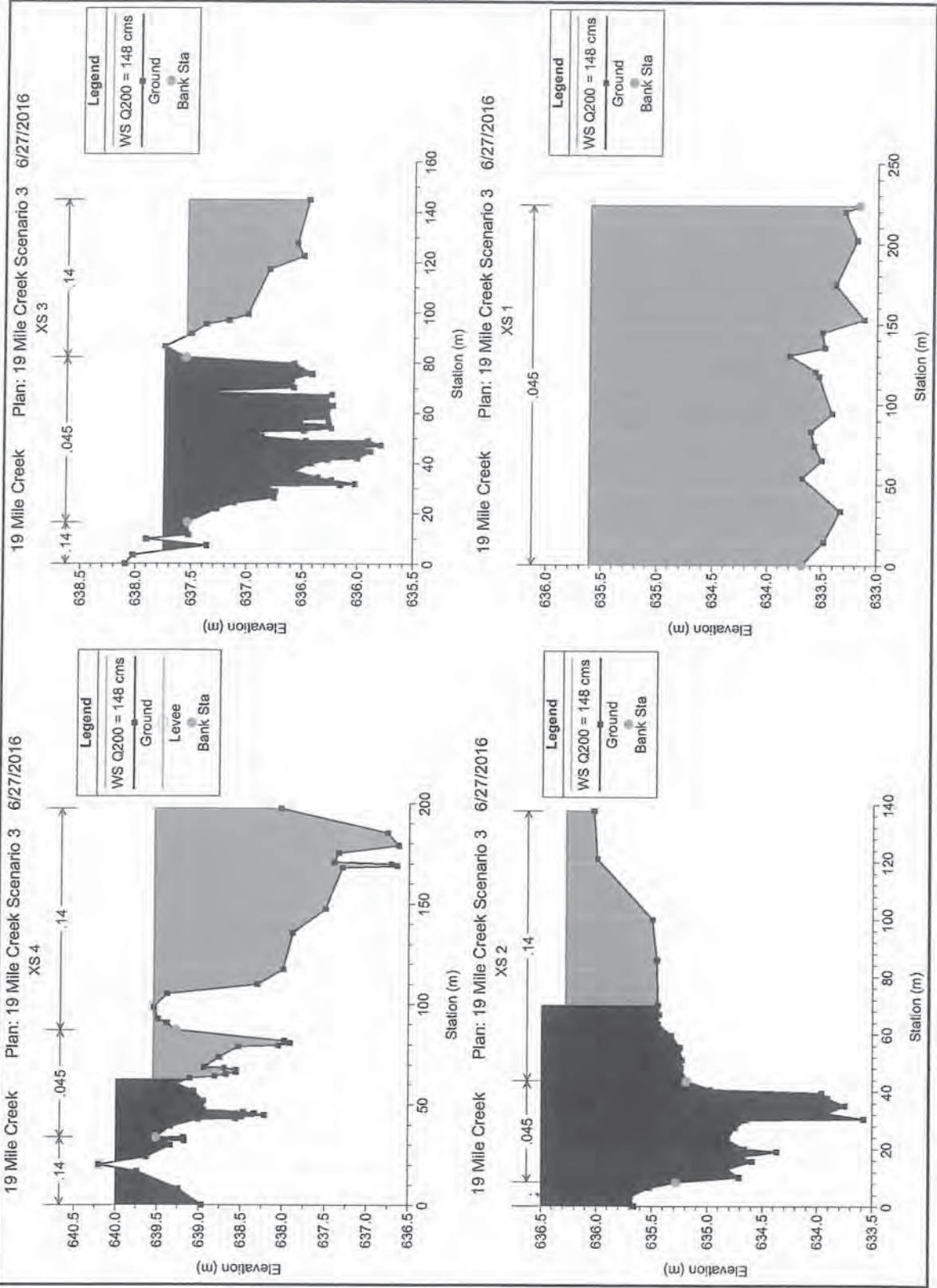




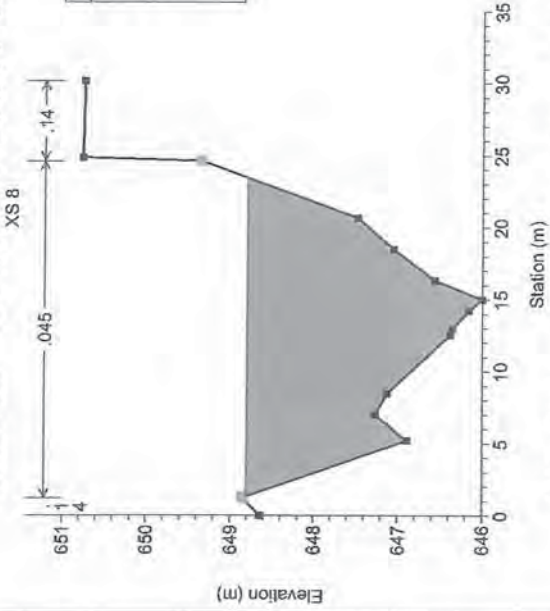
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

Legend	
WS Q200 = 148 cms	
Ground	
Left Levee	
Right Levee	

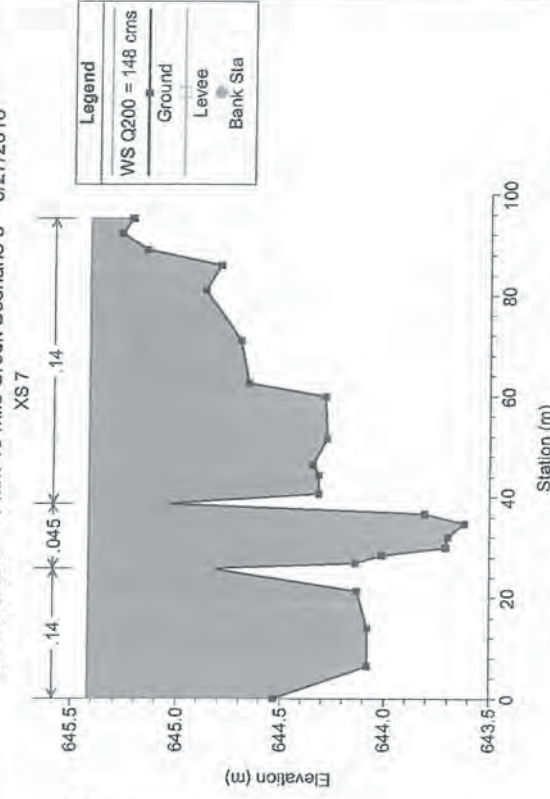




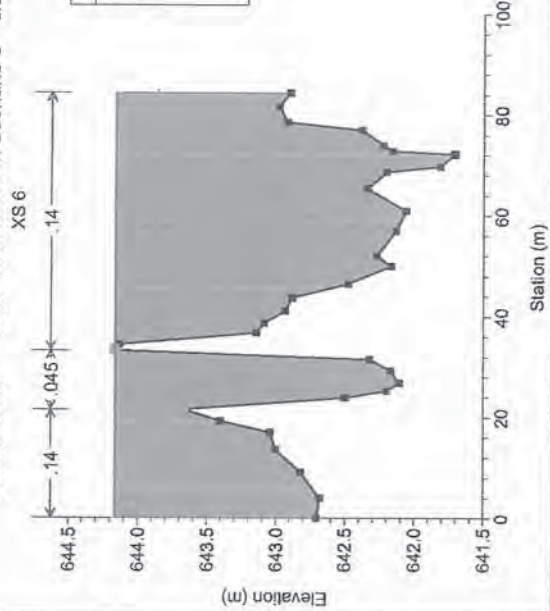
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



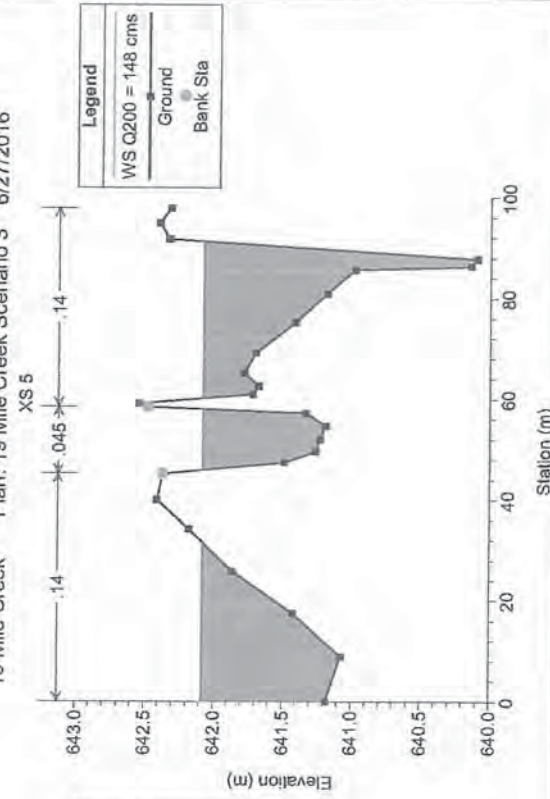
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



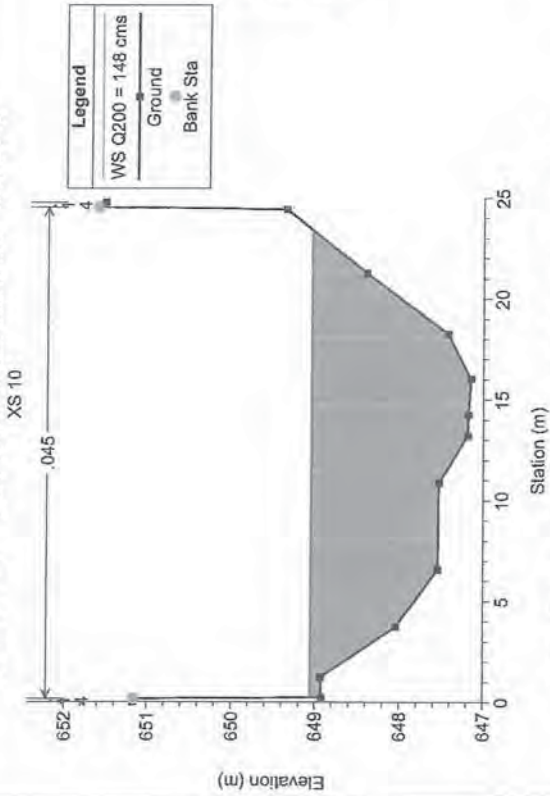
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



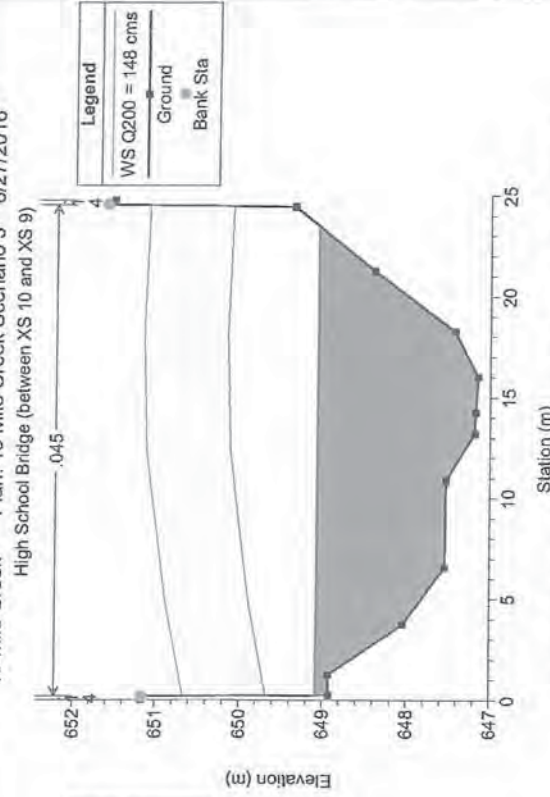
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



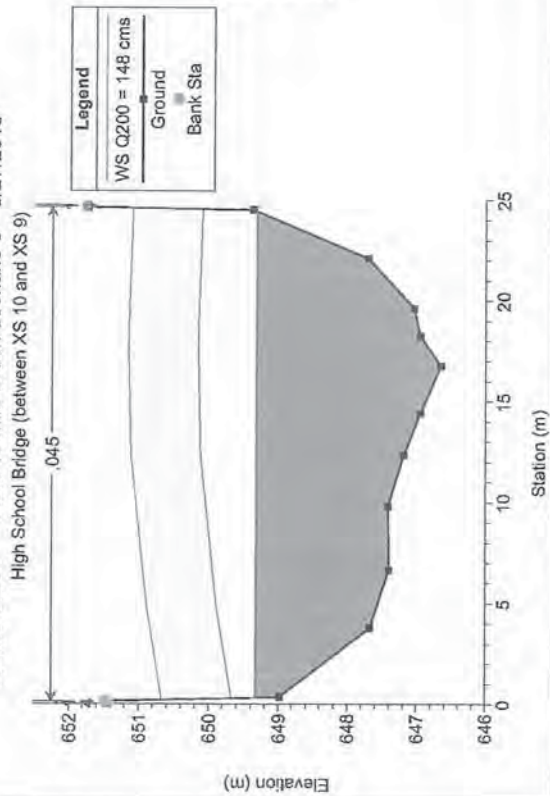
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



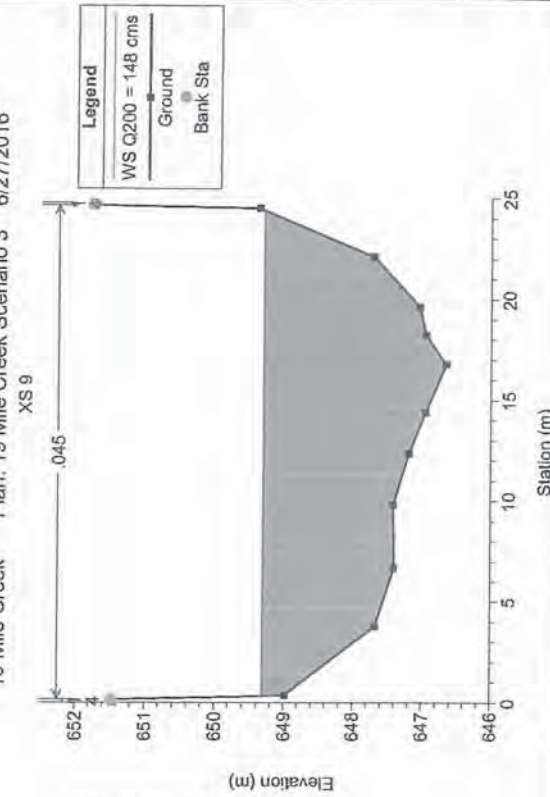
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

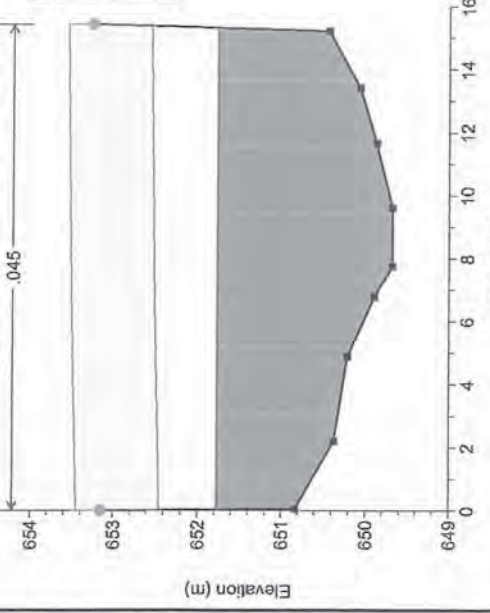


19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



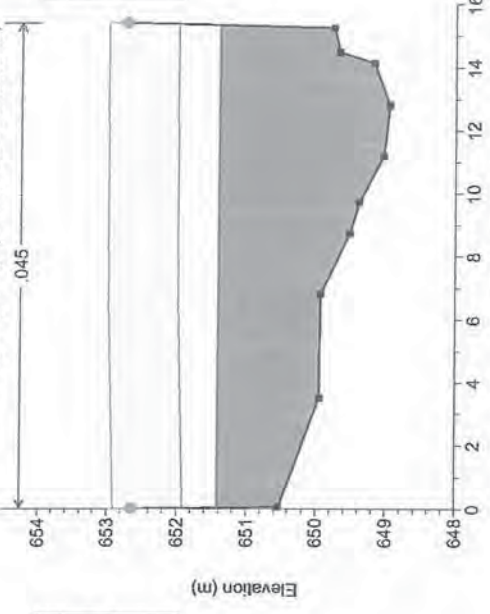
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

Highway Bridge (between XS 13 and XS 12)



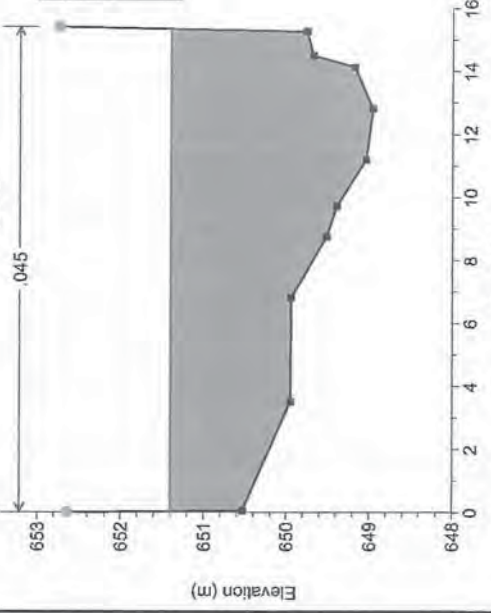
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

Highway Bridge (between XS 13 and XS 12)



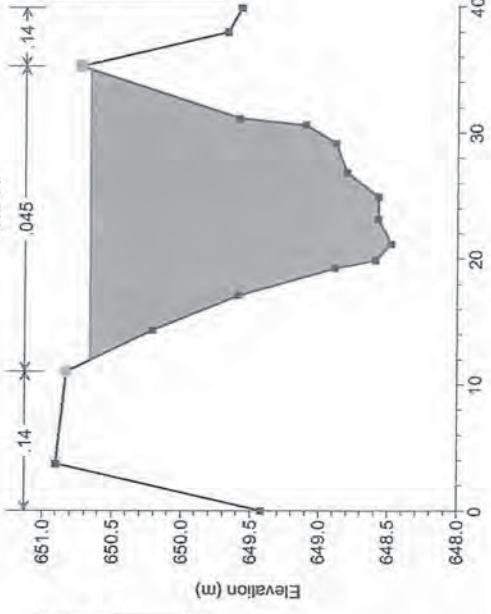
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

XS 12



19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

XS 11



19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

Valley Trail Bridge (between XS 16 and XS 15)



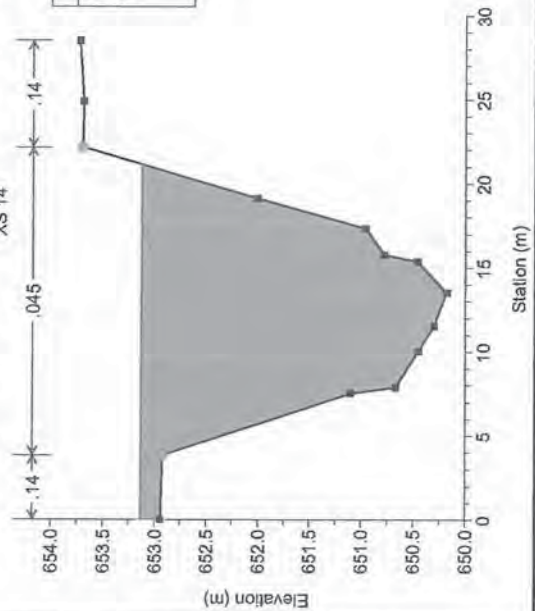
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

XS 15



19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

XS 14

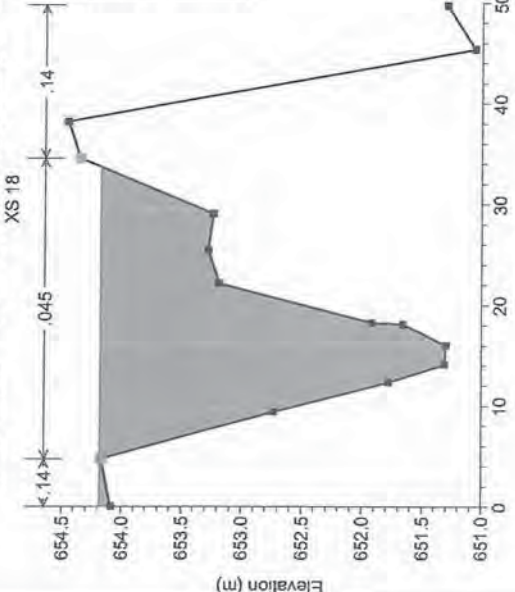


19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016

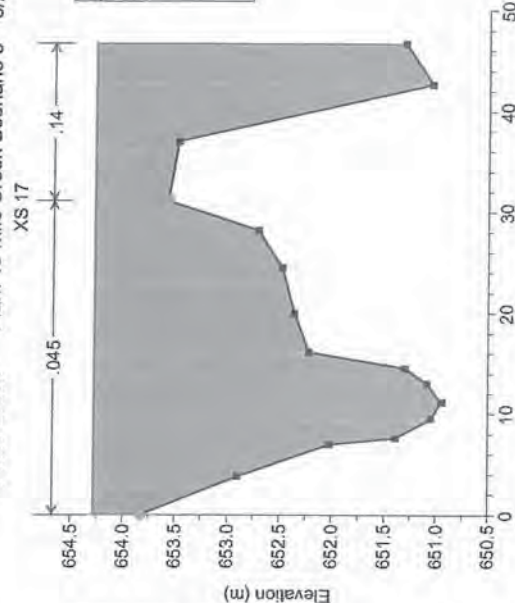
XS 13



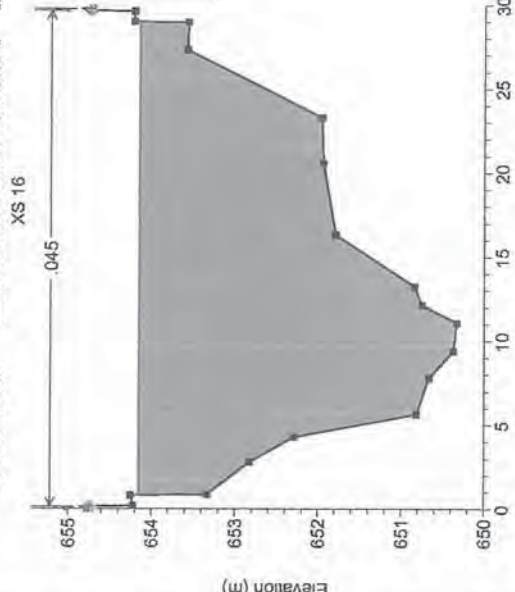
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



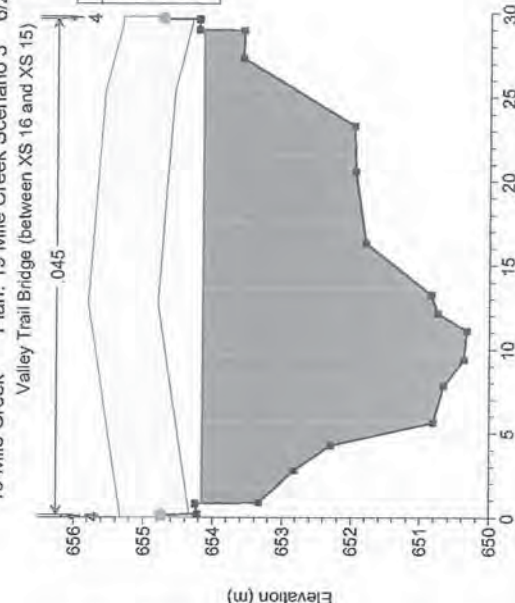
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



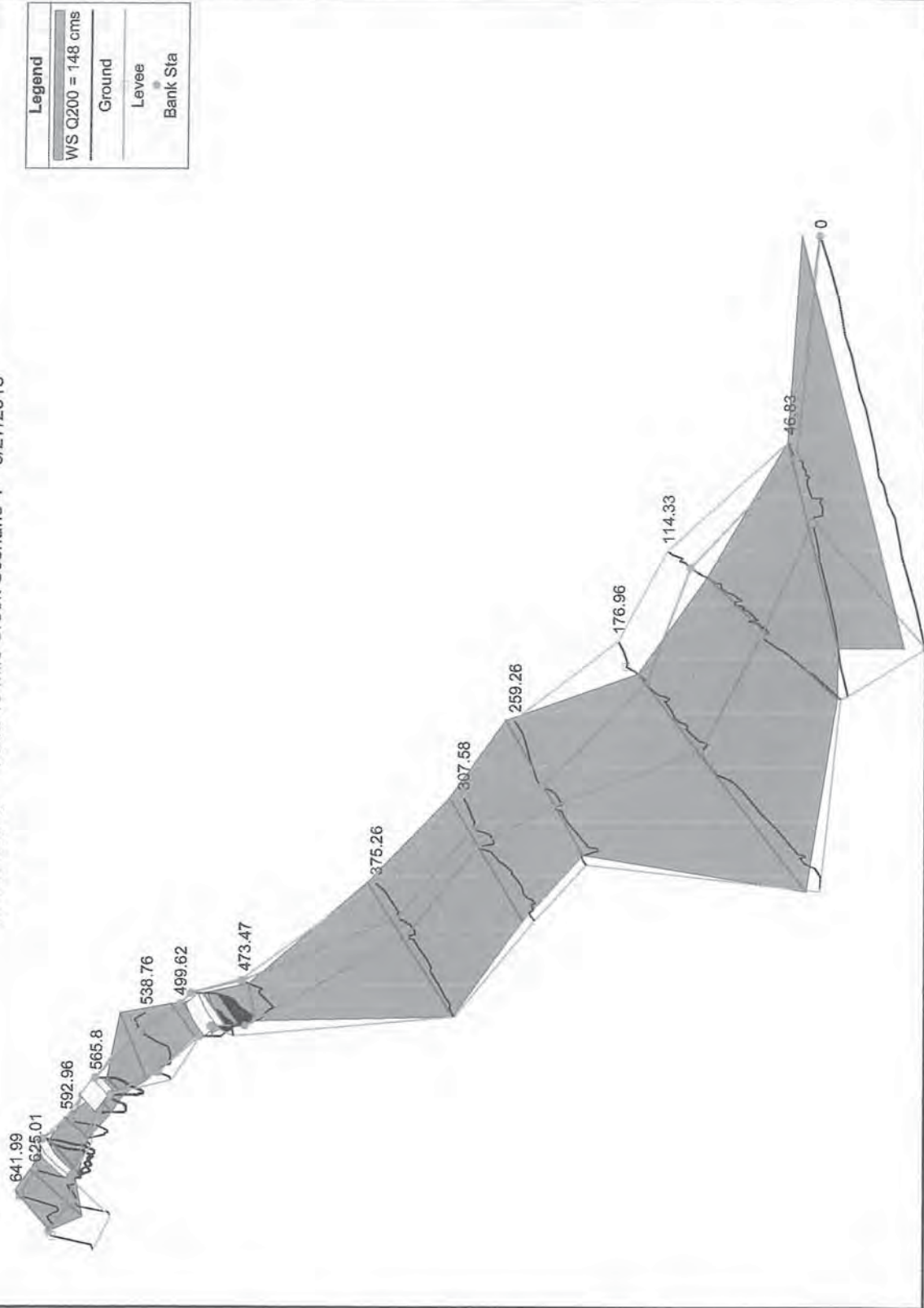
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



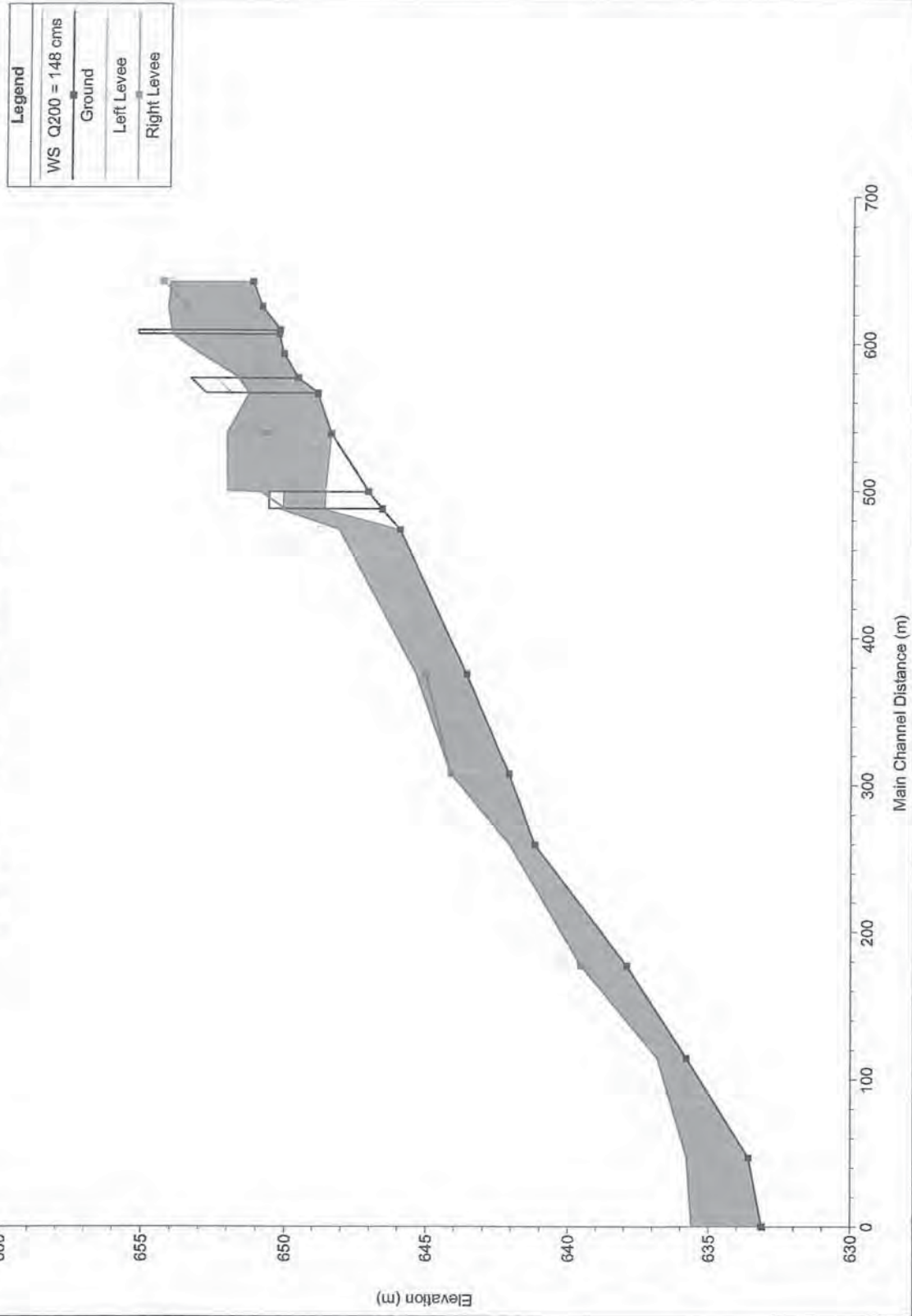
19 Mile Creek Plan: 19 Mile Creek Scenario 3 6/27/2016



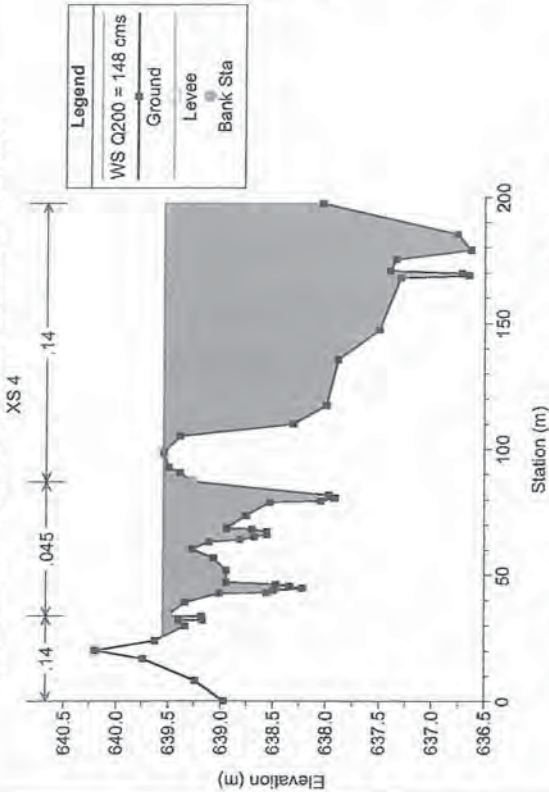
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



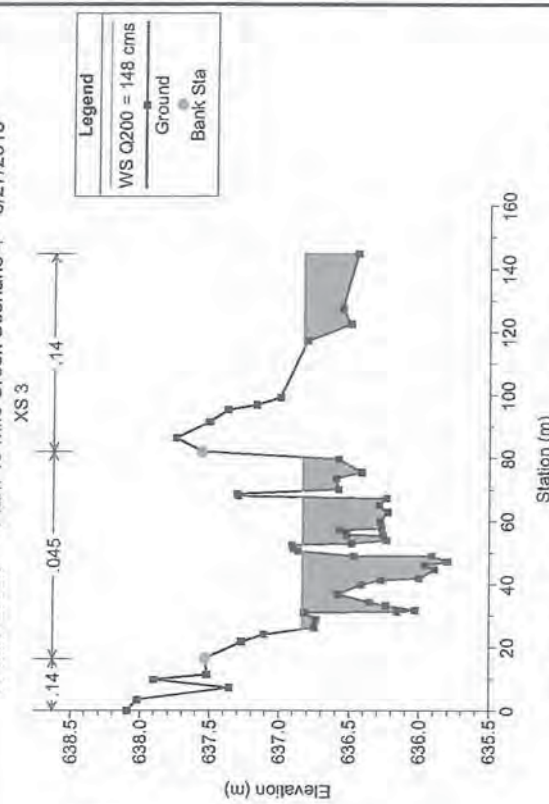
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



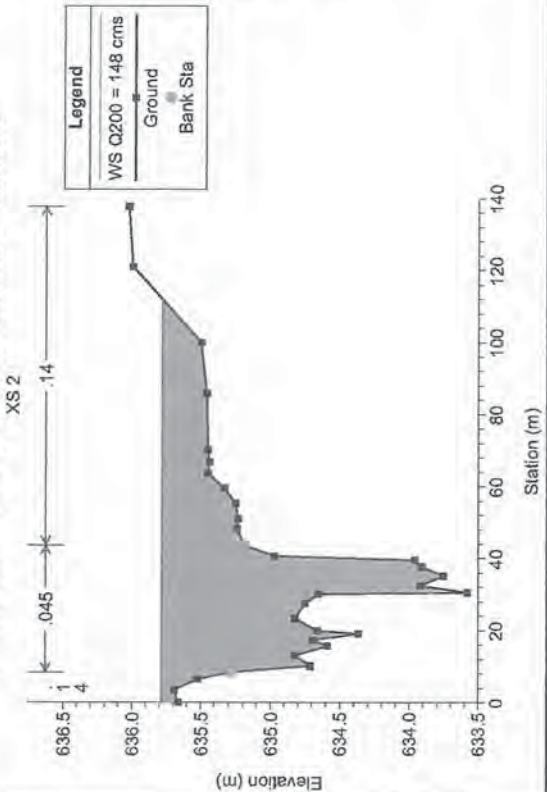
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



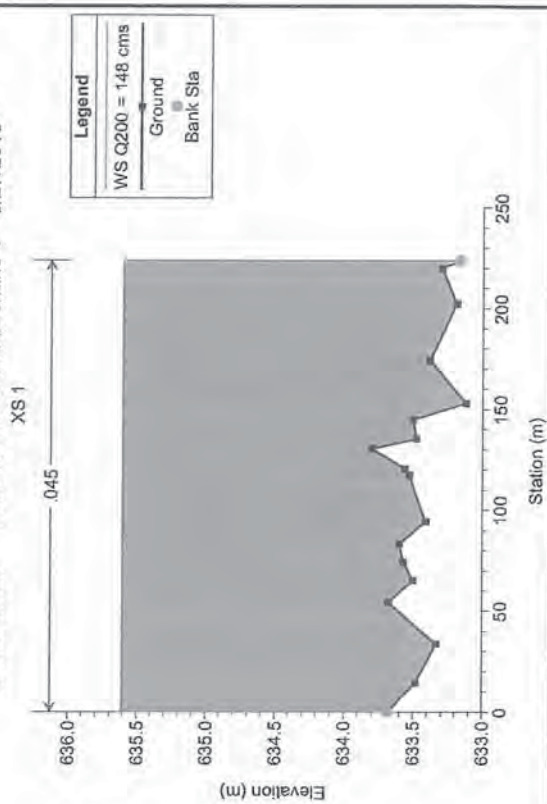
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



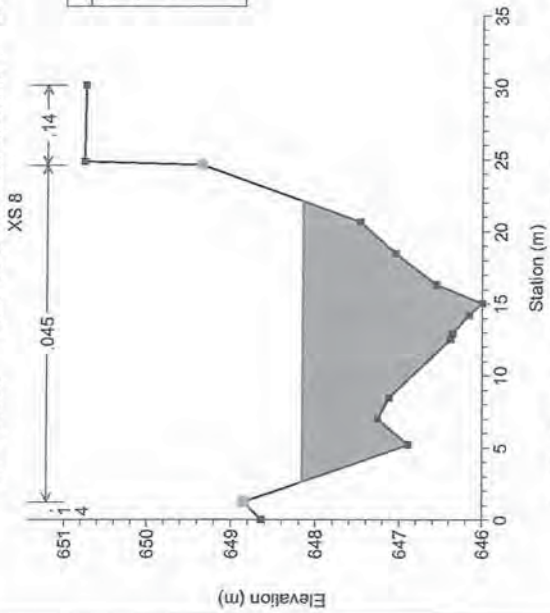
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



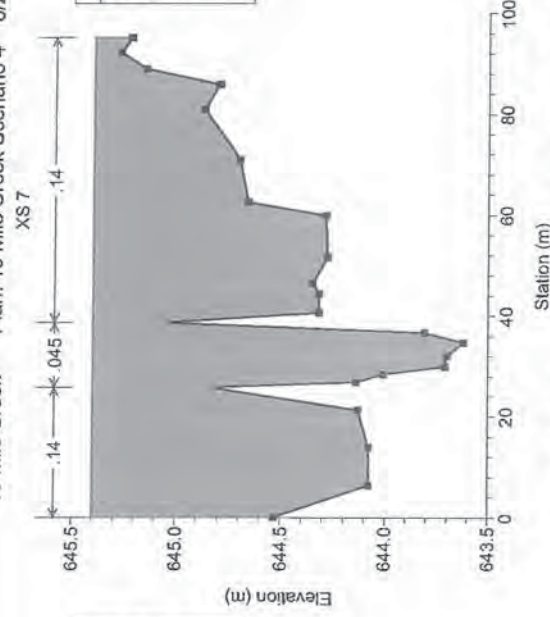
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



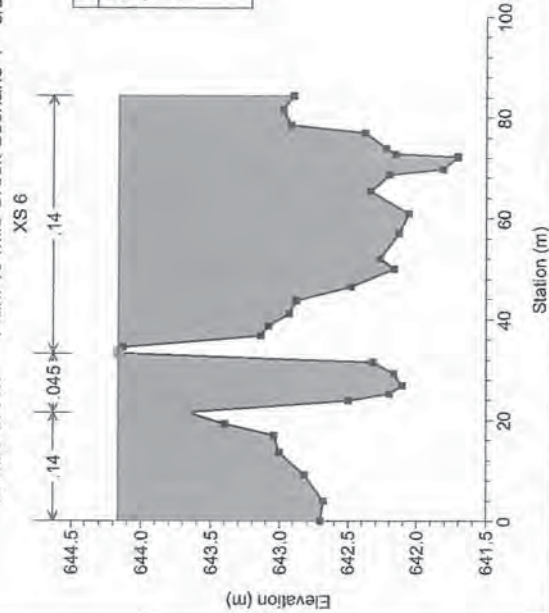
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



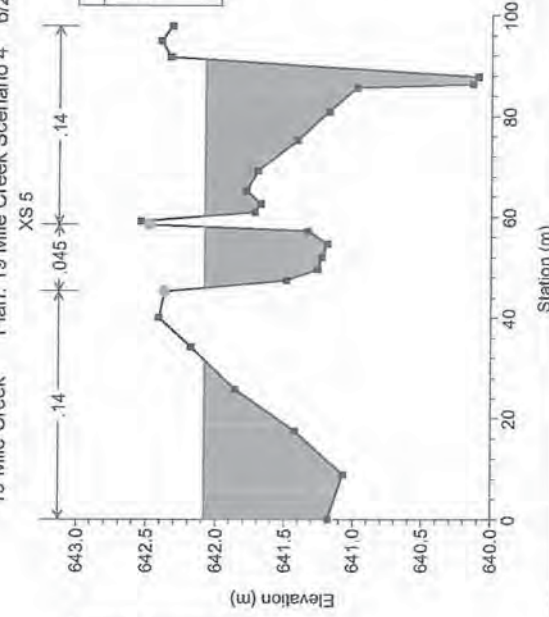
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

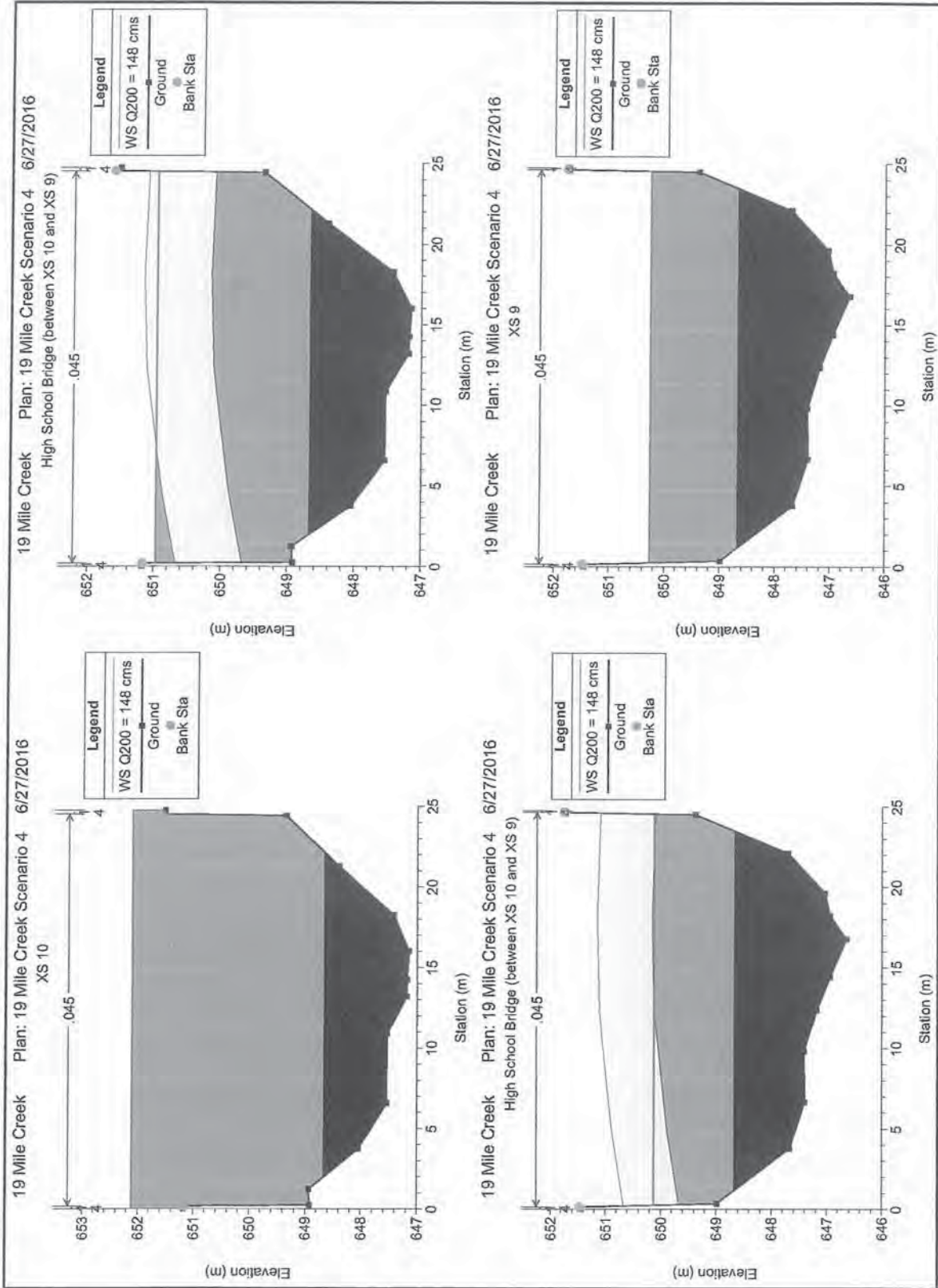


19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



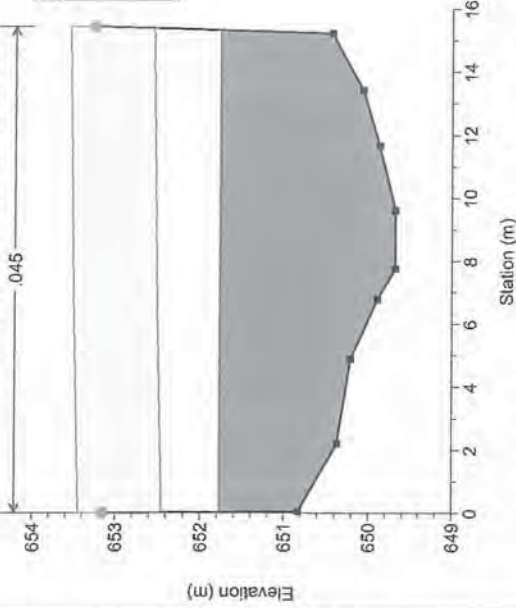
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016





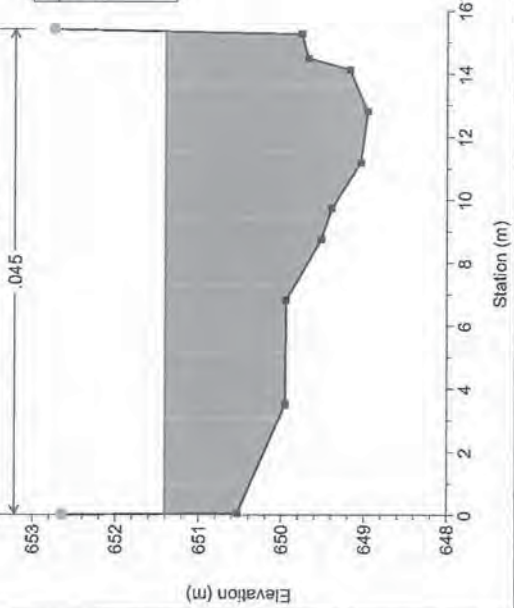
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

Highway Bridge (between XS 13 and XS 12)



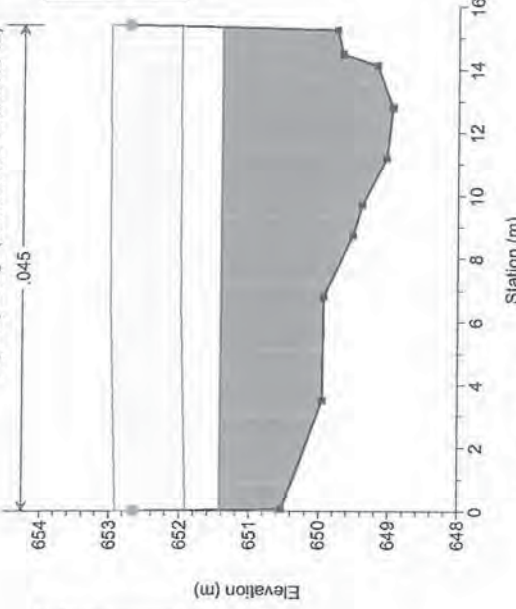
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

XS 12



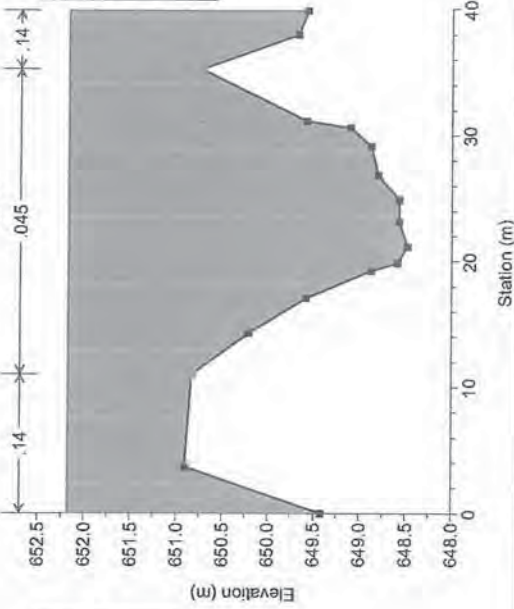
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

Highway Bridge (between XS 13 and XS 12)



19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

XS 11



19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

Valley Trail Bridge (between XS 16 and XS 15)



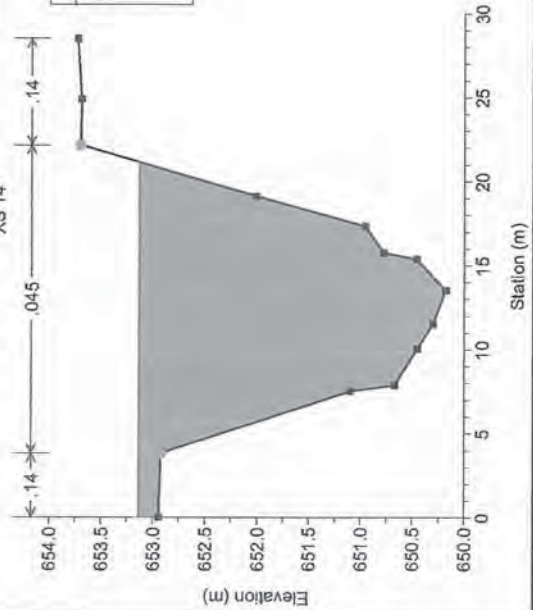
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

XS 15



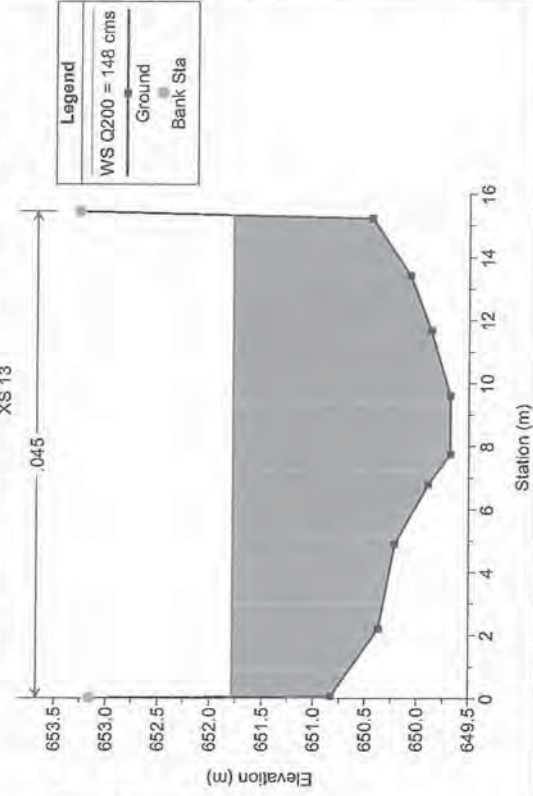
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

XS 14

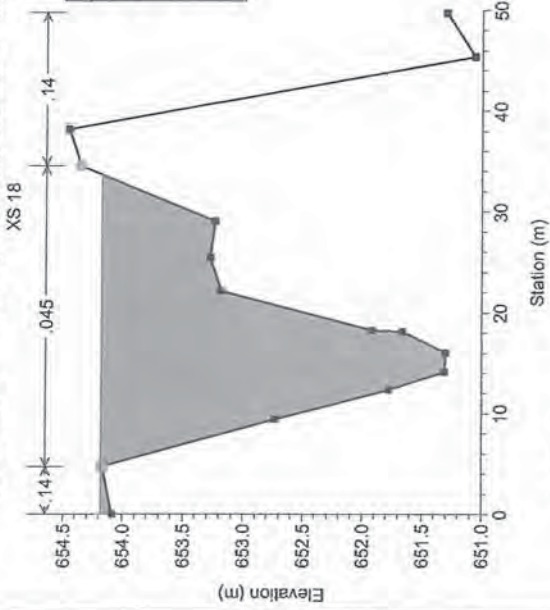


19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

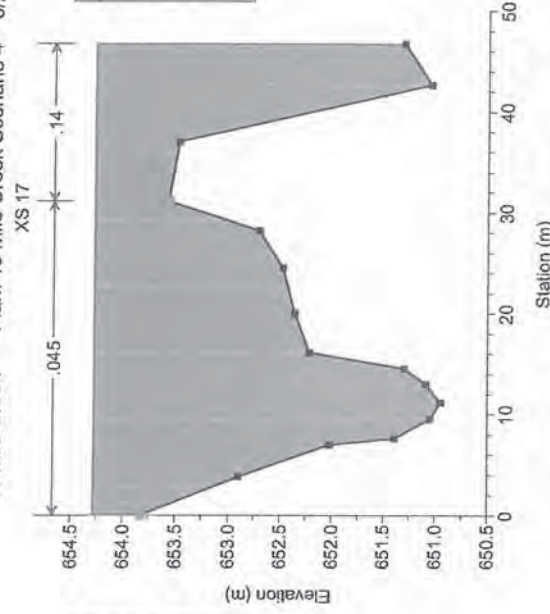
XS 13



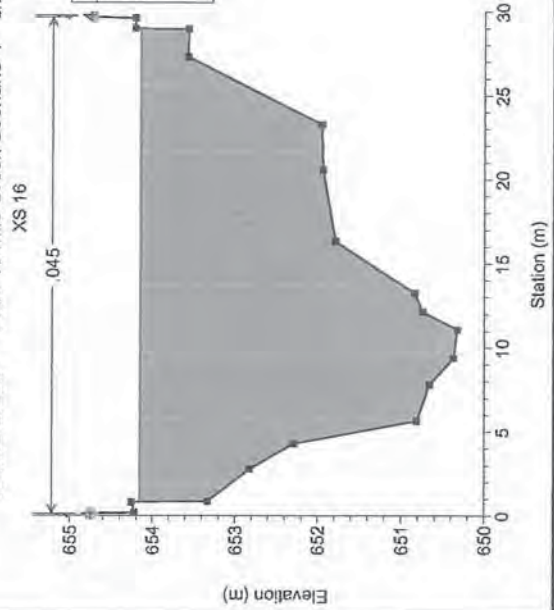
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016



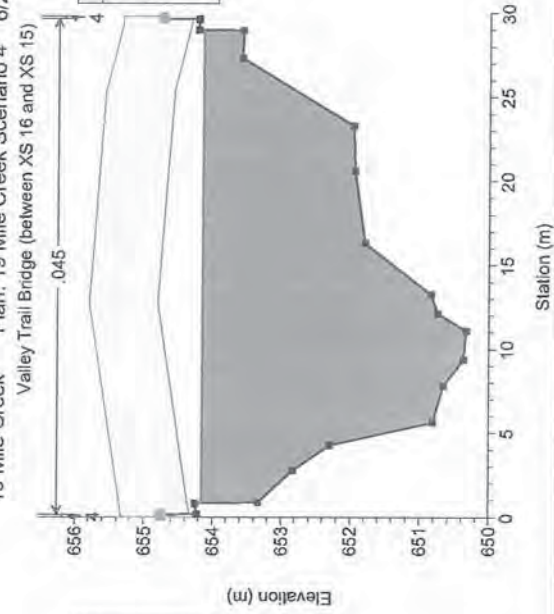
19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

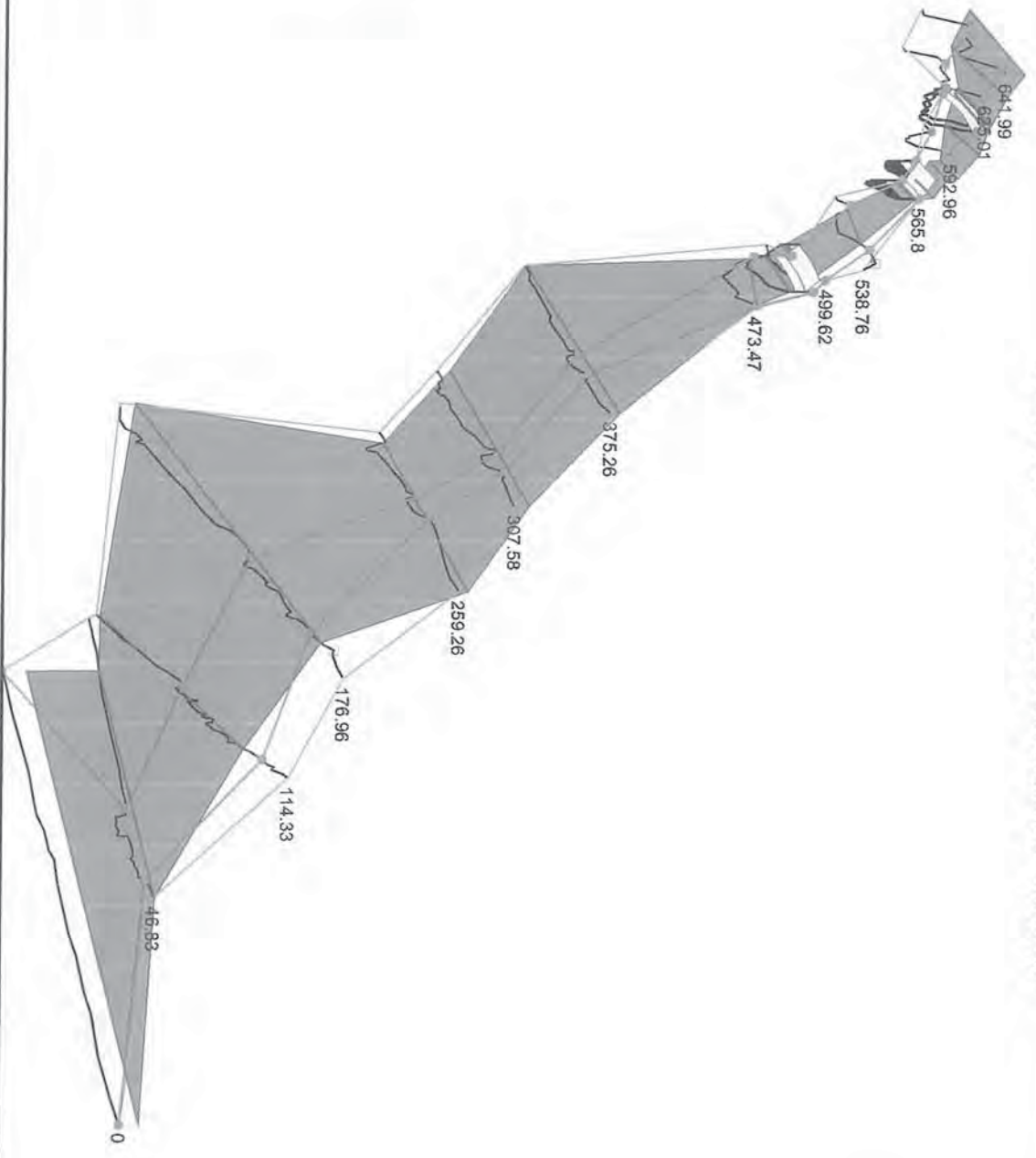


19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

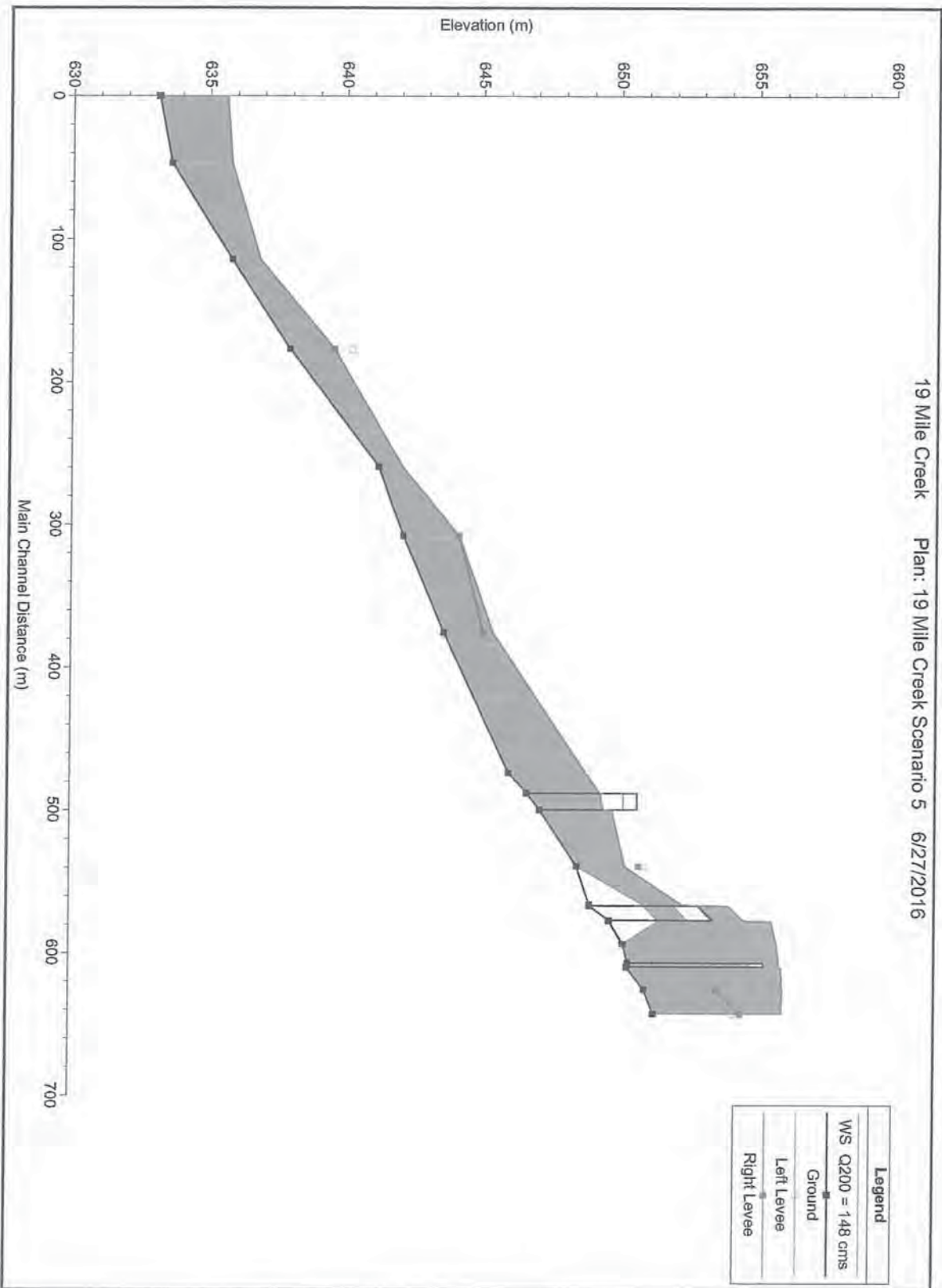


19 Mile Creek Plan: 19 Mile Creek Scenario 4 6/27/2016

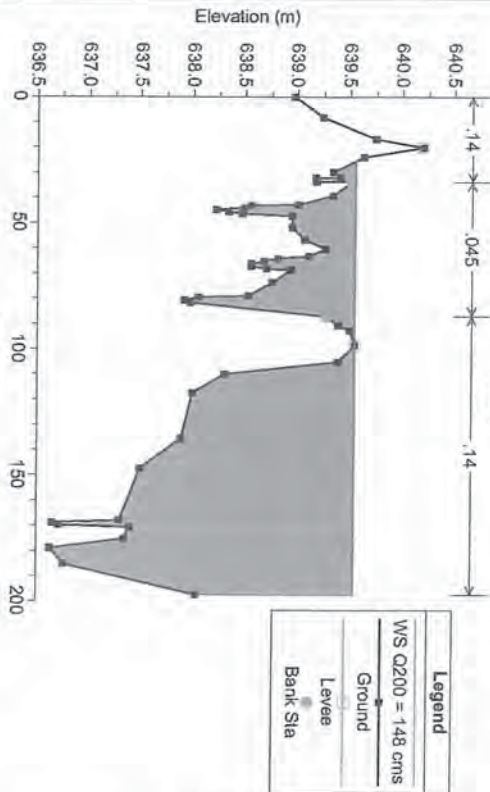




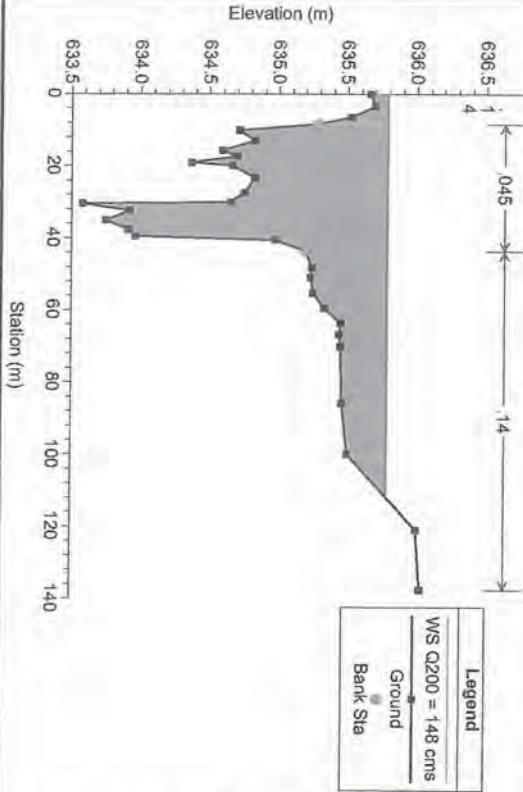
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016



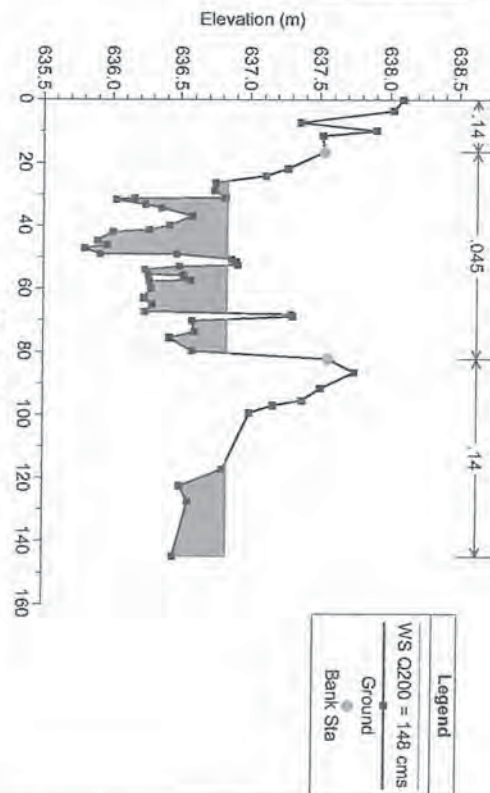
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 4



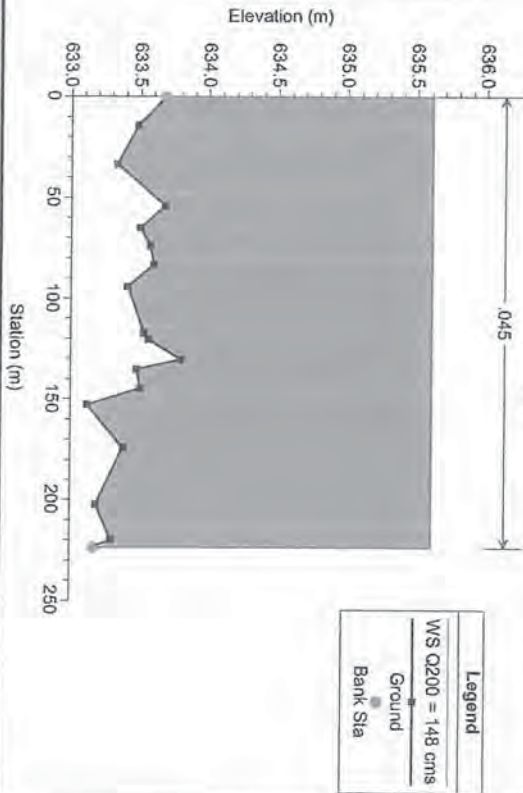
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 2



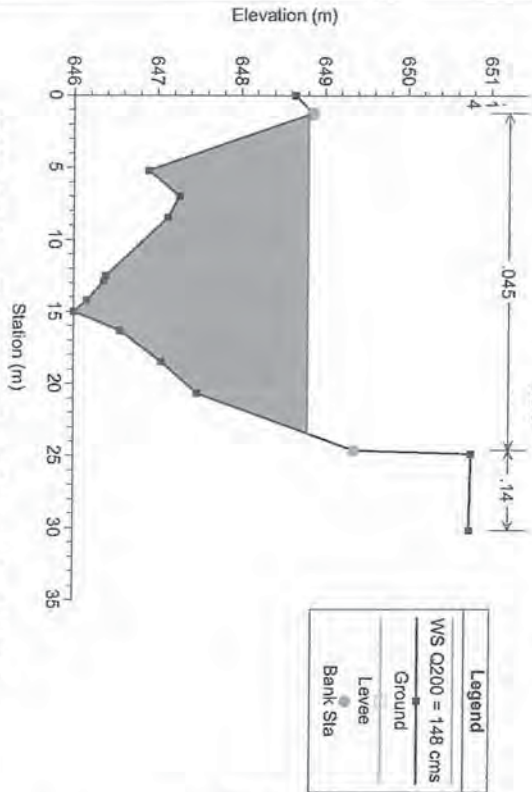
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 3



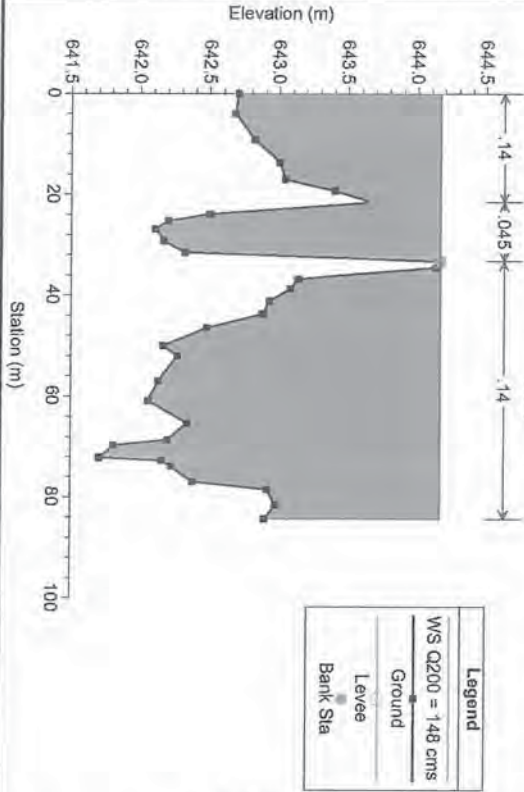
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 1



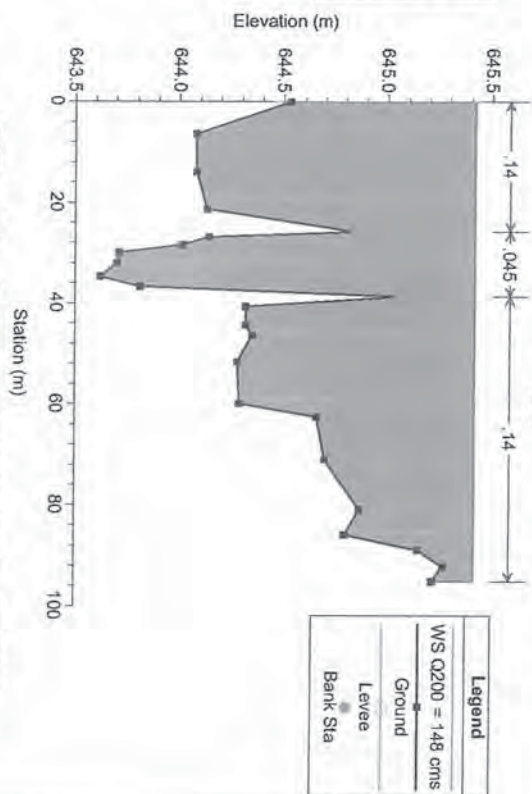
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 8



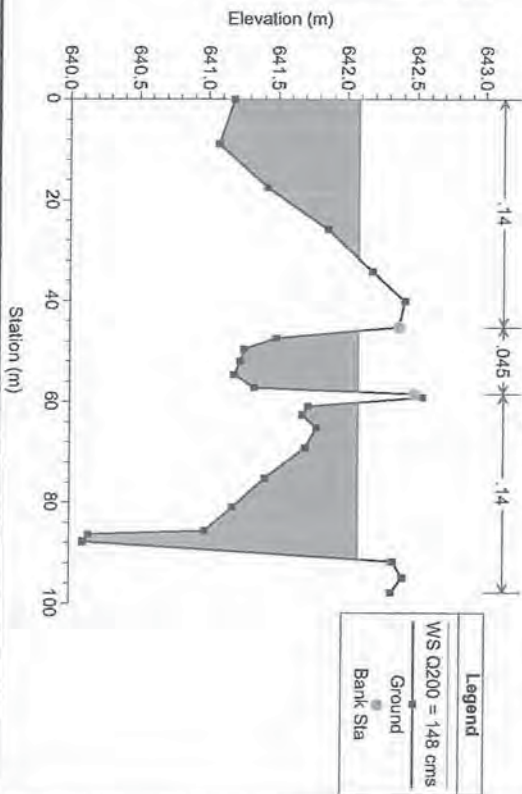
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 6



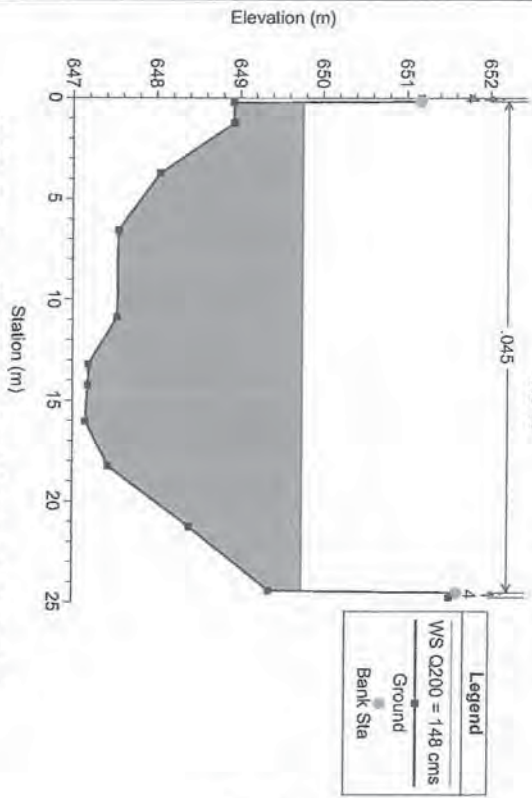
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 7



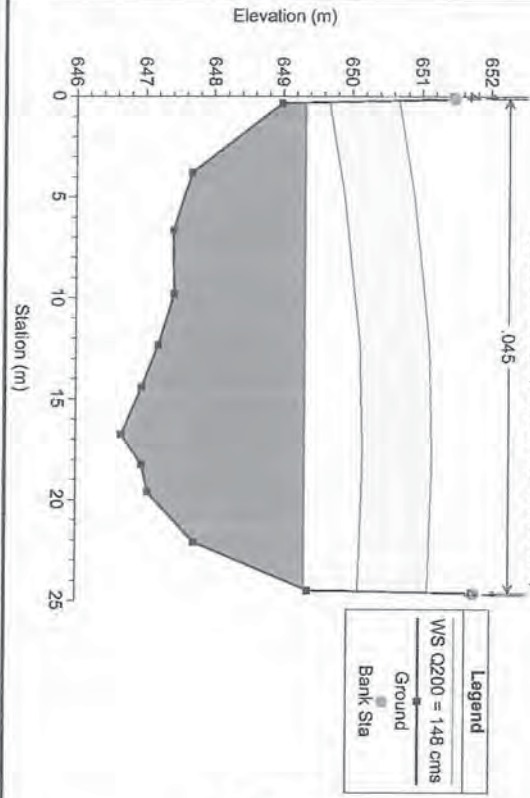
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 5



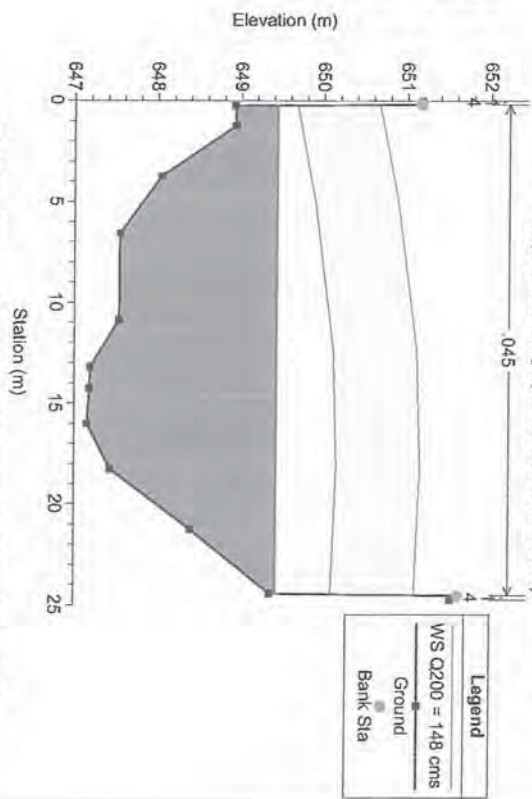
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 10



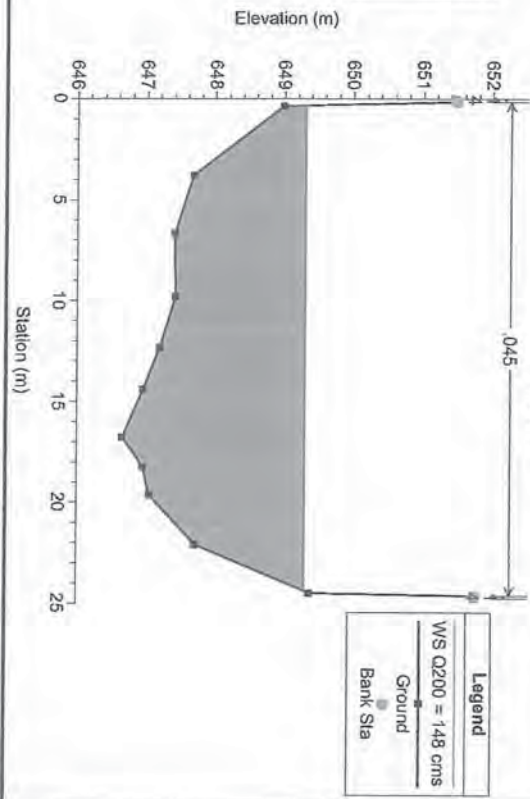
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
High School Bridge (between XS 10 and XS 9)



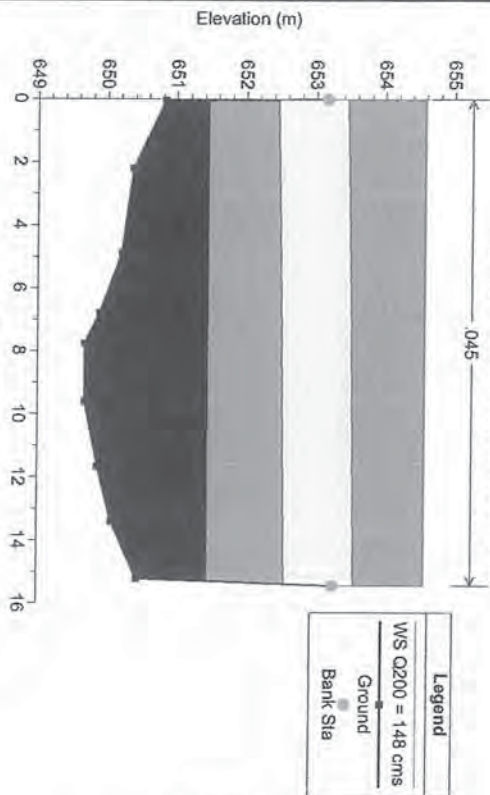
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
High School Bridge (between XS 10 and XS 9)



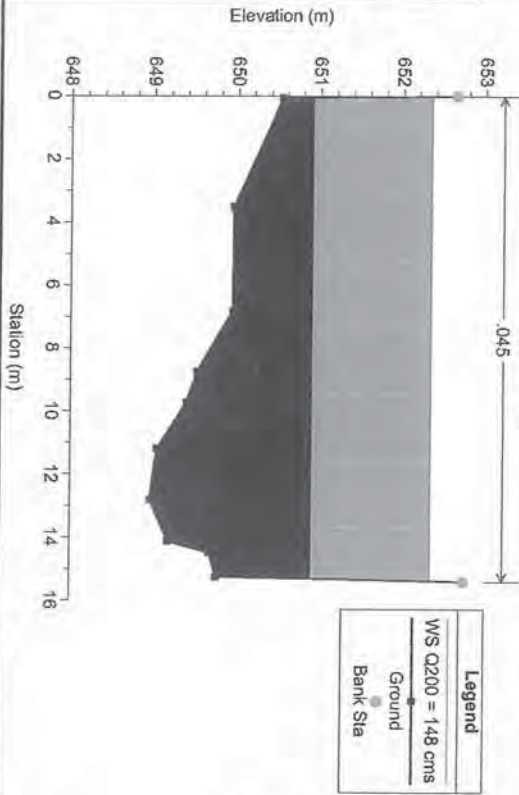
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 9



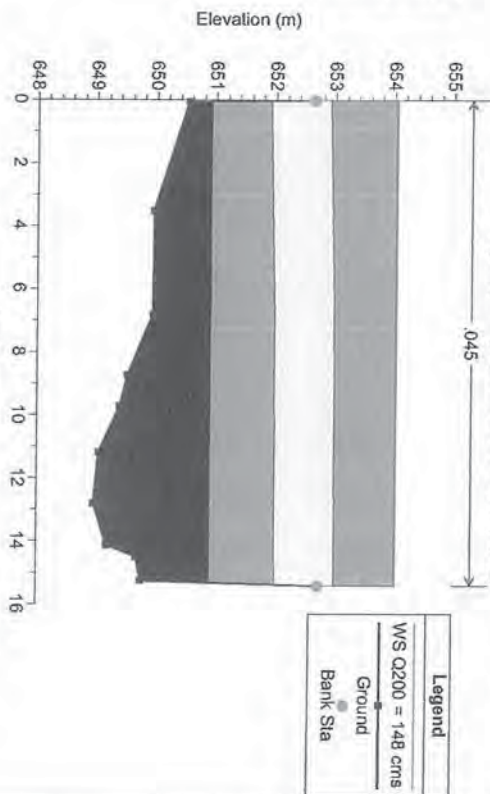
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Highway Bridge (between XS 13 and XS 12)



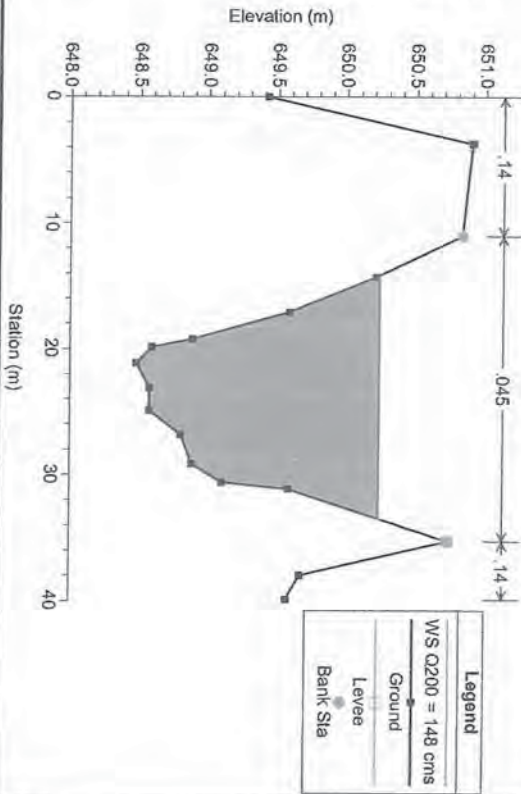
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 12



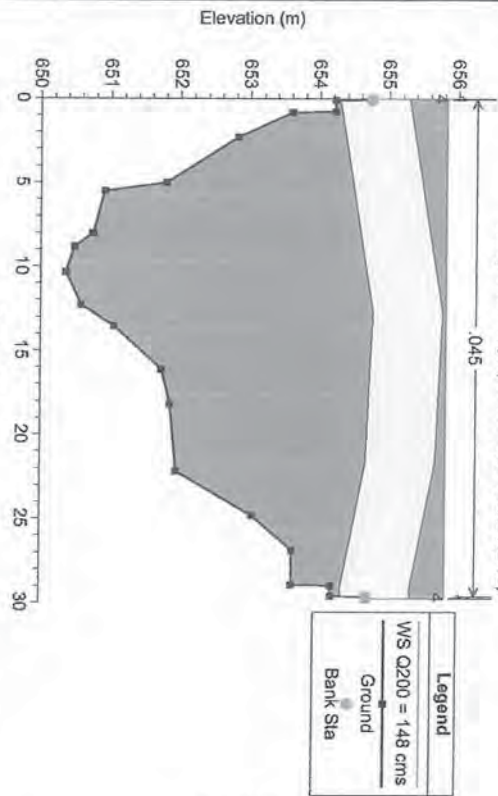
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Highway Bridge (between XS 13 and XS 12)



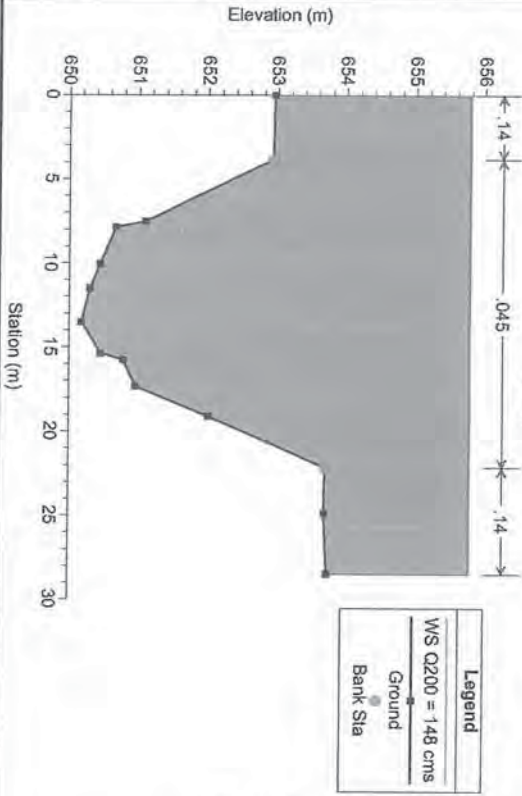
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 11



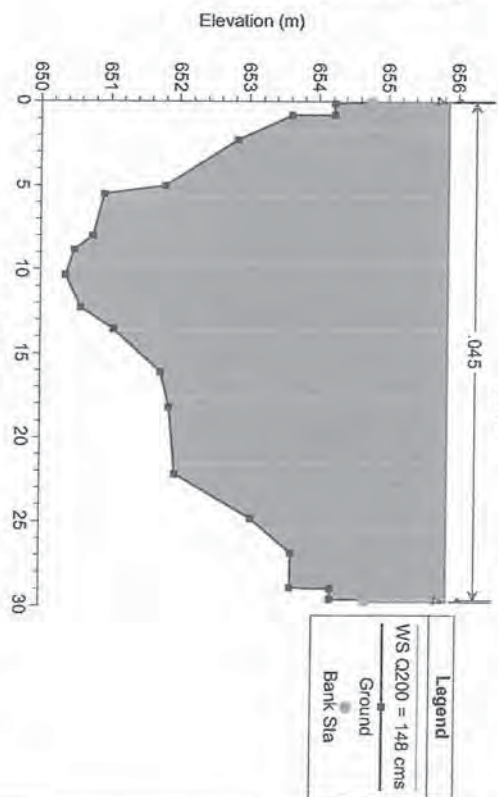
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



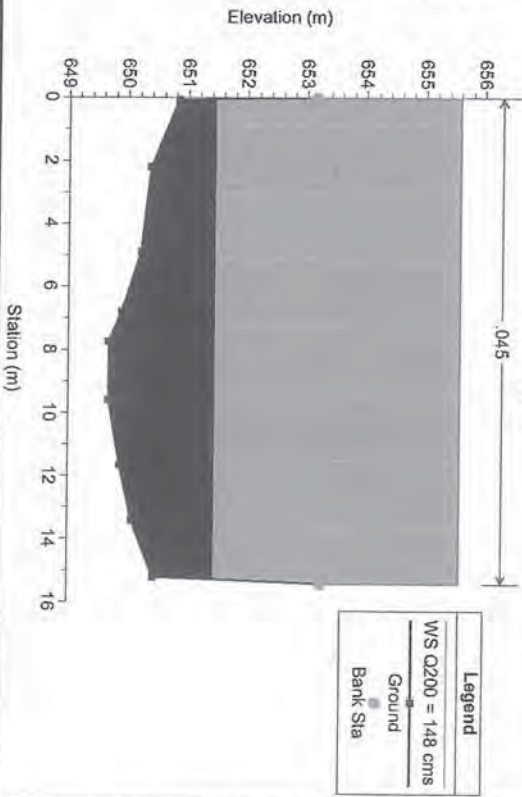
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 14



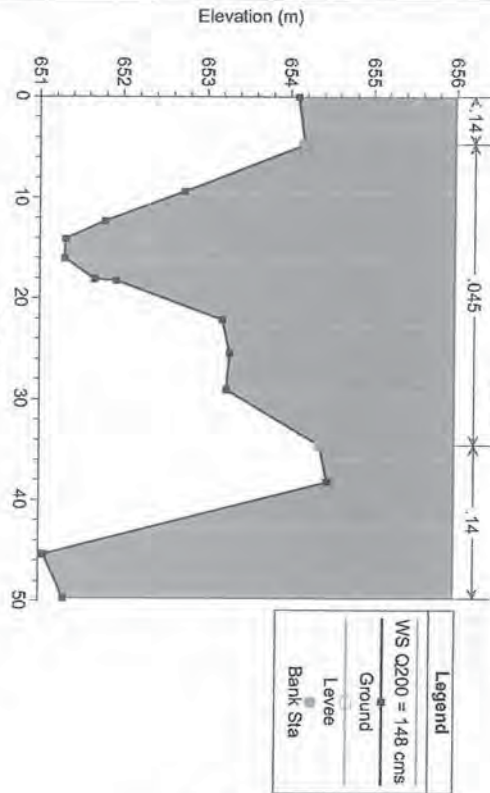
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 15



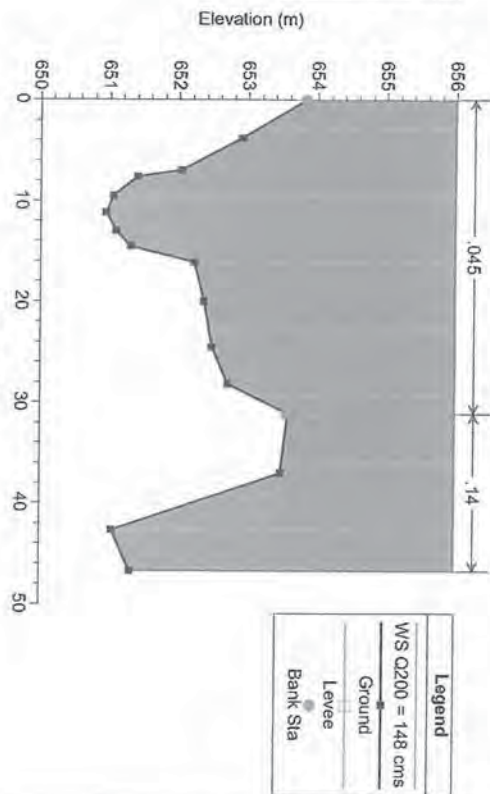
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 13



19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 18



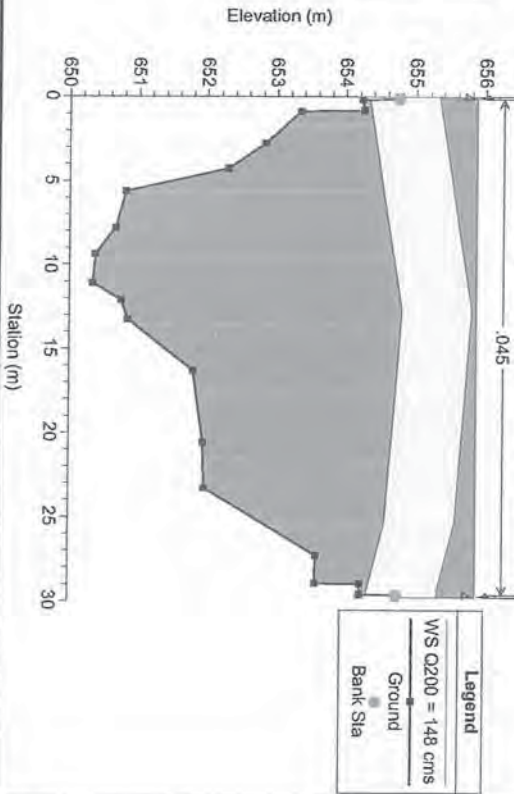
19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 17



19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
XS 16



19 Mile Creek Plan: 19 Mile Creek Scenario 5 6/27/2016
Valley Trail Bridge (between XS 16 and XS 15)



B5 - HEC-RAS 1-D MODEL SUMMARY TABLES

HEC-RAS Plan: 19 Mile #1 River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Ch
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	636.23	0.014719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.66	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.84	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.88	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Dike River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.68	635.76	635.76	636.26	0.016496	3.22	57.08	70.09	0.92
1	114.33	Q200 = 148 cms	148.00	635.90	637.05	637.34	637.99	0.073567	4.30	34.40	55.03	1.74
1	178.98	Q200 = 148 cms	148.00	637.92	639.78	639.78	640.22	0.020166	2.95	55.13	69.69	0.98
1	259.26	Q200 = 148 cms	148.00	641.19	642.43	642.39	642.89	0.043190	4.47	79.79	90.66	1.43
1	307.58	Q200 = 148 cms	148.00	642.11	643.88	643.56	644.14	0.017445	3.43	99.93	76.46	0.93
1	375.26	Q200 = 148 cms	148.00	643.62	645.02	645.40	646.26	0.076470	6.30	56.69	87.52	1.93
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36	Bridge										
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.66	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40	Bridge										
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68	Bridge										
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Avulsion River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m ³ /s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m ²)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000089	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	636.50	636.28	636.60	636.99	0.564036		39.74	67.61	0.00
1	114.33	Q200 = 148 cms	148.00	637.75	637.55	637.87	638.20	0.363042		41.59	54.17	0.00
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.59	0.004360	1.35	204.08	134.82	0.45
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.018003	4.04	36.61	22.09	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30	649.05	649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.05	649.42	650.38	0.040858	5.12	28.93	23.18	1.46
1	538.76	Q200 = 148 cms	148.00	648.48	650.66	650.96	651.83	0.032886	4.80	30.83	23.06	1.33
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile HSB River: 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	46.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	636.23	0.0147719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.40	645.42	645.86	0.021643	4.08	91.44	95.04	1.08
1	473.47	Q200 = 148 cms	148.00	646.00	648.16	648.80	650.20	0.067341	6.34	23.35	19.46	1.85
1	487.09	Q200 = 148 cms	148.00	648.67	650.25	650.25	651.03	0.019516	3.92	37.74	24.31	1.00
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	648.67	652.11	650.27	652.28	0.001608	1.80	82.71	24.73	0.31
1	538.76	Q200 = 148 cms	148.00	648.48	652.16	650.96	652.36	0.002249	2.04	94.30	39.86	0.39
1	565.8	Q200 = 148 cms	148.00	648.96	651.40	651.81	653.02	0.039335	5.64	26.26	15.31	1.37
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	649.68	651.78	652.22	653.46	0.040471	5.75	25.72	15.29	1.42
1	592.96	Q200 = 148 cms	148.00	650.18	653.13	653.13	654.08	0.017022	4.33	34.86	21.13	0.98
1	605.89	Q200 = 148 cms	148.00	650.36	654.10		654.38	0.004362	2.37	62.52	28.18	0.51
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	654.15	653.11	654.41	0.003692	2.24	66.04	28.18	0.47
1	625.01	Q200 = 148 cms	148.00	650.95	654.28	653.58	654.48	0.003790	2.11	90.72	46.73	0.48
1	641.99	Q200 = 148 cms	148.00	651.30	654.18	654.18	654.87	0.018495	3.68	40.41	33.66	1.00

HEC-RAS Plan: 19 Mile Hwy Br. River, 19 Mile Creek Reach: 1 Profile: Q200 = 148 cms

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	0	Q200 = 148 cms	148.00	633.12	635.60	633.78	635.60	0.000069	0.31	484.59	223.59	0.07
1	45.83	Q200 = 148 cms	148.00	633.58	635.78	635.78	635.78	0.014719	3.08	69.71	111.77	0.87
1	114.33	Q200 = 148 cms	148.00	635.80	636.83	637.26	638.51	0.216249	5.97	31.04	80.15	2.83
1	176.96	Q200 = 148 cms	148.00	637.92	639.55	639.55	639.58	0.003752	1.05	219.85	171.88	0.40
1	259.26	Q200 = 148 cms	148.00	641.19	642.08	642.32	643.13	0.150076	6.74	51.21	74.65	2.54
1	307.58	Q200 = 148 cms	148.00	642.11	644.16	644.16	644.32	0.009035	2.74	128.58	84.39	0.69
1	375.26	Q200 = 148 cms	148.00	643.62	645.42	645.42	645.86	0.020505	4.00	93.21	95.04	1.05
1	473.47	Q200 = 148 cms	148.00	646.00	648.80	648.80	649.63	0.017865	4.03	36.71	22.11	1.00
1	487.09	Q200 = 148 cms	148.00	646.65	649.30		649.89	0.011347	3.40	43.53	24.08	0.81
1	493.36		Bridge									
1	499.62	Q200 = 148 cms	148.00	647.15	649.75	649.42	650.29	0.009840	3.23	45.77	24.23	0.75
1	538.76	Q200 = 148 cms	148.00	648.48	650.23	650.96	652.58	0.082429	6.79	21.79	19.28	2.04
1	565.8	Q200 = 148 cms	148.00	650.91	652.34	653.04	654.66	0.071798	6.75	21.91	15.37	1.81
1	571.40		Bridge									
1	576.99	Q200 = 148 cms	148.00	651.45	655.58	653.58	655.86	0.002913	2.33	63.60	15.43	0.37
1	592.96	Q200 = 148 cms	148.00	650.18	655.78		655.92	0.000888	1.71	106.46	28.49	0.26
1	605.89	Q200 = 148 cms	148.00	650.36	655.86		655.95	0.000644	1.29	114.79	29.75	0.21
1	607.68		Bridge									
1	609.47	Q200 = 148 cms	148.00	650.33	655.95	653.10	656.03	0.000573	1.24	119.32	29.77	0.20
1	625.01	Q200 = 148 cms	148.00	650.95	655.98	653.58	656.04	0.000514	1.13	170.53	46.73	0.19
1	641.99	Q200 = 148 cms	148.00	651.30	655.98	654.18	656.06	0.000848	1.36	152.03	49.70	0.24

B6 - SCOUR DEPTH CALCULATIONS

SCOUR DEPTH CALCULATIONS

Method 1: Zeller Equation (Simons Lj & Associates, 1985)

$$Y_{gs} = Y_{max} [(0.0685 V_m^{0.85}) / (Y_h^{0.4} S_e^{0.5}) - 1]$$

where

Q_{design}	=	Design flood flow, cfs
Y_{max}	=	Max depth of flow, ft
V_m	=	Average velocity of flow, fps
Y_h	=	Hydraulic depth of flow, ft
S_e	=	Energy slope (or bed slope for uniform flow)
Y_{gs}	=	General scour depth, ft

Method 2: Regime Equation by Blench (Pemberton & Lara, 1984)

$$Y_{f0} = q_f^{2/3} / F_{b0}^{1/3}$$

$$Y_s = Z Y_{f0}$$

where

Q_{design}	=	Design flood flow, cfs
w	=	Channel top width, ft
q_f	=	Design discharge per unit width or Q_{design}/w
D_{50}	=	Median grain size of material, mm
F_{b0}	=	Blench's "zero bed factor" as a function of D_{50}
Y_{f0}	=	Water depth for zero bed sediment transport
Blench Z	=	A factor as a function of the degree of bend
Y_s	=	General scour depth below stream bed

Method 3: Regime Equation by Lacey (West Consultants Inc., 2003)

$$Y_m = 0.47(Q/f)^{1/3}$$

$$Y_s = Z Y_m$$

where

Q	=	Design flood discharge, cfs
f	=	Lacey's silt factor
	=	$1.76(D_m)^{1/2}$
D_m	=	Mean grain size of material
Y_m	=	Mean water depth
Lacey Z	=	A factor as a function of the degree of bend
Y_s	=	General scour depth below stream bed

Result Summary for Scour Depth Calculations

XS	No.	V _{chl} (m/s)	Y _s (m)	Min Chl Elev (m)	Scoured Elev (m)	Berm Crest (m)	Elev Diff (m)	Driveway Station	Berm Station
	XS 7	6.3	0.6	643.62	642.97	645.72	2.75	190	-
	XS 6	3.4	1.1	642.11	640.98	644.60	3.62	260	-
	XS 5	4.5	1.1	641.19	640.12	643.24	3.12	300	-
	XS 4	3.0	1.2	637.92	636.71	640.59	3.88	390	100
	XS 3	4.4	1.3	635.80	634.52	638.03	3.51	-	170
	XS 2	3.3	0.8	633.58	632.76	636.85	4.09	-	220

Assumptions:

1. Mean grain size of material in 19 Mile Creek = 0.6 mm as per exp sieve analysis dated May 20, 2016 for AH16-01 S6 @ 5.8 m Test No. 5

Comparison of Results from the 3 General Scour Depth Calculation Methods

XS	No.	Y _s (m)			For Design ²
		Method 1 Zeller ¹	Method 2 Blench	Method 3 Lacey	
	XS 7	0.3	1.1	0.6	0.6
	XS 6	0.0	1.1	1.1	1.1
	XS 5	0.0	1.0	1.1	1.1
	XS 4	0.0	1.3	1.1	1.2
	XS 3	0.0	1.4	1.1	1.3
	XS 2	0.1	1.2	1.1	0.8

Note:

¹ It should be noted that in some cases, the Zeller method results in zero general scour depth.

² For design purposes, when Zeller method results in zero general scour depth, only results from the Blench and Lacey methods were used in calc

B7 - EXP SERVICES INC. AUGERHOLE: AH16-01

APPENDIX C – LCI FINAL BERM DESIGN DRAWINGS



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
Telephone: (604)874-1245

RECORD OF AUGERHOLE : AH16-01

PAGE 1 OF 2

PROJECT NUMBER VAN-00226703-A0
PROJECT NAME White Glacier
DRILLING DATE 2016-04-13
DRILLING CONTRACTOR Uniwide Drilling Co. Ltd.
DRILLING METHOD Solid Stem Auger
EQUIPMENT TYPE Truck Mounted Auger Drill
LOGGED BY DGS CHECKED BY EGS

CLIENT Teck Yuan Lee
PROJECT LOCATION 8020 Alpine Way, Whistler, BC
AUGERHOLE LOCATION N: 5555190 E: 503201
ELEVATION _____
GROUND WATER LEVELS: ☒ AT TIME OF DRILLING 0.2m visible
☒ AT END OF DRILLING _____
☒ AFTER DRILLING _____

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT N VALUE BLOWS/0.3m ▲	POCKET PEN (kPa) ⊙	FINES CONTENT (%) □
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80
							DYNAMIC CONE BLOWS/0.3m ⚡	FIELD VANE SHEAR (kPa) Peak Remold	PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
							20 40 60 80	100 200 300 400	20 40 60 80
1 2 3 4 5 6 7 8 9 10		ORGANIC SILT & PEAT, layered, trace rootlets, dark and light brown, wet, (very soft)		S1	AU	1		253	
		SAND & SILT to SILTY SAND, layers of silt, pockets of peat remnants, grey with light brown pockets, wet, (very soft) sand was medium to coarse grained	0.6	S2	AU	0		52	
		PEAT, fibrous, brown and dark brown, wet, (firm to stiff)	1.5	S3	AU	0			
		GRAVELLY SAND, some silt, pockets of peat, grey, wet, (loose to compact) sand was medium to coarse grained, gravel was angular	2.0	S4	AU	11 22 10		484	
		GRAVEL & SAND, trace to some silt, grey, wet, (loose)	4.6	S5	AU	16 14 9 5		30	
		-occasional 100mm to 250mm thick layers of peat between 6m and end of hole		S6	AU	6 6 4 2 4 6		29	
		SAND, some gravel, trace to some silt, grey, wet, (loose to compact)	7.6	S7	AU	5 5 7 7 10 5			
				S8	AU	6 8 7			

EXP GEO 0228703-A0.GPJ EXP STD GDT 16/04/21

(Continued Next Page)



exp Services Inc.
275-3001 Waybume Drive
Burnaby, BC V5G 4W3
Telephone: (604)874-1245

RECORD OF AUGERHOLE : AH16-01

PAGE 2 OF 2

PROJECT NUMBER VAN-00226703-A0
PROJECT NAME White Glacier
DRILLING DATE 2016-04-13
DRILLING CONTRACTOR Uniwide Drilling Co. Ltd.
DRILLING METHOD Solid Stem Auger
EQUIPMENT TYPE Truck Mounted Auger Drill
LOGGED BY DGS CHECKED BY EGS

CLIENT Teck Yuen Lee
PROJECT LOCATION 8020 Alpine Way, Whistler, BC
AUGERHOLE LOCATION N: 5555190 E: 503201
ELEVATION _____
GROUND WATER LEVELS: ☒ AT TIME OF DRILLING 0.2m visible
☒ AT END OF DRILLING _____
☒ AFTER DRILLING _____

DEPTH (m)	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT N VALUE BLOWS/0.3m ▲	POCKET PEN. (kPa) ⊙	FINES CONTENT (%) □
			NUMBER	TYPE	RECOVERY %			
						20 40 60 80	100 200 300 400	20 40 60 80
						DYNAMIC CONE BLOWS/0.3m ⚡	FIELD VANE SHEAR (kPa) Peak Remold	PLASTIC & LIQUID LIMIT MOISTURE CONTENT PL MC LL
						20 40 60 80	100 200 300 400	20 40 60 80
	SAND, some gravel, trace to some silt, grey, wet, (loose to compact) (continued)		S9	AU		4		
						7		63

Bottom of hole at 10.7m.

APPENDIX C – LCI FINAL BERM DESIGN DRAWINGS

CLIENT:

WHITE GLACIER INTERNATIONAL
LAMOREUX ARCHITECT INCORPORATED

PROJECT:

NINETEEN MILE CREEK TRAINING BERM (PRIVATE DIKE)
8030 ALPINE WAY, WHISTLER, B.C.

FIGURE	DRAWING No.	TITLE
FIGURE 1	15-10-000	COVER SHEET
FIGURE 2	15-10-001	PLAN VIEW, PROFILE AND TYPICAL SECTION FOR TRAINING BERM (UPPER SECTION)



DOUG BLISH SURVEY SERVICES LTD.
Douglas J. Blish, A.S.T., P.E.
Unit 10, 1370 Alpine Lakes Road, Whistler, B.C. V8N 1B1
Phone 603-3314 / Fax 603-3314
doug@blish.ca / http://blish.ca

LCI Water Resources Group
Lamoureux Architect Inc. Since 1987
1000 Alpine Lakes Road, Whistler, B.C. V8N 1B1
Phone 603-3314 / Fax 603-3314
www.lamoureux.ca

COVER SHEET

DATE:
Revised: 15-10-14

FILE:
J1031

CHART:

PROJECT:

WHITE GLACIER INTERNATIONAL
NINETEEN-MILE CREEK TRAINING BERM
8030 ALPINE WAY, WHISTLER, B.C.

SCALE:

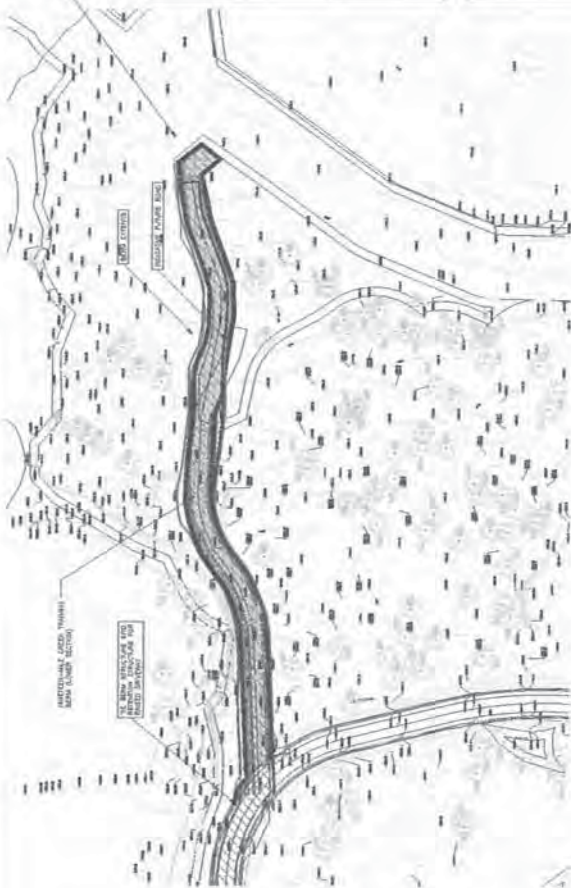
JOB NO.: J1031

DWG.: 15-10-000

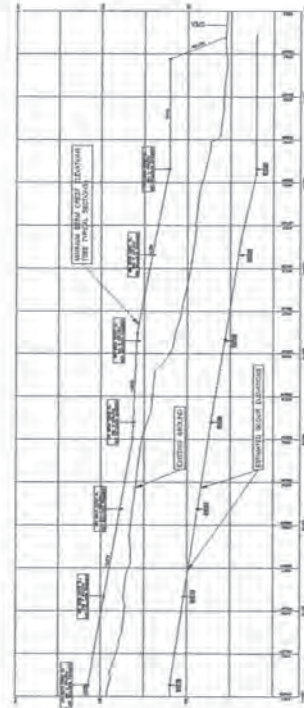
1

BELOW NOTES

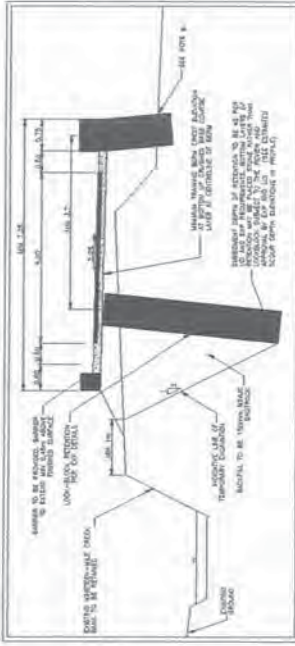
1. THE DESIGN OF THIS PROJECT WAS BASED ON THE "DESIGN OF A TRAINING BERM" BY L. J. BROWN, JR., 1971, WHICH IS A TECHNICAL PAPER OF THE U.S. ARMY CORPS OF ENGINEERS, WASH. D.C. 20315.
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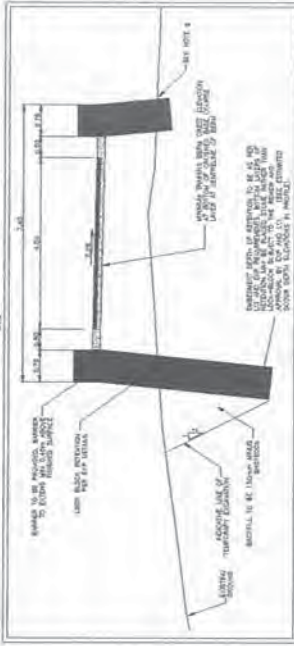
PLAN VIEW
LOWER SECTION
SCALE: 1:500



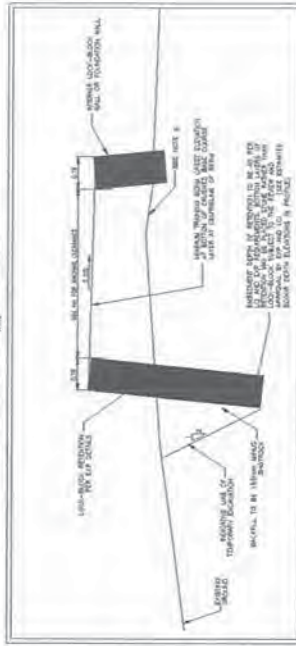
PROFILE
SCALE: 1:500



TYPICAL SECTION BERM - 1:1, 0:150 - 0:150 (SEE PLAN)



TYPICAL SECTION BERM - 1:1, 0:150 - 0:150 (SEE PLAN)



TYPICAL SECTION BERM - 1:1, 0:150 - 0:150 (SEE PLAN)

<p>DOUG BLISS SURVEY SERVICES, LLC Douglas J. Bliss, ASCE, RAS Applied Behavior Technologies (Consulting) Unit 11, 1370 Alpha Lake Road, Whistler, B.C. V0N 1B1 Phone: 604-533-2222 Fax: 604-533-2222 e-mail: doug@bliss.ca / http://bliss.ca</p>	<p>LCI Water Resources Group Lester Consultants Inc. Since 1981 Suite 405, 417 West 10th St. Vancouver, B.C. V6Y 1P8 Tel: 604-681-2222 Fax: 604-681-2222 e-mail: lci@lci.ca / http://lci.ca</p>	<p>TITLE: PLAN VIEW, PROFILE AND TYPICAL SECTIONS FOR TRAINING BERM (LOWER SECTION)</p>	<p>Date: November 1, 2014</p> <p>Client: Project</p>	<p>WHITE GLACIER INTERNATIONAL NINETEEN-MILE CREEK TRAINING BERM 8030 ALPINE WAY, WHISTLER, B.C.</p>	<p>SCALE: AS SHOWN</p> <p>JOB NO.: J10031</p> <p>DWG.: 15-10002</p> <p>3</p>
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MEMORANDUM

DATE: November 01, 2016
TO: Tom Vitous, Lamoureux Architect
CC: Tracy Napier, RMOW
FROM: Adrien Baudouin, R.P.Bio, Cascade Environmental
RE: 8030 Alpine Way-Protection of Natural Environment
FILE #: 619-01-04

Cascade Environmental Resource Group Ltd. was retained to provide environmental service during the development of the property located at 8030 Alpine Way, Whistler, BC. Pursuant to Section 919.1(1)(a) of the Municipal Act, the subject property is designated as an area for the protection of the natural environment, its ecosystem and biological diversity (RMOW, 2012). The Official Community Plan and the RMOW inventory mapping identify issues of concern to development on the subject property. This memo addresses the environmental concerns regarding the proposed berm and the servicing.

OCP 23.4.1 a: Loss of natural and environmentally sensitive areas

The berm and the servicing will be located within the disturbed corridors of the existing drive ways. Therefore, the proposed development does not present any environmental concerns and should not result in the loss of natural and environmentally sensitive areas.

OCP 23.4.1 b: Impact on wildlife habitat and movement corridors

The berm and the servicing will be located within the disturbed corridors of the existing drive way. Therefore, wildlife habitat and movement corridors should not be impacted.

OCP 23.4.1 c: Impact on storm water

Sediment delivery to the 19 Mile Creek and the wetlands present on the property will be avoided by installing silt fence at the base of the construction fence delineating the setbacks. The silt fence and maintenance of existing riparian vegetation will reduce sediment transport and erosion. The proposed development should not increase the stormwater impacts.

OCP 23.4.1 d: Creation of wildlife habitat

Native plants should be used for landscaping to provide wildlife habitat.

OCP 23.4.1 e: Streamside Protection Regulations

The Streamside Protection Regulations have now been replaced by the Riparian areas Regulations (RAR). An RAR assessment was conducted and the setback from the high water mark of the ditches, streams, wetlands and lake were established. The latest RAR assessment report was submitted on March 03, 2016 (RARNS # 3725C).



Please don't hesitate to contact me should you have any queries or concerns regarding this report.

Prepared by:
by:

With support and review provided

Adrien Baudouin, M.Sc., R.P.Bio.

Biologist

Cascade Environmental
Resource Group Ltd.

Dave Williamson Q.E.P.

Principal

Cascade Environmental Resource
Resource Group Ltd.

References

Resort Municipality of Whistler. 2012. Official Community Plan. Prepared for RMOW.



MEMORANDUM

DATE: January 5, 2016
TO: Craig Thomas, Lamoureux Architect
CC: Kevin Creery, RMOW
FROM: Adrien Baudouin, R.P.Bio, Cascade Environmental
RE: 8030 Alpine Way-Protection of Natural Environment and from Hazardous Conditions
FILE #: 619-01-01

Cascade Environmental Resource Group Ltd. was retained to provide environmental service during the development of the property located at 8030 Alpine Way, Whistler, BC. Pursuant to Section 954 (4) (a) and (b) of the Municipal Act, the subject property is designated as an area for the protection of the natural environment and an area for the protection of development from hazardous conditions, its ecosystem and biological diversity (RMOW, 2012). The Official Community Plan and the RMOW inventory mapping identify issues of concern to development on the access road to the subject property (Development Permit Area 13 - Wedge Park). This memo addresses the environmental concerns regarding the proposed development which consist in raising the level of the road for flood protection.

OCP 17.4.1 a: Preserve or enhance the natural watercourses

The proposed development will be located within the disturbed corridor of the existing driveway. Therefore, the proposed development should not impact any watercourse.

OCP 17.4.1 b: Protection of wetlands, fish and wildlife habitats

The proposed development will be located within the disturbed corridor of the existing driveway. Therefore, wetlands, fish and wildlife habitat should not be impacted. No vegetation clearing is anticipated.

OCP 17.4.1 c: Protection from seasonal flooding and the high water table

The purpose of the proposed development is the protection from flood flows, seasonal flooding and the high water table. Sediment delivery to the 19 Mile Creek and the wetlands present on the property will be avoided by installing silt fence at the base of the construction fence delineating the setbacks. The silt fence and maintenance of existing riparian vegetation will reduce sediment transport and erosion during the construction period. Silt fencing will be removed once construction is completed and disturbed soils are stabilized.

Please don't hesitate to contact me should you have any queries or concerns regarding this report.

Prepared by:
by:

With support and review provided



Adrien Baudouin, M.Sc., R.P.Bio.
Biologist
Cascade Environmental
Resource Group Ltd.



Dave Williamson Q.E.P.
Principal
Cascade Environmental Resource
Resource Group Ltd.

References

Resort Municipality of Whistler. 2012. Official Community Plan. Prepared for RMOW.



CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD.

Environmental Memorandum

DATE: March 27, 2018
TO: Roman Licko, RMOW
CC: Brad Lamoureux, Lamoureux Architect Inc.
FROM: Dave Williamson, Cascade Environmental Resource Group Ltd.
RE: Response to RMOW Development Permit Questions - 8030 Alpine Way, Whistler, BC
FILE #: 619-01-04

In response to a number of concerns raised by Council at the meeting of March 20, 2018, Cascade has prepared this memo providing clarification. Staff requests are shown in italics herein.

2. Please provide an evaluation of relative impacts on wetlands and the natural environment associated with alternative flood protection measures. IE: Training berm vs raising the buildings.
 The proposed flood protection berm was placed directly on the footprint of an existing flood protection berm that was constructed by the previous owners of the land to provide debris flow protection. In accordance with the requirements of the Riparian Area Regulation (RAR) of the BC *Fish Protection Act*, the existing conditions of the forested wetlands and their associated riparian areas delineated as Streamside Protection Enhancement Area (SPEA) through the Detailed Assessment Methodology, are preserved and protected. The delineated SPEAs on the property were audited and confirmed by the province. In order to maintain the integrity of the SPEAs, all development must fit within the areas that fall outside of the SPEAs or be placed on existing, disturbed sites. The proposed berm is located on the existing berm footprint.

As part of the flood protection analysis, a number of configurations and alignments of berms were considered. Solutions to locate a flood protection berm entirely within the property would have a negatively impacted SPEAs on the property and would therefore be non-compliant with RAR. A berm located along the West Property line was deemed as a possible alternative measure to protect the property but would have encroached into the SPEA and would require removal of mature forest and infilling wetlands. The adverse environmental effects would be unjustifiable. The proposed design represents the most environmentally responsive and RAR compliant configuration. The only alternative flood protection measure available involved raising the buildings above the flood elevation. The resulting fill necessary to achieve that elevation and the angle of repose, would result in intrusions into the SPEA, rendering the development non-compliant with the RAR; as such, it was not viable.

2 c. Please have your QEP provide an memorandum stating which solution is the most environmentally friendly.

After reviewing the various opportunities, Cascade determined the proposed berm to be the least impactful and therefore the most environmental friendly design option.

4. Please provide a QEP assessment of the impact of the berm development on the Wedge Park Parcel. I realize CERG has already provided a memorandum regarding the DP Guidelines for Development Permit Area 13. This new assessment should speak to the effects (if any) on the riparian ecosystem and further if there are any effects to migration of mammals, etc.



The presence of a berm will not significantly alter the existing condition of the land. The existing riparian areas defined by the SPEAs will not be affected by the berm. The proposed berm was designed to fit within the footprint of the existing disturbance from the berm and access road. The only change is the elevation of the top surface. Through the park, the elevation ranges from existing grade to a maximum of 1.5 m (between 0+240 and 0+290, Drawing R-1). The armour on the face of the berm will be backfilled with soil and planted within the extent of the disturbance footprint. All backfilling and grading will be carried out under the direction of the QEP monitor. The presence of the berm should not significantly impede movement of wildlife through Wedge Park.

With respect to preserving the existing groundwater regime, Evan Sykes states that *"The berm would be backfilled with permeable material and subgrade structure would also consist of permeable material allowing groundwater to flow around or underneath the berm. In addition, a lock block berm would train surface water in a flood event; however, is not waterproof and groundwater would be able to flow through. Also, a drain pipe is to be installed to reduce water induced pore pressure during a seismic event and will be outletted such that it would promote groundwater flow around the berm"* (EXP email, March 27, 2018).

A memorandum provided by Mauricio Herrera (Tetra Tech, March 27, 2018) states that the RMOW is concerned that a berm could impede groundwater flow to Wetland 3 and Wetland 4, but that in this case *"impact is mitigated given that the berm will be backfilled with permeable material and the subgrade structure would also consist of permeable material allowing groundwater to flow around or underneath the berm"*. Further, a sub-surface drainage pipe across the berm would ensure shallow groundwater flow continues to feed the wetland and should adequately mitigate the risk of any reduction of groundwater flow to the wetlands.





Appendix K

May 12, 2016

Reference No. VAN-00226703-A0

Lamoureux Architect Inc.
3392 Marine Drive
West Vancouver, BC V7V 1M9

Attention: Mr. Brad Lamoureux

Email: Brad@lamoureuxarchitect.ca

**Re: Geotechnical Exploration Report
White Glacier
Edgewater Resort, Whistler, BC**

Dear Sir:

1.0 INTRODUCTION

Exp Services Inc. (**exp**) has completed a geotechnical exploration program in accordance with our fee proposal dated May 26, 2015, for the proposed White Glacier project in Whistler, BC and accepted May 28, 2015. The purpose of the study was to review the subsoil and groundwater conditions underlying the site and to provide geotechnical recommendations for site preparation and foundation design for the proposed development. Between the conceptual design and preliminary design stage some additional structures were included in the overall project. The geotechnical exploration program completed on June 2 to 3, 2015 was planned based on conceptual design and limited site access. For preliminary design subsoil data extrapolated from the June 2015 geotechnical exploration program was used for preliminary the design. Site specific exploration may be required during detailed design.

This report addresses geotechnical issues for the proposed main building: Geotechnical aspects of two other buildings and modification to an existing berm are addressed under separate covers. The scope of services was limited to the provision of geotechnical engineering services only and does not include any provision for the investigation, analytical testing or assessment of the potential for soil and/or groundwater contamination at the site or possible bio-engineering considerations.

2.0 SITE AND PROJECT DESCRIPTION

The proposed development is located about 350m southwest of the intersection Sea-to-Sky Hwy and Alpine Way. There are three main structures proposed with some smaller structures possible in the future to be located around subject property. A list of proposed structures is presented below. Locations of the structures can be found on Site Plan A1.0 attached.

1. Residence (RES)
2. Reception (Site 2)
3. Studio (Site 3)

Proposed structures #1 Residence are located in the main cluster and the remaining sites are located adjacent to the existing access road (Site 2) and north of the main building (Site 3). The proposed main site is located about 220m west and 50m north of the existing Edgewater Lodge.

Alpine Way is aligned in north south direction on the west side of the proposed development. Green Lake is generally located on the east side of the proposed development. Whistler Executive Transportation office building is located on the south east side of the proposed development, about 15m north of Alpine Way. It was understood that proposed main building will be a one to two storey residential building. Proposed finished grade in the area of the main cluster: is understood to be increased to an elevation greater than the flood construction level, to be determined by others. We understand this will result in a grade increase of 2 to 3m, based on preliminary discussions. Based on the current preliminary drawings the grade for the main building is proposed to be increased by providing a crawl space or a placement of structural fill between the existing and finished grade.

In addition, modifications to an existing berm are required to accommodate the FCL for the main building.

3.0 SCOPE OF SERVICES

Key geotechnical evaluation and design issues for the project include:

- a. Characterization of the subsurface soil and groundwater conditions;
- b. Provision of preliminary recommendations for foundation support of the proposed structure;
- c. Conduct site specific ground response analysis and provide response spectrum, assess liquefaction potential and associated lateral and vertical displacement and differential movements, provide recommendations for possible ground improvement techniques;
- d. Provide lateral pressures for design of below grade walls.

4.0 SUBSURFACE CONDITIONS

4.1 Surficial Geology

Based on geological and Landslide Inventory of The Upper Sea to Sky Corridor (File No. 5324) the proposed site consisted of floodplain sediments; sand and silt, commonly including organic materials and underlain, in many places, by gravel; 1 to 3mm thick.

4.2 Geotechnical Drilling and Subsurface Exploration

Exp's field work was carried out on June 2 and 3, 2015 and included the following:

- One (1) Seismic Cone Penetration Test sounding (SCPT) to 30m depth, by sub-contractor ConeTec of Richmond, BC.
- Five (5) Standard Penetration Test sounding (SPT) to depths ranging from 6.4 to 30.5m, by sub-contractor Mud Bay Drilling Co. Ltd., of Surrey, BC.
- Five (5) Sonic Bore holes drilled to depths varying from 6.4 to 31.4m, by Mud Bay Drilling Co. Ltd.
- One (1) standpipe piezometer installed to a depth of 6.1m, by Mud Bay Drilling Co. Ltd.
- Measurement of groundwater depth.

- An electro-magnetic survey of the site was completed prior to drilling to locate buried utility lines. This survey was carried out by sub-contractor Western Locate Services Ltd., of Coquitlam, BC.

Locations of the test holes/SCPT are shown on the attached Test Hole Location Plan, Figure 1.

A topographic survey was conducted by Doug Bush Survey Services Ltd. A plan of the survey is provided in Appendix G.

Additional site investigation will be required during the detail design to confirm the assumed site conditions at structure No. 6 to 12.

4.2.1 Seismic Cone Penetration Test (SCPT)

One SCPT was conducted at the location shown on the Test Hole Location Plan. A 500 bar capacity compression type cone was used for the SCPT sounding. This cone has a tip area of 10 cm². In CPT, soil resistance on the cone, soil friction on the friction sleeve (located behind the cone), and pore water pressure near the tip of the cone are continuously measured using electronic transducers and stored on a computer as the cone is advanced into the ground.

Seismic shear waves were generated by striking the end of a steel beam with a large sledge hammer. The steel beam was positioned under the hydraulic jacks at the rear of the drill rig. Multiple shear waves were generated from each end of the beam at each testing depth. A field computer and oscilloscope were used for viewing the shear wave traces in the field and were digitally stored for future analysis. The orientation of the beam relative to the cone test depth was taken into account for calculating the wave travel path.

A horizontally mounted geophone within the body of the cone behind the cone tip was used to record the arrival of the shear waves. The seismic data acquisition system recorded 4000 to 8000 samples points for each wave trace at a resolution of 20000 samples per second.

Seismic Wave Velocity Measurements were conducted at 1 m intervals in accordance with the procedures described by Robertson et al. (1986). Before taking wave velocity measurements, the rods were decoupled from the drill rig to avoid transmission of energy down the rods.

The SCPT data was utilized for the determination of subsurface stratigraphy and soil parameters for geotechnical analyses, including seismic design and liquefaction assessment.

4.2.2 Standard Penetration Test (SPT)

Standard Penetration Tests (SPT) and split-spoon samples were taken at 1.5m intervals. A 63.5kg (140 lb) Safety Hammer was used for the SPTs. Blow Counts for each 150mm of penetration were recorded for four consecutive sets (i.e.: for a total penetration of 600mm). The blow counts in the second and third readings of every set were added together to obtain a final blow count per 0.3 m at a given depth. The blow counts along with the soil descriptions are provided in the borehole logs. The SPT data was utilized for interpretation of soil density/consistency at the test hole locations and for geotechnical analyses.

4.2.3 Sonic Bore Hole

A truck-mounted sonic drill rig, supplied and operated by Mud Bay Drilling Co. Ltd., of Surrey, BC, was used to complete the bore holes. Five (5) bore holes were completed to depths ranging from 6.4 to 31.4m below ground surface. The "sonic" drilling method employs high frequency resonant energy to

advance a core barrel and a casing into the ground. The internal diameter of the core barrel used is 111 mm and the wall is 12.7 mm thick. The outer diameter of the casing is 152 mm and the wall thickness is 25 mm. As the hole is advanced soil enters into the core barrel. At regular intervals the core barrel, together with the soil inside is withdrawn, while the casing remains in-place to prevent collapse of the hole. After removal of the soil into plastic bags, the core barrel is sent down the hole and the drilling procedure is repeated. Some photographs with increasing depths are provided in Appendix C for bore holes BH15-01 and BH15-05.

One (1) standpipe piezometer was installed in BH15-05 to depth of 6.1m below ground surface, with 3.1m of slotted screen at the bottom of the well.

All field work was carried out under the full-time supervision of a member of **exp's** geotechnical staff who located the test holes in the field, examined and logged the subsurface conditions encountered, and collected representative soil samples for detailed examination and testing in our laboratory. Following completion of drilling, the CPT and auger holes were backfilled and sealed according to the regulations of the B.C. Ground Water Protection Act.

The logs of the auger holes are provided in Appendix A, and CPT data and interpretation plots are provided in Appendix B attached.

4.3 Laboratory Tests

Laboratory tests were conducted on representative soil samples obtained from the bore holes. The tests included natural moisture content tests, Atterberg Limits tests on cohesive soils, sieve analysis on granular soils and consolidation tests on undisturbed cohesive soil samples. The following is a summary of the laboratory tests carried out.

4.3.1 Natural Moisture Content Test

Moisture content determinations were performed on select soil samples obtained from the exploration to assist in identification of soil types and to correlate with engineering design parameters. The tests were done in general accordance with the test procedures in ASTM D-2216. Results of the tests are shown on the bore hole logs, provided in Appendix A.

4.3.2 Atterberg Limit Tests

Atterberg Limits, the liquid and plastic limits, are used for classification and indexing of cohesive soils and for correlating with engineering design parameters. The liquid and plastic limits are defined as the moisture content of a cohesive soil at arbitrarily limits for liquid and plastic behavior, respectively. Liquid and plastic limits were conducted on three (3) selected samples in accordance with ASTM D-423 and ASTM D-424, respectively. The results of the tests are provided in Appendix D.

4.3.3 Sieve Analysis

Sieve analysis was performed on select soil samples obtained from the exploration to determine the grain size distribution of the granular soil. Sieve analysis was conducted on four (4) select samples in general accordance with ASTM C-136 and ASTM C-117, respectively. The results of the tests are provided in Appendix E.

4.3.4 Consolidation Tests

One dimensional consolidation tests were carried out to obtain consolidation settlement characteristics of the cohesive soils. The tests were conducted on two (2) undisturbed Shelby tube samples obtained from sonic hole in accordance with ASTM D-2435. Results of the tests are provided in Appendix F of this report.

4.4 Sub soil Conditions

In general, the test holes information indicate the following subsurface soil conditions, in order of increasing depth. It should be noted that the soil conditions may vary beyond drill hole locations and below the depth of exploration.

- | | |
|----------------|--|
| UNIT A | FILL – 0.1 to 0.2m thick top soil followed by loose to compact silty SAND, some gravel, some woodwaste. Thickness ranged between 0.3 and 1.1m. About 0.8m thick woodwaste was encountered below the top soil in test hole BH15-01 only. |
| UNIT B | Soft to firm, wet/moist, dark brownish black PEAT/organic SILT, trace sand and silt. Thickness ranged between 0.5m and 1.5m. Moisture content varied from 70% to 280%. |
| UNIT C | soft to very soft, grey, sandy SILT, trace of gravel and organics. Only encountered at BH15-03 and thickness was about 1m. Moisture content was about 80%. |
| UNIT D | compact, wet, sandy GRAVEL/SAND and GRAVEL, trace to some silt, encountered in test holes BH15-01 to 04. Thickness varied from 1.5 to 4m. At test hole BH15-02, this unit of soil was encountered to the bottom of the test hole (6.4m). |
| UNIT E | soft to very soft, clay SILT, trace silt and peat/organic. Moisture content varied from 80% to 90%. Only encountered in test hole BH15-01, thickness was about 1.7m. |
| UNIT F | loose, wet, sand, trace silt, about 3m thick in BH15-01. About 18m thick in BH15-05, there were occasional layers of woodwaste/organics encountered in test hole BH15-05. Woodwaste was the main unit between depths 10.5 and 15m. |
| UNIT D1 | compact, wet, sandy GRAVEL/SAND and GRAVEL, trace to some silt, only encountered in test holes BH15-01. Thickness was about 3.4m between depth 8.8 to 12.2m. |
| UNIT E | soft to stiff, SILT, some clay to clayey, occasional wood fragments/organics, with occasional .5m to 1.5m thick layers of sand in BH15-01. Moisture content varied from 30% to 80%. Thickness of this layer varied from 11m to 16.5m. |
| UNIT F1 | compact, wet, sand, trace to some gravel and silt. About 3m thick in BH15-01 (end of the hole was 31.4m) about 0.5m thick in BH15-05 (end of the hole was 30.8m). |

4.5 Groundwater Condition

Inferred groundwater depth at the time of drilling was measured at about 1 to 2.5m below the existing grade. The groundwater level measured at the standpipe piezometer about two hours after the drilling was 0.6m below the existing grade. Based on previous test hole depth of ground water was about 10m below the existing grade at the intersection of Sea-to-Sky Highway and Alpine Way.

It should be noted that groundwater conditions may vary and fluctuate seasonally in response to climate conditions, and possibly also due to precipitation, runoff, changes in land use, and other factors. Water level in the Green Lake could make a big influence on the water level in the surrounding area.

5.0 SEISMIC CONSIDERATIONS

5.1 Introduction

It is understood that the Resort Municipality of Whistler Building By-Law implements the criteria of the BCBC2012/NBCC2010 ("Building Code") for the seismic assessment of their facilities. In the BCBC2012 and NBCC2010, an earthquake motion with a return period of 2475 years is specified. The philosophy for earthquake design in the Building Code is prevention of collapse, but to accept damage to structures. The expectation is that "typical" or "normal" structures will be near collapse and the building may not be repairable following the design earthquake. Implicit within the Building Code is the intent to limit damage during low to moderate level earthquake shaking.

5.2 Seismic Design Parameters

Site specific interpolated seismic design parameters for this site were obtained from the interactive website maintained by the Geological Survey of Canada (GSC). Table 1 presents the parameters in the form of response spectrum for motions at a hypothetical, "outcropping firm ground", for the design 2475 year event.

**Table 1 - Response Spectrum for 5% Damping at
"Outcropping Firm Ground" (BCBC 2012)**

Periods, (s)	Acceleration Response Spectra (g)
0.2	0.63
0.5	0.47
1.0	0.281
2.0	0.156
PGA	0.285

The "outcropping firm ground" is specified as soils with average shear wave velocity in the range of 360 m/s to 750 m/s. Very dense soils or soft bedrock could be classified as "firm ground".

The ground motions would be altered (amplified or attenuated) as earthquake induced shear waves propagate through the soils which overlie the "firm ground". To develop site-specific-near- surface design ground motions and to carry out liquefaction assessment, a site-specific ground response analysis was carried out. The following sections describe the ground response analysis and the results

5.3 Seismic Ground Response Analysis

5.3.1 Introduction

Seismic ground response analysis was carried out using the computer program PROSHAKE (Version 1.12) in order to develop site-specific seismic design parameters. The program PROSHAKE models the soil deposit as a 1-D column, allowing vertical propagation of the earthquake induced shear waves.

5.3.2 Input Earthquake Records

The analysis was carried out using eight earthquake records, input at the outcropping “firm ground”. The records were modified using the computer program SYNTH such that the response spectrum of each record matches that presented in Table 1.

5.3.3 Soil Parameters

The soil properties for the ground response analysis include shear wave velocity (V_s), unit weight, and relationships between shear modulus and damping with shear strain. Shear wave velocity profile obtained at test hole SCPT15-1 was used in the analysis and presented in Figure 2.

The “Elastic halfspace” for the SHAKE analysis was assumed at 60m depth, with a shear wave velocity of 555 m/s (mean V_s of the range recommended in NBCC 2010).

Shear modulus reduction and damping curves used in the analysis are from published data for similar soils (Seed and Idriss, 1970, for sand or sand and gravel; Vucetic and Dobry, 1991 for silts and clays). For sand layers, the upper bound modulus reduction and lower bound damping curves from Seed et al (1986) were used.

5.3.4 Near Surface Response Spectrum

Response spectra for 5% damping, for motions at ground surface and 2m below the ground surface were obtained from the ground response analysis are shown graphically in Figure 3 and 4, respectively. Figure 5 shows the response spectra for Site Class C, D, E, average from the shake analysis and the recommended response spectra if the ground improvement is not implemented. If the ground densification techniques are applied then the site could be used as Site Class E, with F_a and F_v of 1.24 and 1.92, respectively.

5.3.5 Peak Ground Acceleration (PGA)

PGA profiles obtained from the analysis for the six input records and the mean profile are shown in Figure No. 6. Based on the analysis the mean surface PGA for the 2475 year event is 0.11g for this site if the ground improvement is not implemented. If ground improvement such as densification technique is applied then surface PGA could be 0.35g.

5.3.6 Cyclic Stress Ratio (CSR)

CSR was calculated as $0.65 \cdot \tau_{\text{peak}} / \sigma'_v$, where τ_{peak} and σ'_v are peak of the cyclic shear stress and vertical effective stress respectively at a given depth. CSR profiles for the six input records and the mean profile are shown in Figure No. 7. The mean CSR profile was then used in liquefaction assessment as described in the next sub-section.

5.4 Liquefaction Assessment

Liquefaction susceptibility of the sub-soils was assessed using the procedures given in Youd et al (2001) with the CSR profiles described above. The cyclic resistance of the ground, expressed in the form Cyclic Resistance Ratio (CRR) was obtained using SPT data according to the Youd et al (2001) procedure for CPT method.

Earthquake magnitude for this assessment was taken as 7.0 for the 1:2475 year event (Ref. Task Force Report, Geotechnical Design Guidelines for Buildings on Liquefiable Sites in Accordance with NBC 2005 for Greater Vancouver Region, May 8, 2007).

Factor of Safety against liquefaction (F.S.) was calculated as the ratio of CRR/CSR. The results of the assessment are shown graphically in Figures No. 8 and 9. Soil layers with a F.S. less than 1 are considered liquefiable for the 2475 year return period earthquake event. It can be seen from Figure No. 8 and 9, sandy soil below water table is likely liquefiable, the extent and thickness of liquefiable layers was estimated to be about 20m. The SILT/CLAY soils are likely to be liquefiable based on the guidelines of the Task Force Report (2007). Strain softening could occur during a high magnitude earthquake event. Liquefaction induced settlement was estimated based on procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5 Consequences of Liquefaction

Following liquefaction, the soils lose a significant portion of their shear strength and behave like a heavy liquid. Some of the consequences are: liquefaction induced settlement of the ground, lateral spreading of the ground and the overlying structures, flotation, tilting and/or shear failure of the foundations.

5.5.1 Post-liquefaction Settlement

Dissipation of the excess pore water pressure developed during shaking and liquefaction would cause settlement of the ground. As mentioned above, the sandy soil below water table is likely liquefiable. Based on Figures 8 and 9, there may be liquefaction between 4 to 20m depth. Cumulative thickness of liquefiable layers was estimated to be 12 to 16m. Post-liquefaction settlement due pore pressure buildup within the soil mass was estimated to be in the order of 500 to 700mm based on SPT holes data and using the procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5.2 Lateral Spreading

As discussed before the sub-surface under the water table is liquefiable. Magnitude of lateral spreading of the ground was calculated using Youd et al (2002) procedure. The existing topography around this station is generally flat. However, the presence of Green Lake on the east side (a “ground slope” condition) would likely result in movement towards the lake. A survey of the Lake bottom by Doug Bush Survey Services Ltd. indicated a gently inclined slope. The analysis indicates that lateral ground movements in the order of 1000mm to 1500mm may occur following the design earthquake if ground improvements are not implemented. Note that Youd et al. (2002) procedure is highly empirical and great uncertainty exists in the calculated numbers. A range of half to twice the values given is recommended for design considerations.

5.5.3 Flotation

Note that the static groundwater level was potentially in the order of about 1 to 2m below existing ground surface. However, groundwater in the area is known to fluctuate and can intermittently rise closer to the surface. Flood construction level is understood to be about 2 to 3m above existing grade; therefore, for static buoyancy design, we recommend assuming a potential high groundwater level 3m above the ground surface.

Following liquefaction, the liquefied soil would behave like a heavy liquid, inducing added buoyancy forces on buried structures and possibly leading to floatation. The buoyancy force can be calculated using an equivalent fluid pressure of 18kN/m^3 for liquefied soils. The magnitude of the buoyancy force depends on the depth and thickness of the liquefiable soil layer. The uplift force due to buoyancy during liquefaction could be calculated using the equivalent fluid pressure for liquefied soils for the portion of the structure submerged below groundwater.

5.6 Consolidation Settlement

Soil layering encountered the two deep holes were not consistent. Based on BH15-01 there is soft compressible Peat/organic silt in the upper 1.5m to 2.5m and about 2m of thick clayey silt from 4 to 6m and 10 to 12m thick silt layer between 14.5 to 30m depth. Based on BH15-05 there is soft compressible Peat/organic silt layer in the upper 1m and about 4m thick organic silt with some sand between 11m and 15m depth, then 10.5m thick silt layer between 19.5 and 30m depth. The soft compressible layers have potential for consolidation settlement if any surcharge load is applied. Preliminary settlement analysis was carried out using soil parameters derived from consolidation test results. The computer program Settle 3D was used develop preliminary settlement values. Soil parameters used in the analysis will be provided in the final reporting. As final loads were not available at the time of writing this report, 2m (40kPa) to 3m (60kPa) surcharge loads were applied at the ground surface to estimate the total settlement. Two different soil modes were prepared. One estimates with the existing peat/organic silt and another without (remove about 1.5m thick peat/organic silt). Table 2 below shows some preliminary settlement estimates for various surcharge loads. Total and differential settlement for site specific structure will be provided in the final design.

Table 2: Predicted settlements without Pile

Fill Height (m)	Predicted Settlement (mm)
3.0	660 to 1090
2.0	460 to 770
Following Removal and Replacement of about Upper 1.5 m of soil	
2.0	190 to 290
3.0	400 to 440
4.0	580 to 610
5.0	700 to 800
6.0	830 to 980

Additional settlement analysis was carried with using 15m and 18m long driven piles with 2 to 3m thick surcharge load at the ground surface. Table 3 provides some preliminary settlement prediction.

Table 3: Predicted settlements with Pile

Fill Height (m)	Pile Length (m)	Predicted Settlement (mm)
2	15	60 to 250
3	15	130 to 400
2	18	50 to 210
3	18	130 to 340

Based on the above two tables it appeared that preload treatment is recommended to mitigate 80 to 90% of the predicted settlement. A 1m surcharge above finished grade for 4 to 6 months is expected to be required to achieve the pre-consolidation settlement. Actual settlement monitoring data will be required to confirm the duration of preload. Additional settlement analysis is required to refine the settlement prediction as design progresses. Additional settlement will be required those areas where no site exploration has been conducted in the current exploration program.

6.0 DISCUSSION AND RECOMMENDATIONS

The test holes encountered an organic silt/peat layer followed by a soil profile comprised of soft to firm interlayered clayey silt and sand 2 to 4m thick becoming softer at depth and then transitioning to firm to stiff silt below about 19.5 to 23m depth. Bore holes data indicated sandy soils below 28 to 30m depth. It is expected that a substantial silt layer would be present at greater depths. Further, bedrock is expected to be well in excess of 60m deep close to the lake, the depth of bedrock could be shallower to the west. Based previous test holes completed by **exp** for project near the intersection at Sea-to Sky and Alpine Way the depth of bedrock was about 25m. The groundwater table at the proposed location of the main

building was approximately 1m to 2.5 below existing ground surface at the time of exploration, and is expected to fluctuate seasonally with higher levels in the winter/spring. Depth of groundwater was deeper towards the west, about 10m at the intersection of Sea-to-Sky Highway and Alpine Way area.

As discussed above, the site area was determined to have subsurface soil layers that are settlement sensitive. As the magnitude of settlement is high, preload with a surcharge should be considered to mitigate the post-construction settlement. Removal of the upper top 1 to 2m thick peat/organic silt layer and backfilling with granular soil would reduce the magnitude of settlement by half to one third; however, this settlement is expected to occur relatively rapidly relative to deeper silt layers following ground improvements.

A driven pipe pile could be considered as a foundation option. Open end steel pipe pile and 300mm to 610mm diameter respectively, are considered in analysis.

As discussed above, the site area was determined to have subsurface soil layers that are susceptible to liquefaction under the design earthquake event. Significant lateral and vertical ground displacements (as described above) are expected to occur if soil layers beneath the site were to liquefy, with corresponding horizontal movements and differential settlements within the proposed project elements.

Ground improvement would need to be employed to mitigate the seismic hazard presented by potential liquefaction. Ground improvement is commonly achieved by means of vibro-replacement (stone columns). However, with the limitation of ground improvement techniques and considering that the ground densification can only mitigate and not completely eliminate the hazard of the earthquake induced ground movement, it is recommended that the building be designed on a raft type foundation, with thickenings as required for concentrated loads, to limit the damage caused by earthquake induced ground movements. Static and post liquefaction seismic buoyancy has a significant impact on buried tanked structures. Static buoyancy could be mitigated by using soil anchors. Seismic buoyancy could be mitigated with ground improvements. A draft ground densification specification is provided in Appendix H of the report. Details of densification plan will be provided by others.

6.1 Site Preparation

Site preparation for the proposed residential building should include the removal of all vegetation, organic soils, and soft or disturbed soils to expose underlying sand and gravel. Similarly, removal of unsuitable materials should be completed for walkways, driveways and hardscape features. Grade reinstatement or increases to achieve flood construction elevations below the proposed raft slabs should be achieved by placement of structural fill consisting of well-graded shot rock or pit run sand and gravel placed in lifts with a maximum thickness of 300mm compacted with several passes of a heavy ride-on type vibratory roller. We recommend that a layer at least 300mm thick of clear crushed gravel be placed immediately below the proposed raft slab for drainage, to provide a solid working platform, and for improved and more uniform bearing resistance. The clear crushed rock layer should be compacted to a dense state using vibratory methods.

As indicated previously, soil densification below raft slabs is recommended to mitigate liquefaction during the design seismic event. Depth of the recommended soil densification is about 20m below existing grade. Soil densification is comprised of installation of stone columns in a triangular pattern, for preliminary design approximately 2.75m spacing can be considered. Lateral extent of the densification zone beyond the building foot print could be half of the densification depth. In areas where densification beyond the building footprint is limited to less than about 4m, pile foundations should be considered to mitigate lateral movement due to liquefaction. However, stone column spacing is reduced the setback

from densification edge may be reduced to 3m. Further analysis should be completed as design is advanced and structural loads are available. A densification plan and specifications will be provided under separate cover as design advances. SPT/CPT should be conducted between stone columns to confirm adequate densification has been achieved.

As discussed earlier, preload surcharge is recommended to mitigate the consolidation settlement. A 1m preload surcharge is recommended above the finish grade after completion of densification.

Due to the presence of the organic silt/PEAT in the upper 1 to 2m, there is potential for methane gas generation underneath the proposed building. Some provision for methane gas mitigation should be considered during final design. If the upper organic soil layer above water table is removed during preloading then provision for methane gas underside the building may not be required.

The smaller buildings outside the main cluster may not require ground densification due to the size and function of the buildings. At a minimum over excavate at least 1m below the design subgrade elevation and replaced with structural fill should be completed. Pile foundations are not recommended in areas where ground densification has been completed.

6.2 Excavation and Dewatering

Required excavation depths may be in the order of 1 to 2m below existing grades. Assuming that groundwater may be near ground surface. It appears that the excavation could extend in the order 1 to 1.5m below the groundwater table.

A method used with success in other areas of Whistler with excavations below groundwater is to excavate unsuitable materials and backfill with shot rock which is not moisture sensitive. Backfilling should occur as excavations proceed to allow for equipment to travel on backfill areas only.

Depending on the actual excavation depths, the excavation could possibly be carried out by slope cutting method, which would be the least expensive if feasible. For preliminary planning purposes, we recommend assuming excavation side slopes no steeper than 1H:1V. If the extent of the excavation needs to be minimized, then a commonly used and generally effective method for the ground conditions at the site would involve sheetpile shoring.

Ultimately, the design, operation, and maintenance of the dewatering and shoring system should be made the responsibility of the contractor. The contractor would need to determine the means and methods of dewatering and shoring necessary to meet the project requirements.

6.3 Foundation Design

Table 4 below provides bearing values which may be used for the design of the raft, strip and pad foundation.

TABLE 4: Bearing Pressures

Foundation Material	Factored Ultimate Bearing Resistance	Maximum Allowable Bearing Pressure
Non-densified soil or structural fill placed thereon	75 kPa	50 kPa

Densified soil or structural fill placed thereon	112.5 kPa	75 kPa
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The bearing capacities provided above are subject to the following conditions:

- Raft foundation is setback a suitable distance from finished fill or cut slopes with locations approved by the Geotechnical Engineer;
- Site preparation is completed as described in Section 6.1 "Site Preparation" and load bearing surfaces are reviewed and approved by the Geotechnical Engineer;
- The perimeter of the raft foundation is placed a minimum of 600 mm below finished adjacent grade for frost protection and confinement purposes;
- Minimum width of strip and pad footing should be 0.45m and 0.6m respectively. A minimum embedment of 600 mm below finished adjacent grade for frost protection and confinement is recommended.

A modulus of subgrade reaction for raft slab design of 20,000 to 30,000 kN/m³ is considered appropriate for the subject property.

6.4 Pile Foundation Design

For preliminary design 300mm and 610mm diameter open-ended steel pile can be used for preliminary design. The ultimate axial capacity of the piles can be found in the attached Figure No 12 and 13. A resistance factor 0.5 should be used to calculate the ultimate factored capacity of the pile. A resistance factor 0.5 can only be used if Pile Driving Analyzer (PDA) tests are completed on some test/production piles. More details will be provided in the final report.

Preload should be completed in areas where piles are to be employed as the load is transferred to the lower silt layers.

6.5 Slab-on-Grade

Construction of raft slabs should comply with recommendations provided in Section 6.1 "Site Preparation". Floor slabs constructed on backfill placed on top of the raft slab should be prepared by placement of well-graded free draining structural fill with less than 5% fines content (passing the No. 200 sieve). The material should be placed in maximum 300mm thick lifts compacted to at least 95% Modified Dry Proctor Density (ASTM D 1557). A 100mm thick layer of 19mm clear crushed gravel should be placed beneath concrete slabs in order to provide a drainage and bedding layer. A layer of 6 mil poly vapor barrier should be placed over the clear crushed gravel to protect it from concrete contamination and to limit dampness of the concrete slab from capillary moisture effects.

6.6 Backfill

Backfill used for perimeter fill or for support of exterior sidewalks, driveways, patios etc. should consist of well-graded granular material with less than 5% fines passing the #200 sieve. The backfill should be

placed in thin lifts with a maximum thickness of 300mm compacted to at least 90% Modified Dry Proctor Density. The placement of the backfill should be monitored and density tested to confirm adequate compaction has been achieved for hardscaped areas.

6.7 Sub-Drainage

A perimeter drain should be installed in areas where floor slab is less than 150mm above adjacent finished grade consisting of a 150mm diameter perforated PVC pipe surrounded by 150 mm of 19 mm clear crushed gravel wrapped in non-woven filter fabric. The perimeter drain should be installed approximately 450 to 600mm below the top of the main floor slab. The perimeter drain should be connected to a pumped sump or suitable gravity outlet.

6.8 Below Grade Lateral Earth Pressures

Below grade walls should be backfilled with free draining, well graded granular soil hydraulically connected to the perimeter drain system. The backfill should be compacted to at least 95% Modified Proctor maximum dry density where surrounding area will be paved or have other settlement sensitive features. Otherwise, the backfill compaction can be limited to 90% of the same standard.

Recommended design lateral pressures for design of below grade walls considering active and at-rest pressure conditions are shown in the attached Figure 10 and 11, respectively.

6.9 Geotechnical Reviews

Geotechnical reviews are required to satisfy Letters of Assurance issued for building permits and to confirm general compliance with our designs and recommendations provided in this report. It is considered that geotechnical reviews will be required to address the following issues:

- confirmation of adequacy of stripping within the building envelope;
- review and confirmation of adequacy of ground densification;
- confirm adequate compaction effort of backfill and allowable bearing pressure of building foundation;
- review of backfill for sub-drainage system;
- review of perimeter backfill;
- Pile driving.

7.0 CLOSURE

Please be advised that the contents of this report are based on information (topographic survey, architectural drawings, etc.) provided to **exp** by others and **exp's** understanding of the proposed development as described in this report. If the development plans change, or if during construction the soil conditions are noted to be different than those described in this report, **exp** Services Inc. must be notified promptly and the recommendations on the geotechnical aspects of the proposed development reviewed and adjusted accordingly. This report assumes that **exp** will complete field reviews during construction.

This report was prepared for the exclusive use of our client and designated consultants or agents, and may not be used by other parties without the written permission of **exp** Services Inc. **Exp** should be permitted to review the final architectural and structural plans.

Contractors should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions. This geotechnical report should not be included in contract specifications without suitable qualifications and prior review by **exp** Services Inc. However, the geotechnical report may be used as an attachment to contract specifications, for information purposes only.

Exp's "Interpretation & Use of Study and Report Instructions" is attached. These instructions form an integral part of this report and should be included with any copies of this report.

If you have any questions regarding the contents of this report, please call the undersigned.

Sincerely,

exp Services Inc.



Ujjal Chakraborty, P.Eng.
Geotechnical Engineer

Reviewed by



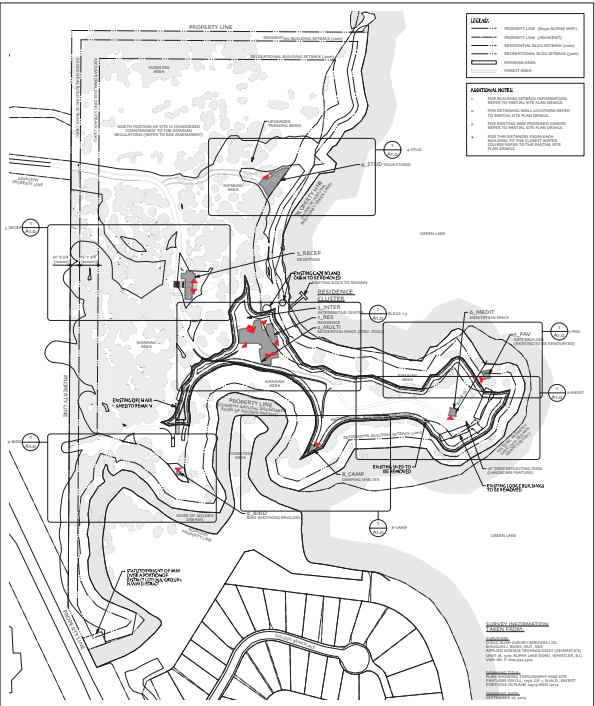
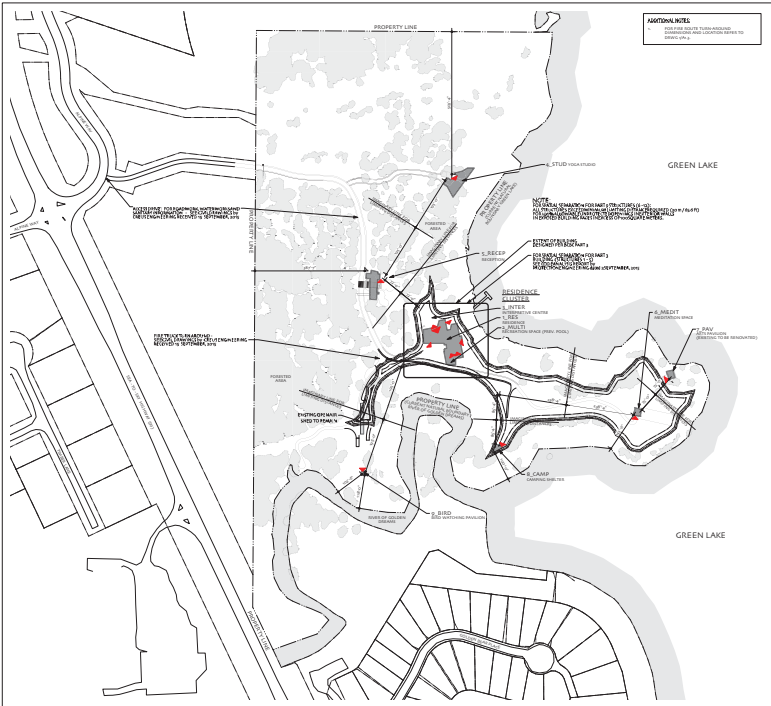
Evan Sykes, P.Eng.
Senior Geotechnical Engineer

Enclosures:

- Interpretation & Use of Study and Report
- Site and Fire Access Plans A0.1
- Figure 1 – Testhole Location Plan
- Figure 2 – Shear Wave Velocity Profile
- Figure 3– Acceleration Response Spectra for Near Surface
- Figure 4 – Acceleration Response Spectra at 2m below Grade
- Figure 5 – Acceleration Response Spectra Recommended
- Figure 6 – Peak Ground Acceleration Vs Depth Plot
- Figure 7 – Cyclic Stress Ratio Vs Depth Plot
- Figure 8 – Liquefaction Assessment Plot
- Figure 9 – Liquefaction Assessment Plot
- Figure 10 – Lateral Earth Pressure for Yielding Wall
- Figure 11 – Lateral Earth Pressure for Non-Yielding Wall
- Figure 12 – Axial Capacity Vs Depth for 300mm Diameter Steel Pipe Pile
- Figure 13 – Axial Capacity Vs Depth for 610mm Diameter Steel Pipe Pile
- Appendix A – Bore Hole Logs (BH15-01 to AH15-05)
- Appendix B – CPT Data and Interpretation Plots
- Appendix C – Photographs From Bore Hole BH15-01 and BH15-05
- Appendix D – Atterberg Limits
- Appendix E – Sieve Analysis Report
- Appendix F – Consolidation Test Results
- Appendix G – Topographic Survey

Appendix H – Draft Densification Specification

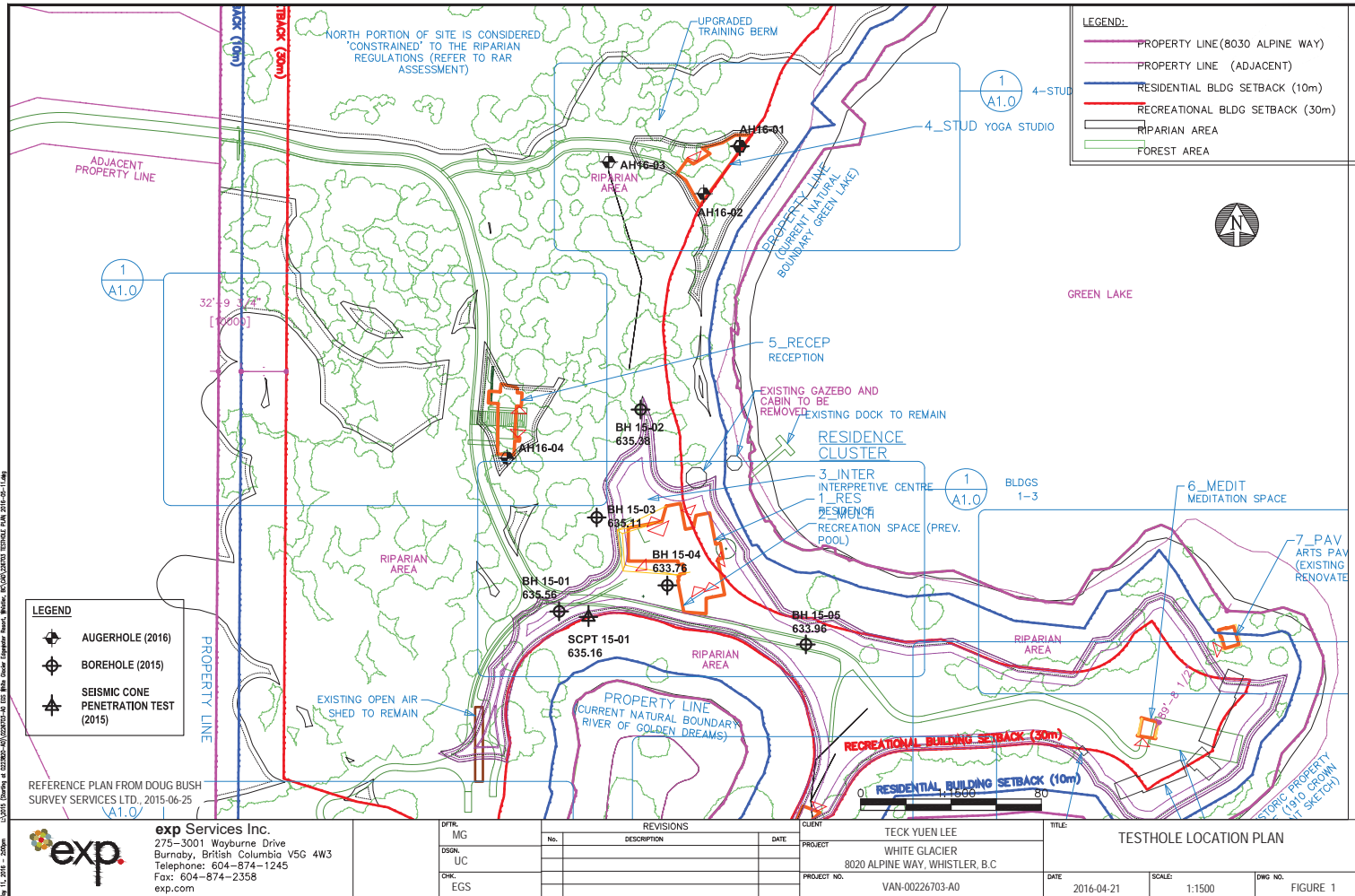
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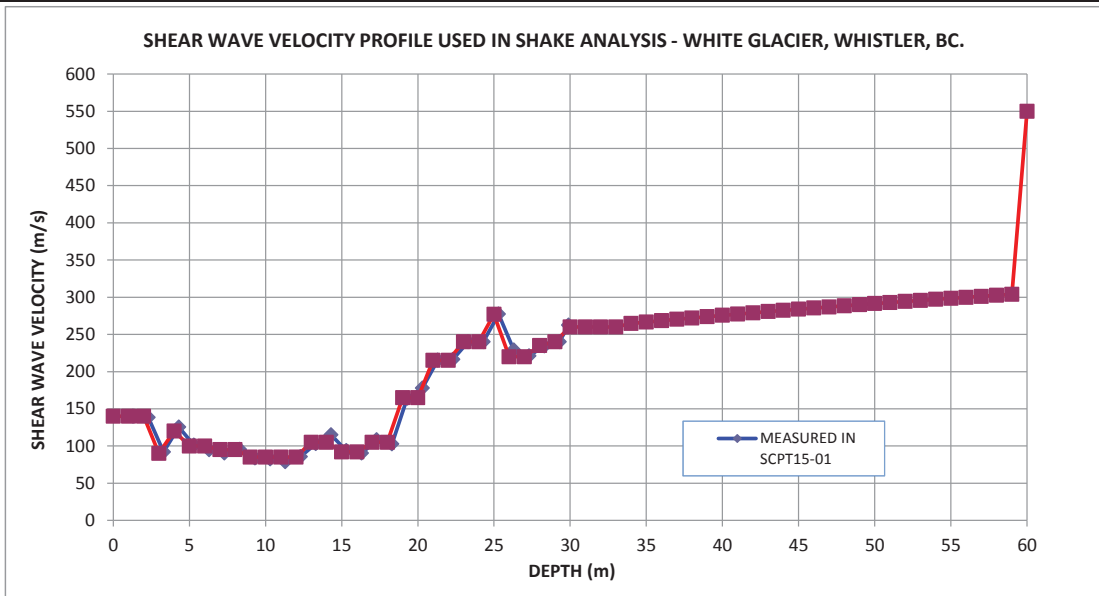


BUILDING SEPARATION PLAN
SCALE: 1" = 100' (1:1248)

SITE PLAN
SCALE: 1" = 100' (1:1248)

1	PRELIMINARY DRAWING ONLY - NFC	LAMOREUX ARCHITECT 1150 W. 10TH AVE. SUITE 100 DENVER, CO 80202 303.733.1111	PROJECT 01001	WHITE GLACIER 8000 ALPINEWAY, WYOMING 82401	DATE 11/04/19	SCALE 1" = 120'	DESIGNED BY ARCHITECT	PROJECT NO. SITE AND ACCESS PLANS	REVISION 0 ALL	DRAWING NO. A0.1
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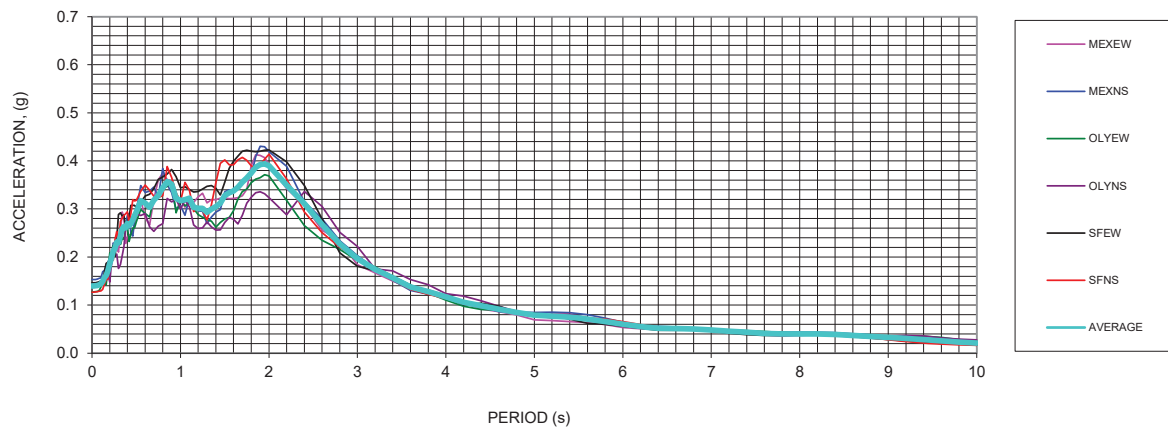
PROJECT
 White Glacier - Edgewater Resort

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TITLE:
 SHEAR WAVE VELOCITY PROFILE USED IN SHAKE ANALYSIS

DATE: 7/13/2015	SCALE: NTS	FIGURE: 2
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ACCELERATION RESPONSE SPECTRA AT GROUND SURFACE 1:2475 YEAR EVENT, 5% DAMPING



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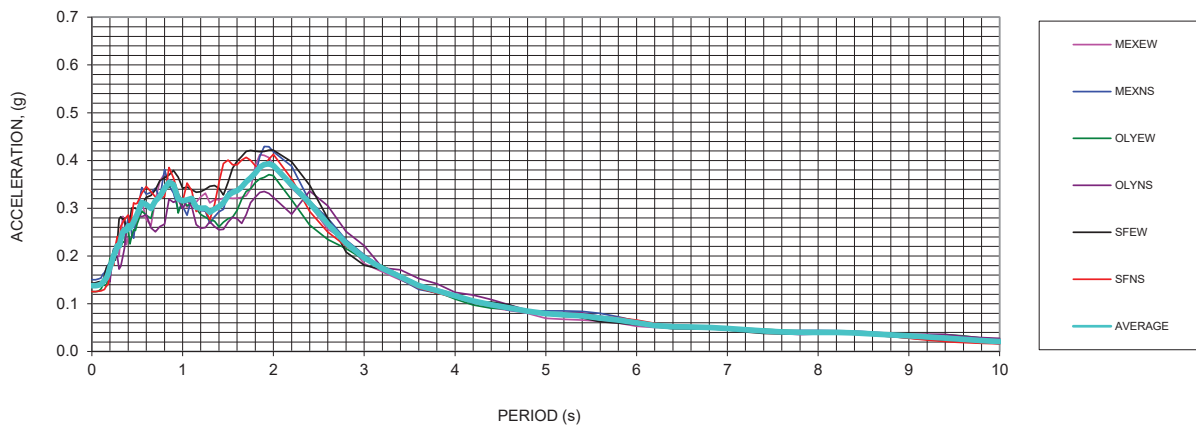
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:

ACCELERATION RESPONSE SPECTRA OF NEAR-SURFACE

DATE: 7/13/2015	SCALE: NTS	FIGURE: 3
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ACCELERATION RESPONSE SPECTRA 2m BELOW GROUND SURFACE SURFACE 1:2475 YEAR EVENT, 5% DAMPING



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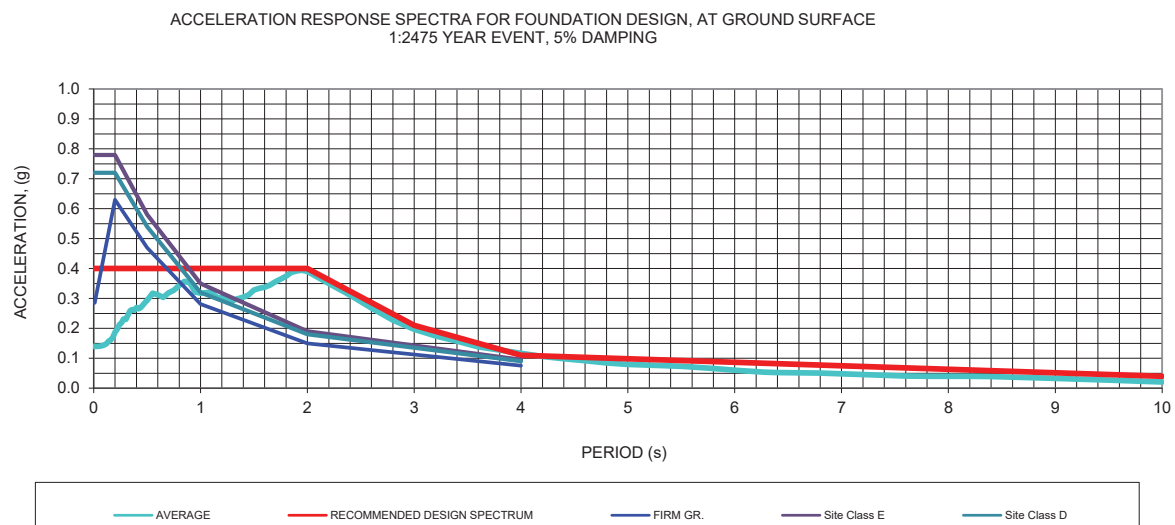
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PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:
 ACCELERATION RESPONSE SPECTRA AT 2M BELOW
 GROUND SURFACE

DATE: 7/13/2015	SCALE: NTS	FIGURE: 4
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White Glacier - Edgewater Resort

PROJECT NO.
226703

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UC

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UC

CHK.
EGS

TITLE:

ACCELERATION RESPONSE SPECTRA FOR FOUNDATION
DESIGN

DATE:

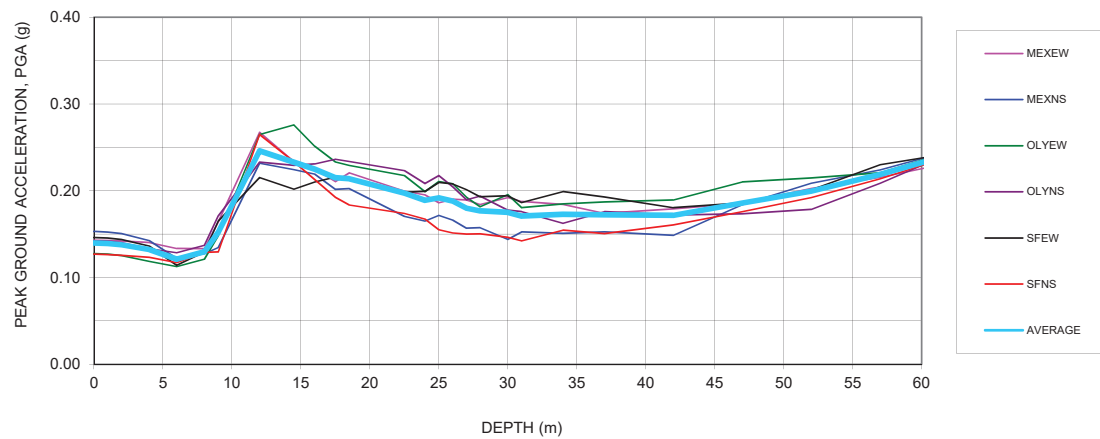
7/13/2015

SCALE:

NTS

FIGURE: 5

RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475 EVENT



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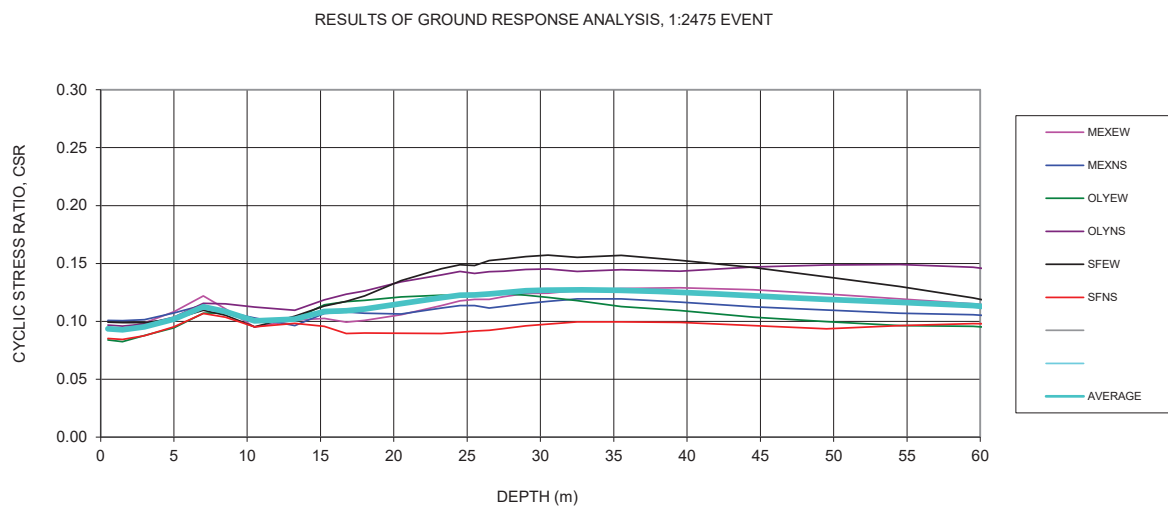
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PROJECT
 White Glacier - Edgewater Resort

PROJECT NO.	DFTR.	DSGN.	CHK.
226703	UC	UC	EGS

TITLE:
 RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, PGA

DATE:	SCALE:	FIGURE:
5/9/2016	NTS	6



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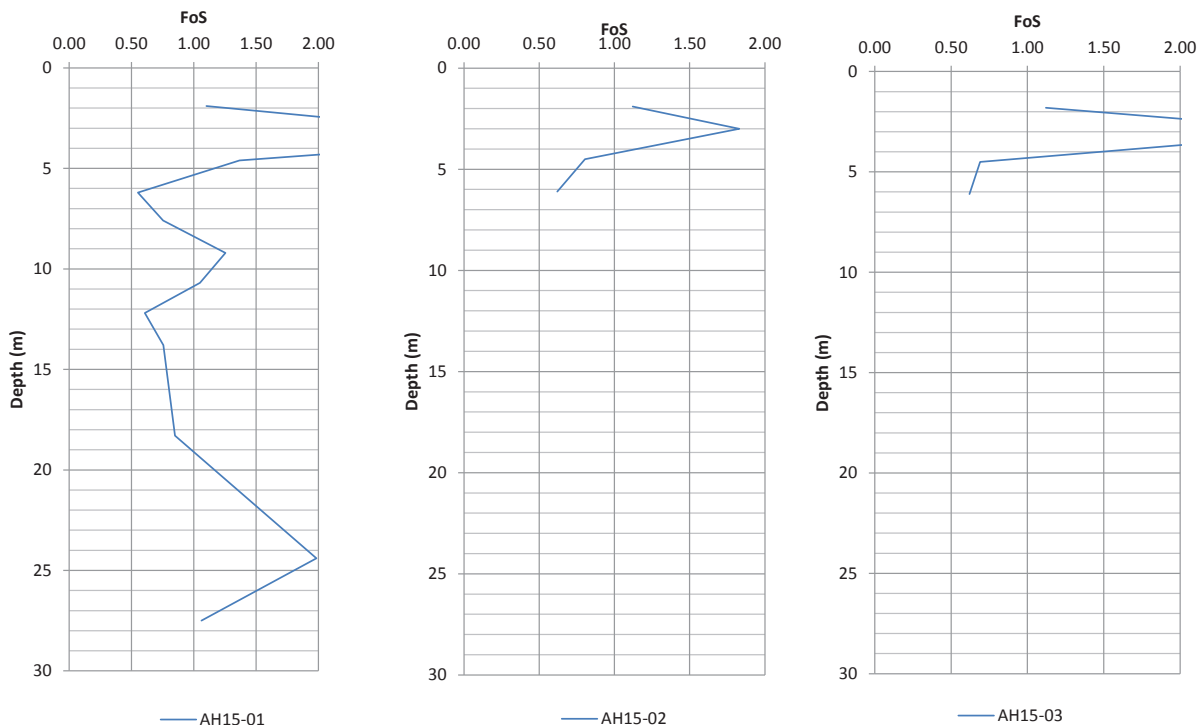
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:

RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, CSR

DATE: 7/13/2015	SCALE: NTS	FIGURE: 7
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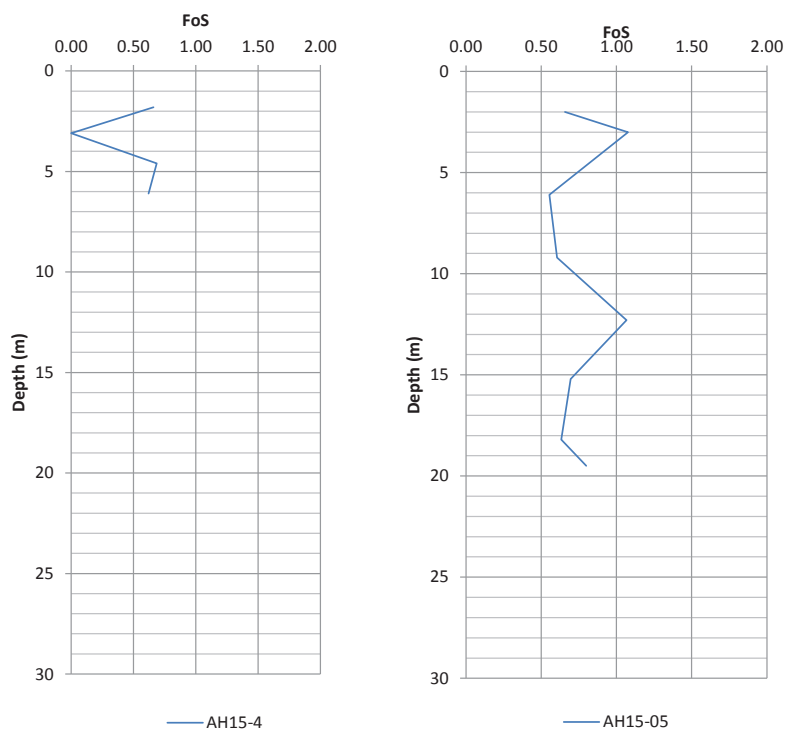
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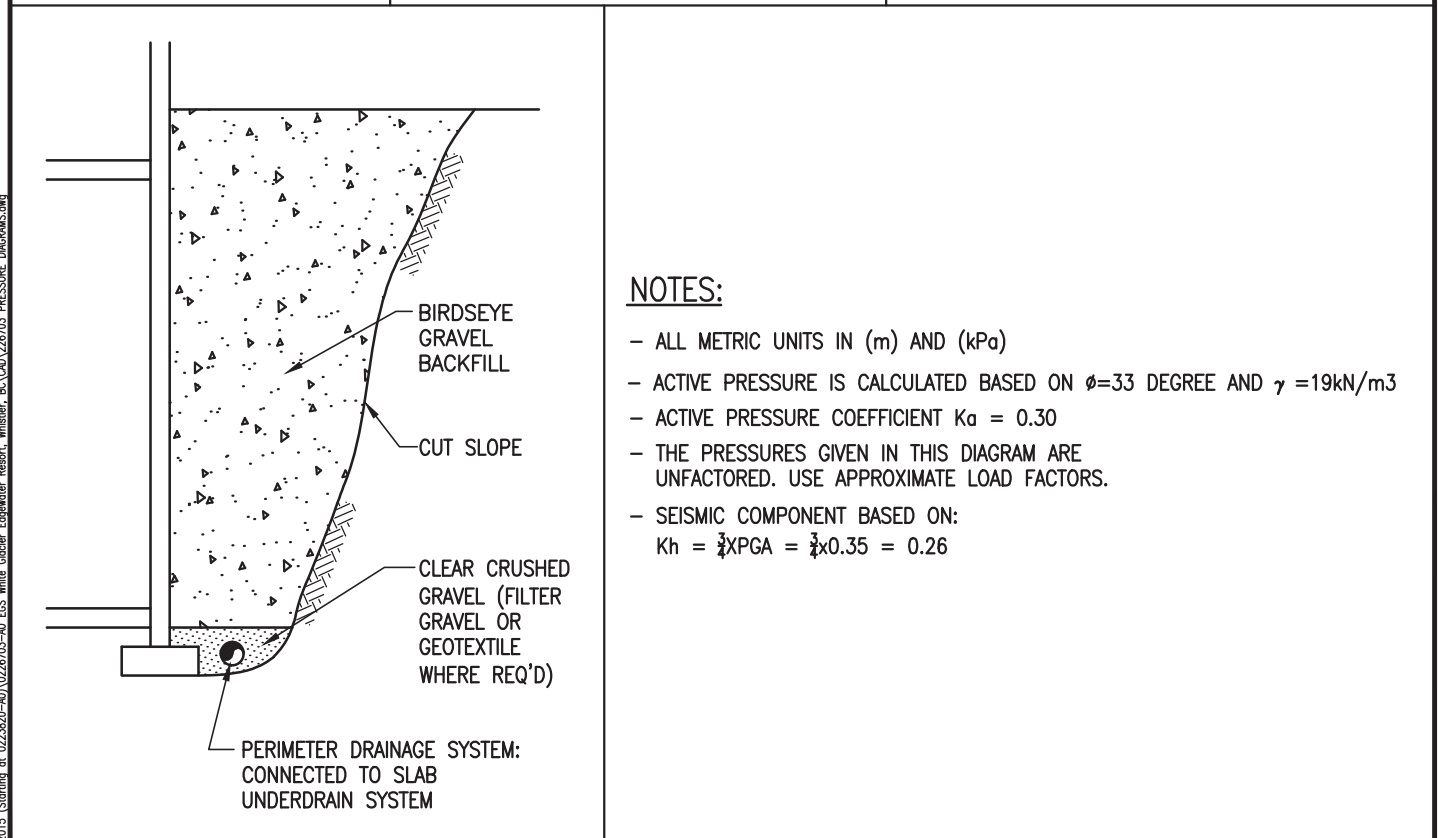
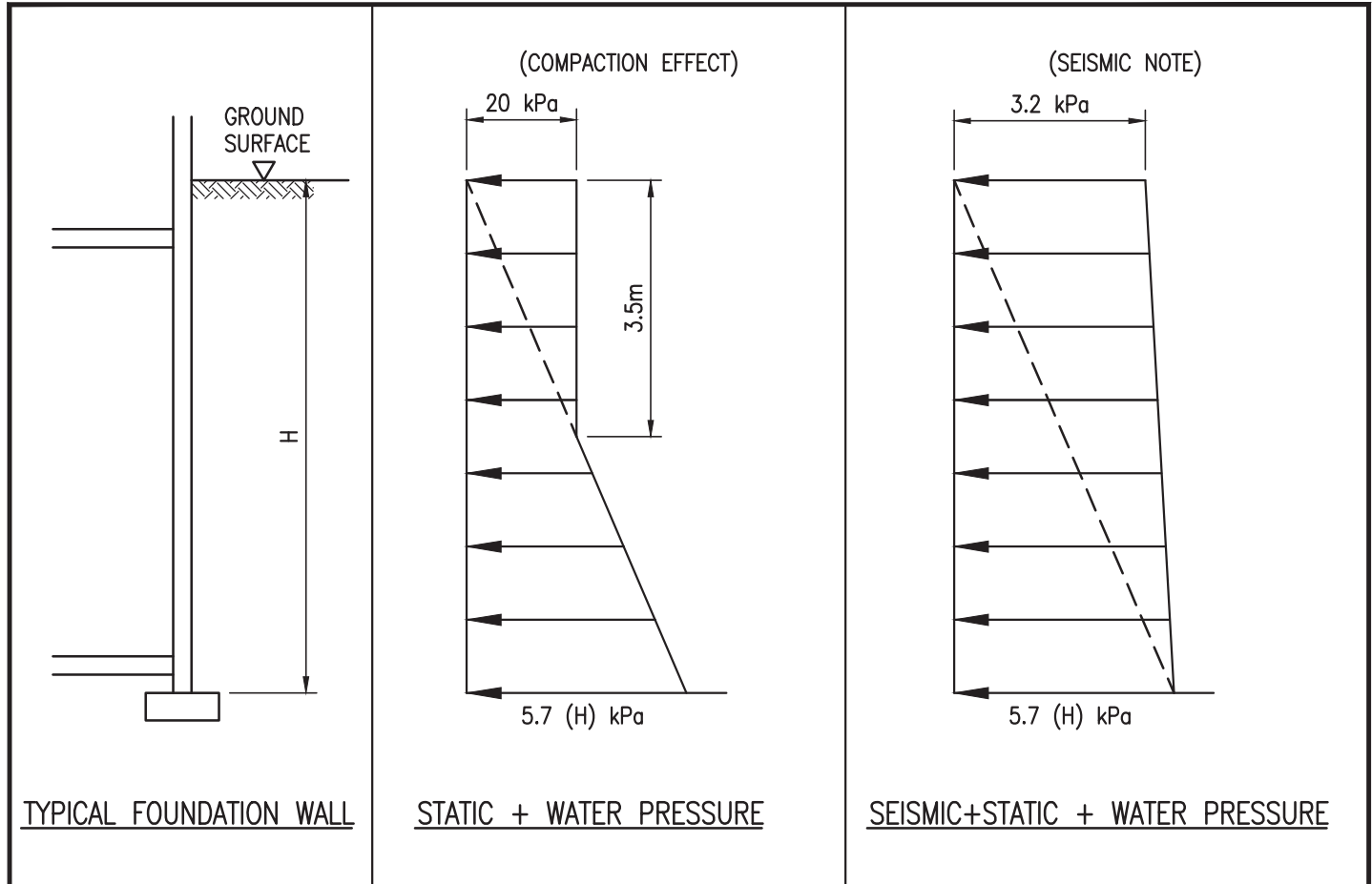
CLIENT: Teck Yuen Lee c/o Lameoureaux Architec Inc.				TITLE: Liquefaction Assessmnt		
PROJECT White Glacier - Edgewater Resort						
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS	DATE: 7/13/2015	SCALE: NTS	FIGURE: 8

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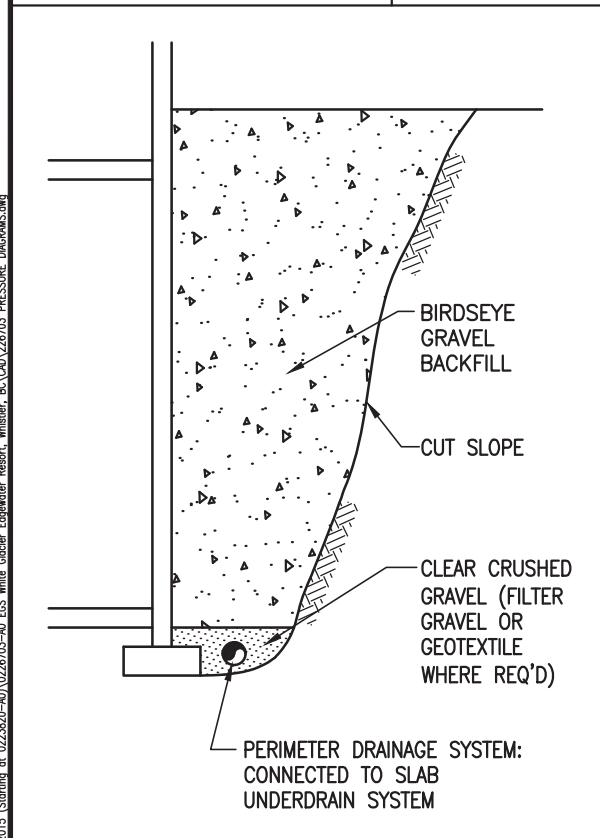
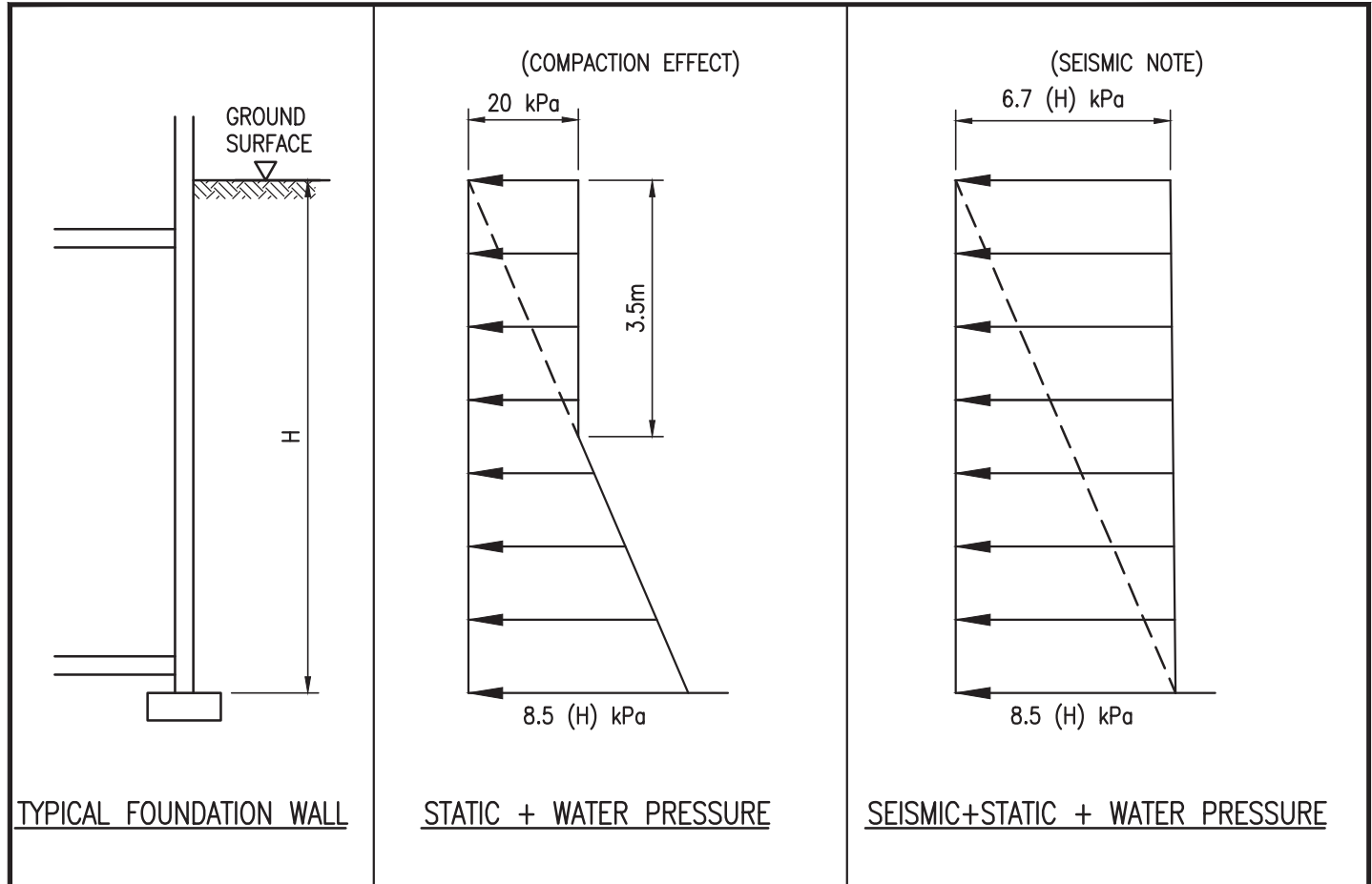


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CLIENT: Teck Yuen Lee c/o Lameoureaux Architec Inc.				TITLE: Liquefaction Assessmnt		
PROJECT White Glacier - Edgewater Resort						
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS	DATE: 7/13/2015	SCALE: NTS	FIGURE: 9



CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE ON YIELDING WALLS, 2475 E		
PROJECT WHITE GLACIER - EDGEWATER RESORT WHISTLER, B.C.						
PROJECT NO. VAN-00226703-A0	DFTR. MG	DSGN. UC	CHK. EGS	DATE 2015-07-08	SCALE: NTS	DWG NO. FIGURE 10



NOTES:

- ALL METRIC UNITS IN (m) AND (kPa)
- ACTIVE PRESSURE IS CALCULATED BASED ON $\phi=33$ DEGREE AND $\gamma = 19 \text{ kN/m}^3$
- EARTH PRESSURE AT REST COEFFICIENT $K_0 = 0.45$
- THE PRESSURES GIVEN IN THIS DIAGRAM ARE UNFACTORED. USE APPROXIMATE LOAD FACTORS.
- SEISMIC COMPONENT BASED ON:
 $K_h = \text{PGA} = 0.35g$



CLIENT

TECK YUEN LEE

PROJECT

WHITE GLACIER - EDGEWATER RESORT
WHISTLER, B.C.

PROJECT NO.

VAN-00226703-A0

DFTR.

MG

DSGN.

UC

CHK.

EGS

TITLE:

LATERAL EARTH PRESSURE ON
NON-YIELDING WALLS, 2475 E

DATE

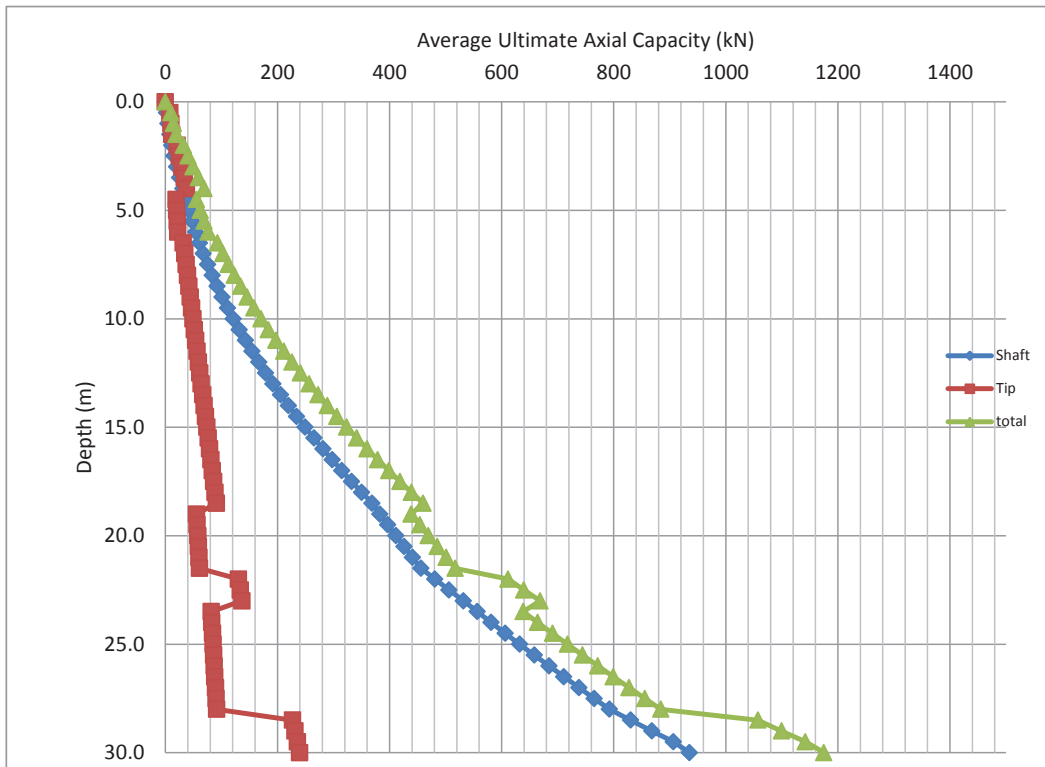
2015-07-08

SCALE:

NTS

DWG NO.

FIGURE 11



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PROJECT
White Glacier - Edgewater Resort

PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:
 Ultimate Axial Capacity for 300mm
 Diameter Openended Steel Pipe Pile

DATE: 7/13/2015	SCALE: NTS	FIGURE: 12
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Appendix A

Bore Hole Logs

BH15-01 to BH15-05

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1A3.8 801 A9' : (Δ A1A5 A\$A-' -/ PMS-AA00.5

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PR			ÄPT Ä\$#	LS			LU ⬢
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PL			TPOM				
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2 3-45 .1 Ä64 ! VNVQVÄ#68ÄYG4; 5ÄÄ4: 6Ä!03
' " // #Ä %6 !ÄÄ !& !7 #Ä %6 _JA Ä

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'90 1". TNSMSTÄ-
/Ä"3.#Ä 8 01 ÄÄ 9' : (∇ Ä1Ä-5 Ä \$ÄÄ-' ' - / PMS-ÄÄÄ.00.5
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#Ä-' ~ /Ä 5 18"# Ä.4: 6ÄC0.
2 3 4Ä5 1 Ä64 ! WNVQVÄ68ÄYG4; 5ÄÄ.4: 6Ä!03
' " // #Ä % 6 IÄÄ 17 #Ä % 6 IÄ Ä

I' - .1 #.68ÄÖ.4Ä&..
4Ä"; !1Ä"!01-". OVQVÄ.4Ä' 1D'Ä' F+;30ÄW
%"Ä&" Ä"!0 1-". B ÄSSSVLNMVSUÄÄNPSLMVSU
'90 1-". TNSMNOÄ-
I/Ä.3#Ä 8 01 ÄÄ 9' : (∇ Ä1Ä-5 Ä\$ÄÄ-'-'-/ QMR-ÄÄÄ00.5
∇ 01Ä.#Ä"\$ÄÄ-'-'-/ JJJ
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!) \$ # X <=		Ä # @ (# (Ä %&A)ÄC@%#%B	Ä)&) HM !)\$# X <=	Ä(Y \$&) Ä			Ä\$#ÄBÄH(ÄZ) W&' Ä~VW	\$ C)# Ä\$)BM Ä\$S1= ⊙	>B) ÄÄ B#) B# <[= □
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					ÄNO	Ä\$#	LS			QL ⬢ NL ⬢
S					ÄNU	AW				
T			JÄD 0+Ä,EÄ9Ä0.-414;+Ä10.ÄE0.bG.4;ÄÄ+1-I3. 0 JÄ,661+413ÄD0+Ä,EÄ,0/14ÄÄ9,FÄ5.I;F	TQUMV	ÄRV	Ä\$#	TL			TU ⬢

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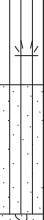




#Ä-' - /Ä!" 1 Ä011 "Ä YG5ÄWÄ 034/ÄC, MÄ&5M

#Ä-' - /Ä 5 18"# ÄÄ: 6ÄC0.

2 3-45 ! 1 Ä64 ! WNVQVÄÄ 68ÄYG4: 5ÄÄ4: 6Ä!03

" " // #Ä %6 !ÄÄ 1& !7 #Ä %6)Ä Ä

' - .1 #. 68ÄÇ.4Ä&..
4Ä"; ! 1Ä " ! 01-". OVQVÄ 4.Ä' 1DÄ F-; 30*ÄW
%"Ä&" Ä"10 1-". B ÄSSSSVQSMRLRÄÄVNPMLTRN
'90 1-". TNSMPPÄ-
/Ä"3.#Ä 8 01 ÄÄ 9' : (∇ Ä 1Ä-5 Ä \$ÄÄ-' -/ PMQ-ÄÄ.00.5
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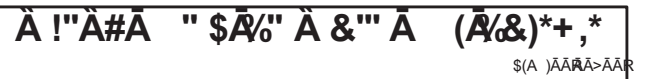
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Appendix B

CPT

CPT Data and Interpretation Plots

PRESENTATION OF SITE INVESTIGATION RESULTS

Green Lake, Whistler

Prepared for:

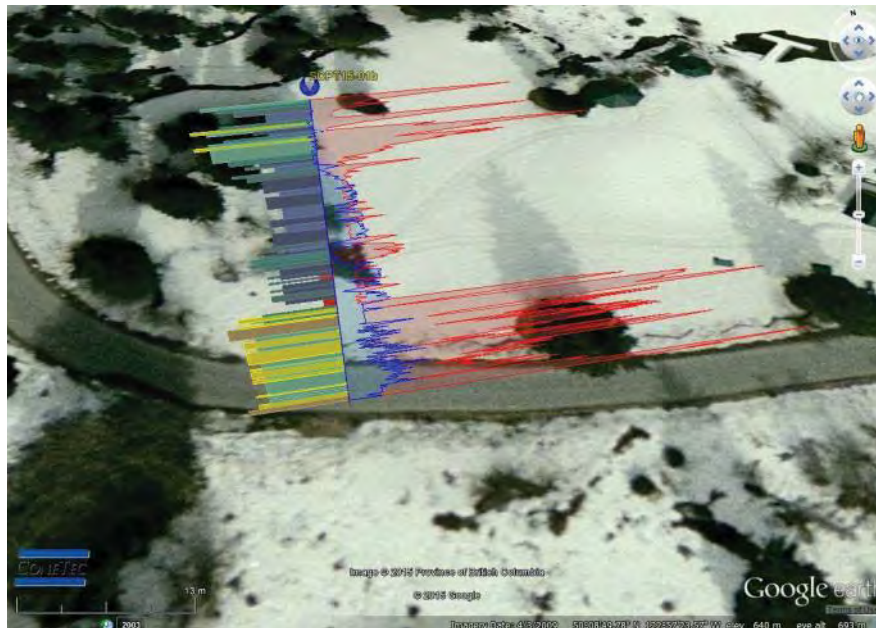
exp Services Inc – Burnaby, BC

ConeTec Job No: 15-02049

Project Start Date: 02-Jun-2015

Project End Date: 02-Jun-2015

Report Date: 03-Jun-2015



Prepared by:

ConeTec Investigations Ltd.
12140 Vulcan Way
Richmond, BC V6V1J8

Tel: (604) 273-4311
Fax: (604) 273-4066
Toll Free: (800) 567-7969

Email: insitu@conetec.com
www.conetec.com
www.conetecdataservices.com



Introduction

This report presents the data gathered by ConeTec Investigations Ltd. on June 2nd 2015. The work, which consisted of 1 SCPT sounding, was conducted next to Green Lake along Alpine Way in Whistler, BC.

Project Information

Project	
Client	exp Services Inc - Burnaby, BC
Project	Green Lake, Whistler
ConeTec project number	15-02049

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Track Rig (M5T)	14 ton rig cylinder	SCPT

Coordinates			
Test Type	Collection Method	EPSG Number	Comments
SCPT	Consumer Grade GPS	32610	Coordinates were collected using a consumer grade GPS device; elevations are not reported

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	Seismic and Advanced, Su (Nkt)
Additional comments	

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm ²)	Sleeve Area (cm ²)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
328:T1500F15U500	AD328	15	225	1500	15	500
Cone AD328 was used for all CPT soundings.						

Interpretation Tables	
Additional information	The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997) was used to classify the soil for this project.

Limitations

This report has been prepared for the exclusive use of exp Services Inc - Burnaby, BC (Client) for the project titled "Green Lake, Whistler". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Investigations Ltd. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm² and 15 cm² tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm² penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm² piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u₂" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

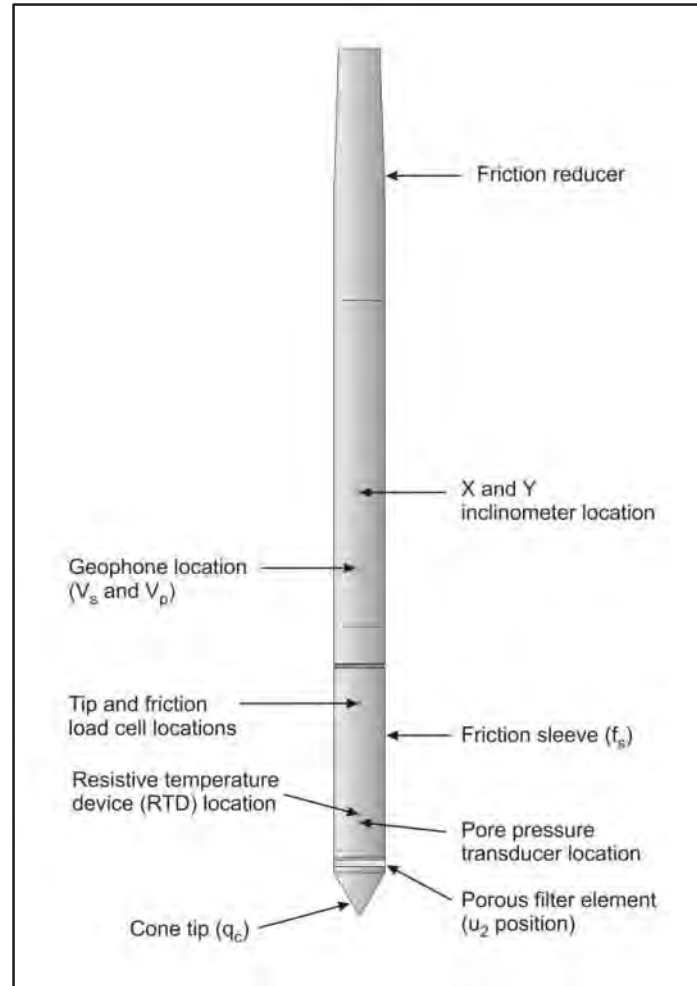


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerine or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerine under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behaviour type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where: q_t is the corrected tip resistance

q_c is the recorded tip resistance

u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)

a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (V_p) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

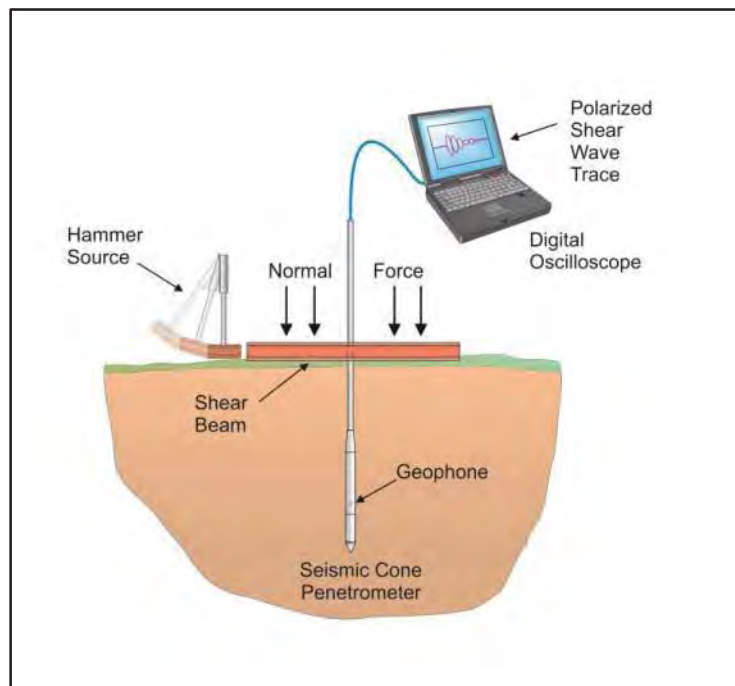


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

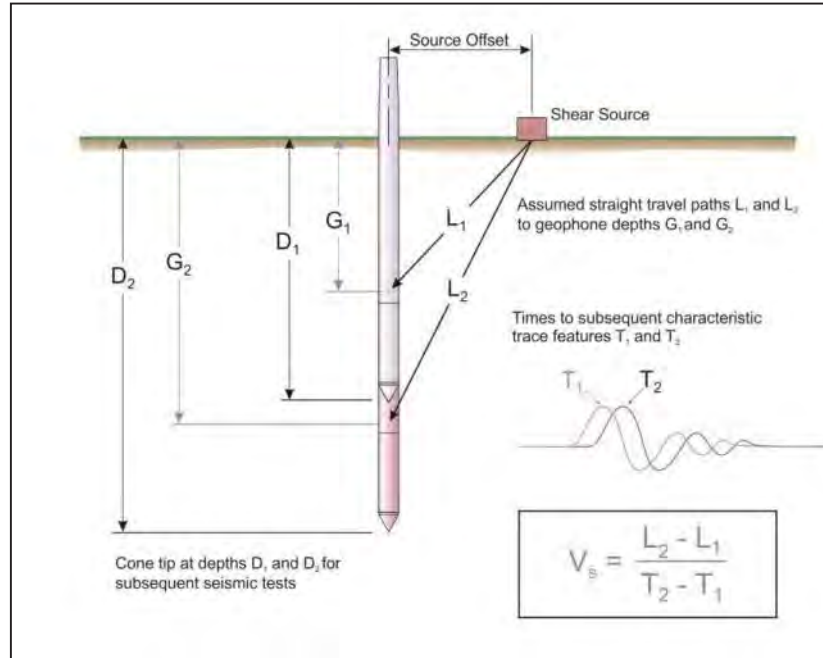


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 30 meters (V_{s30}) has been calculated and provided for all applicable soundings using an equation presented in Crow et al., 2012.

$$V_{s30} = \frac{\text{total thickness of all layers (30m)}}{\sum(\text{layer traveltimes})}$$

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

Crow, H.L., Hunter, J.A., Bobrowsky, P.T., 2012, "National shear wave measurement guidelines for Canadian seismic site assessment", GeoManitoba 2012, Sept 30 to Oct 2, Winnipeg, Manitoba.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

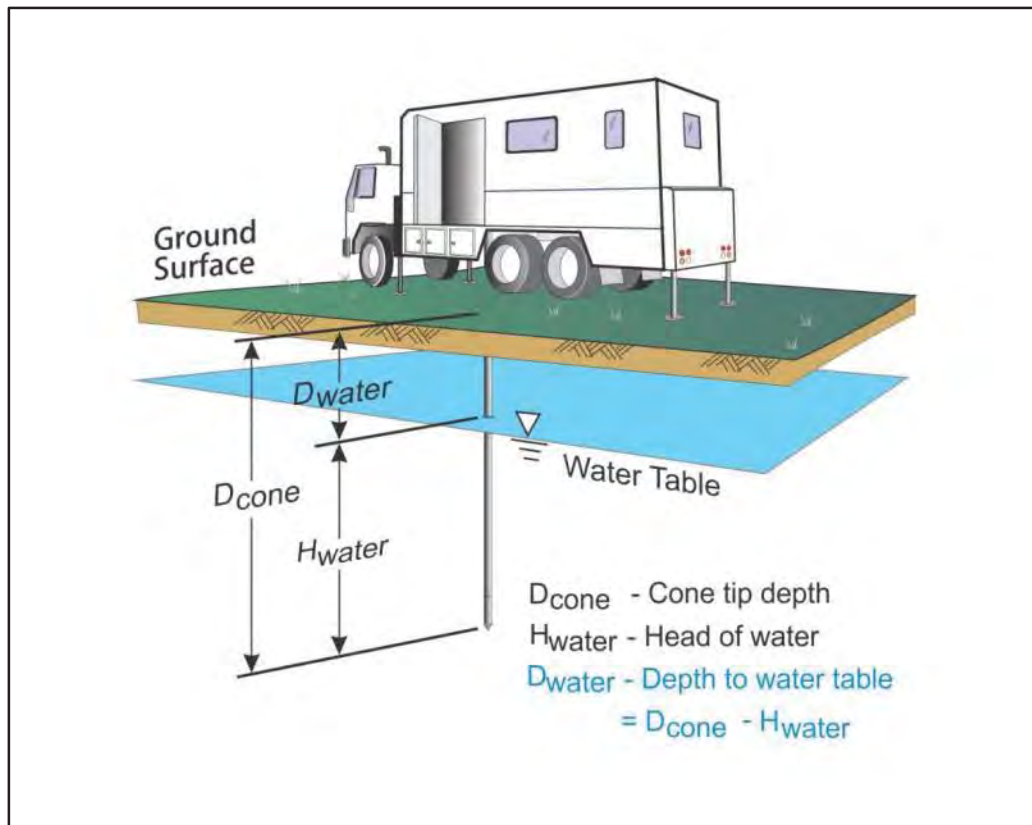


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behaviour.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

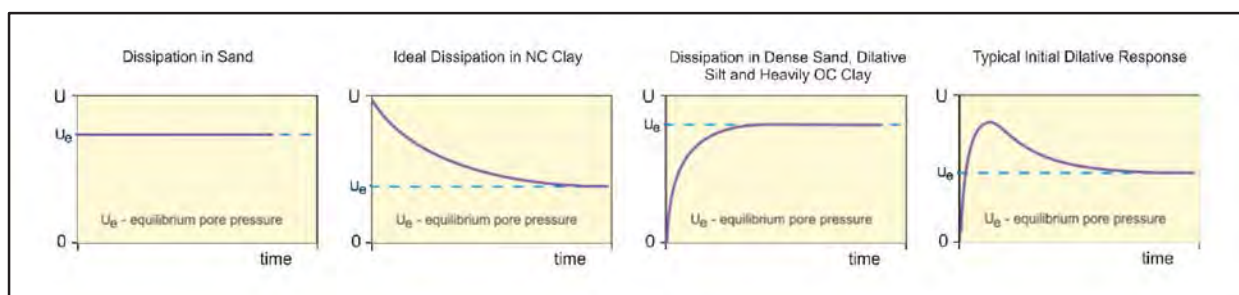


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100} . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100} . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T^*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- T^* is the dimensionless time factor (Table Time Factor)
 a is the radius of the cone
 I_r is the rigidity index
 t is the time at the degree of consolidation

Table Time Factor. T^* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50} , dissipation tests must be taken to a pressure less than u_{50} . The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100} . To estimate u_{50} , both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50} . In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r , the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50} , other methods should be applied to confirm the results for c_h .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots, S_u (Nkt)
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface ¹ (m)	Final Depth (m)	Northing ² (m)	Easting (m)	Refer to Notation Number
SCPT15-01b	15-02049_SCP01b	02-Jun-2015	AD328:T1500F15U500	1.4	30.00	5554986	503134	

1. Assumed phreatic surface based on pore pressure dissipation tests. The equilibrium pore pressure profile was used for the interpretation tables.

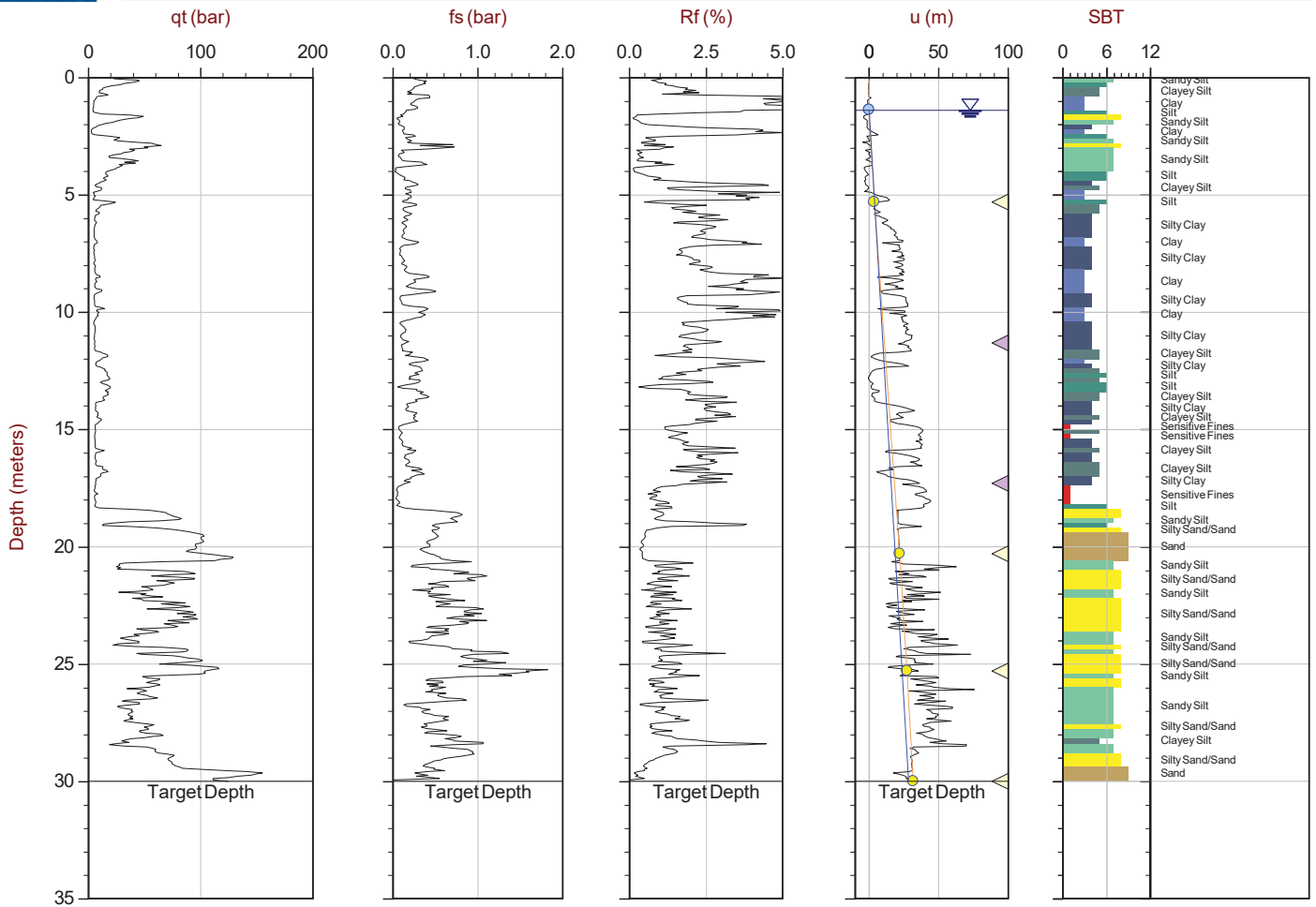
2. Coordinate were collected using a consumer grade GPS device with datum WGS84/UTM Zone 10 North.



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft

File: 15-02049_SCP01B.COR
UnitWt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Avg Int: 0.200 m

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

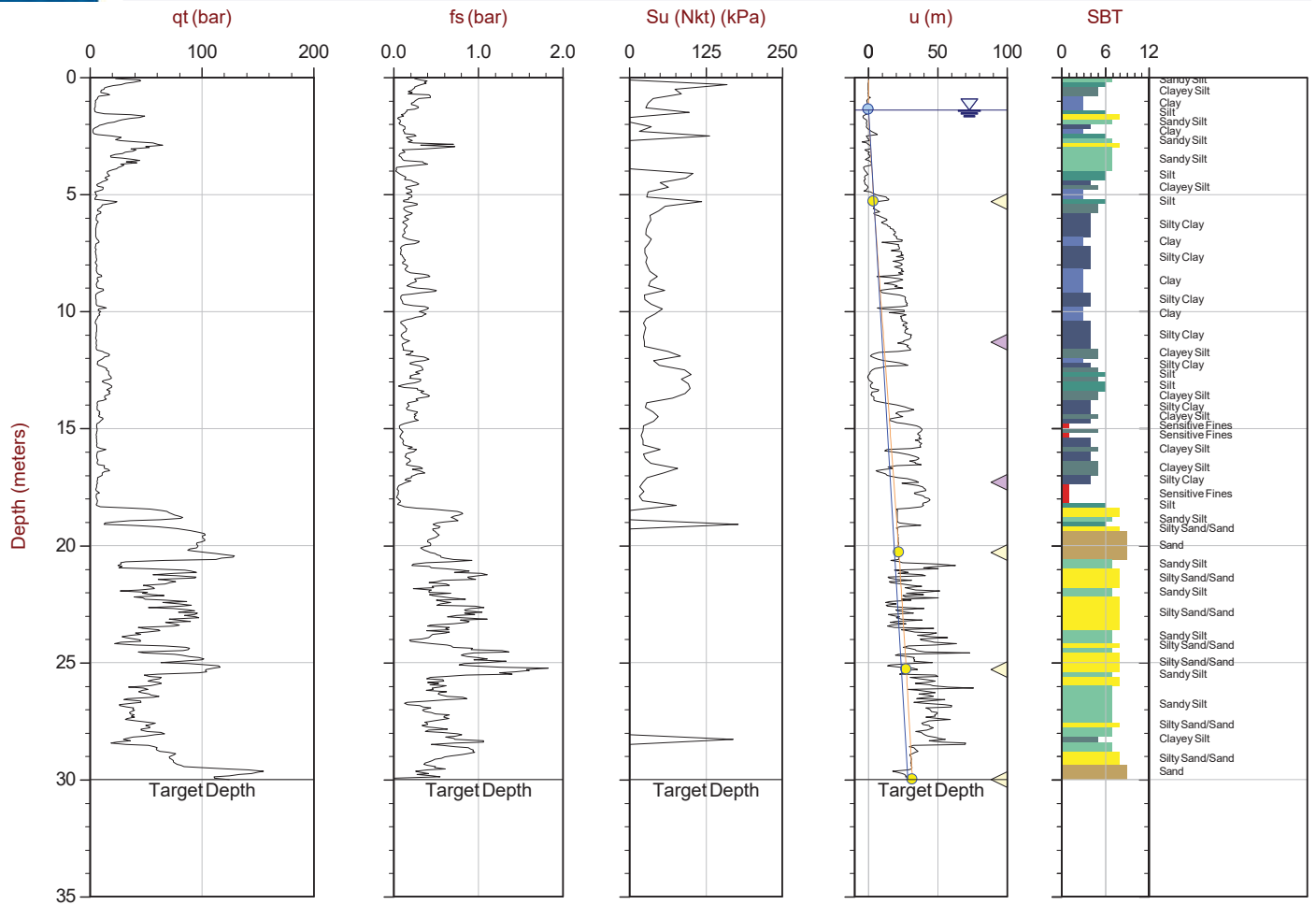
Advanced Cone Penetration Test Plots Undrained Shear Strength (Nkt)



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft

File: 15-02049_SCP01B.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Avg Int: 0.200m Su Nkt: 15.0 ● Assumed Ueq ● Ueq — Hydrostatic Line — Ueq Profile ▲ PPD, Ueq achieved ▼ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

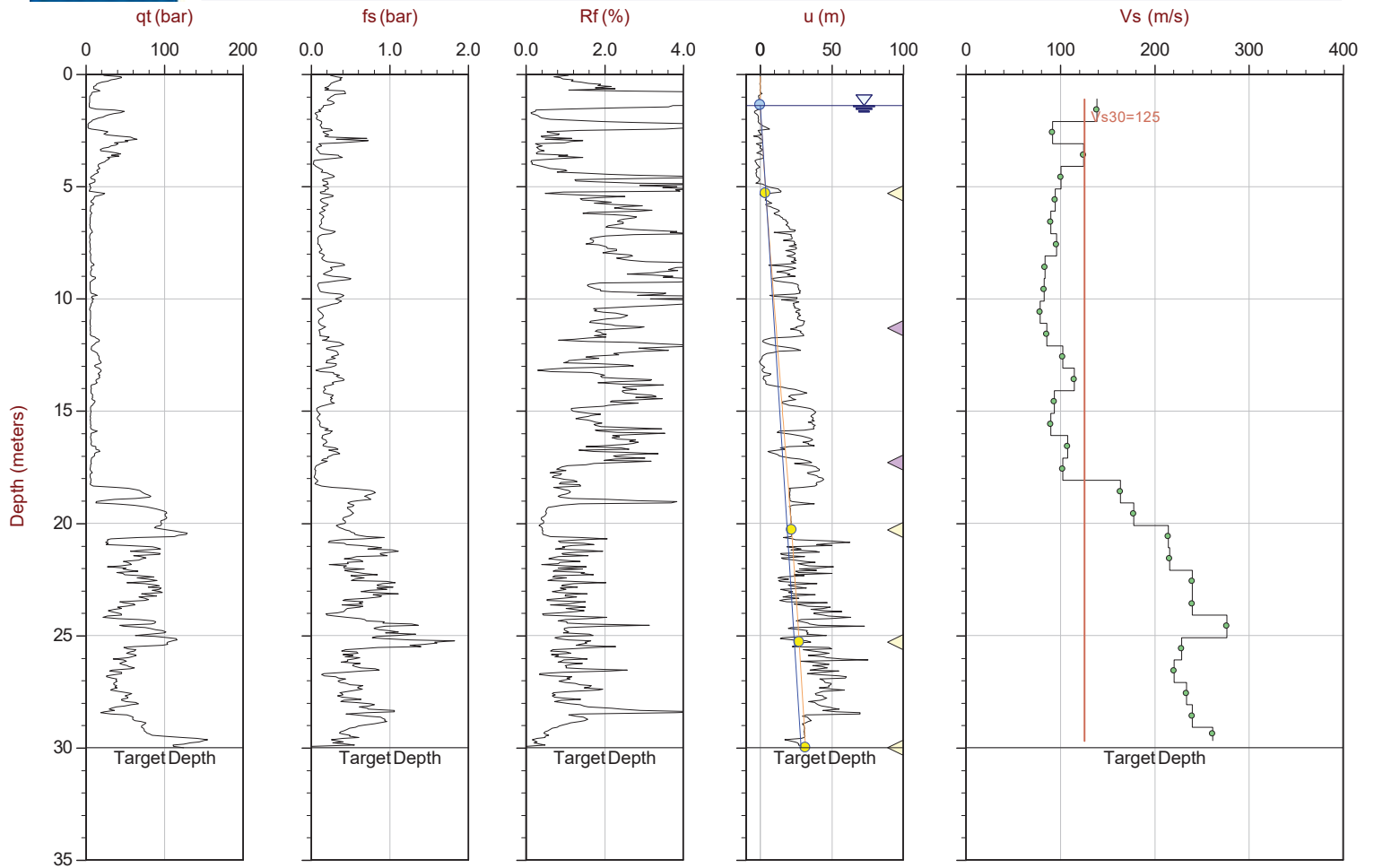
Seismic Cone Penetration Test Plots



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 15-02049 SCP01B.COR
UnitWt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
1.30	1.10	1.17			
2.30	2.10	2.14	0.97	6.98	139
3.30	3.10	3.13	0.99	10.74	92
4.30	4.10	4.12	0.99	7.92	125
5.30	5.10	5.12	1.00	9.85	101
6.30	6.10	6.11	1.00	10.52	95
7.30	7.10	7.11	1.00	11.05	90
8.30	8.10	8.11	1.00	10.46	96
9.30	9.10	9.11	1.00	11.95	84
10.30	10.10	10.11	1.00	12.09	83
11.30	11.10	11.11	1.00	12.71	79
12.30	12.10	12.11	1.00	11.65	86
13.30	13.10	13.11	1.00	9.70	103
14.30	14.10	14.11	1.00	8.68	115
15.30	15.10	15.11	1.00	10.65	94
16.30	16.10	16.10	1.00	11.07	90
17.30	17.10	17.10	1.00	9.23	108
18.30	18.10	18.10	1.00	9.73	103
19.30	19.10	19.10	1.00	6.10	164
20.30	20.10	20.10	1.00	5.62	178
21.30	21.10	21.10	1.00	4.64	215
22.30	22.10	22.10	1.00	4.62	216
23.30	23.10	23.10	1.00	4.17	240
24.30	24.10	24.10	1.00	4.16	240
25.30	25.10	25.10	1.00	3.61	277
26.30	26.10	26.10	1.00	4.37	229
27.30	27.10	27.10	1.00	4.52	221
28.30	28.10	28.10	1.00	4.27	234
29.30	29.10	29.10	1.00	4.17	240



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
29.90	29.70	29.70	0.60	2.29	262

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm ²)	Duration (s)	Test Depth (m)	Estimated Equilibrium Pore Pressure U _{eq} (m)	Calculated Phreatic Surface (m)	Estimated Phreatic Surface (m)	t ₅₀ ^a (s)	Assumed Rigidity Index (I _r)	c _h ^b (cm ² /min)
SCPT15-01b	15-02049_SCP01b	15	300	5.30	3.9	1.4		19	100	36.2
SCPT15-01b	15-02049_SCP01b	15	700	11.30	9.9		1.4	599	100	1.2
SCPT15-01b	15-02049_SCP01b	15	300	17.30	15.9		1.4	165	100	4.3
SCPT15-01b	15-02049_SCP01b	15	300	20.30	22.0	-1.7			100	
SCPT15-01b	15-02049_SCP01b	15	500	25.30	27.4	-2.1		14	100	49.91
SCPT15-01b	15-02049_SCP01b	15	400	30.00	31.8	-1.8			100	

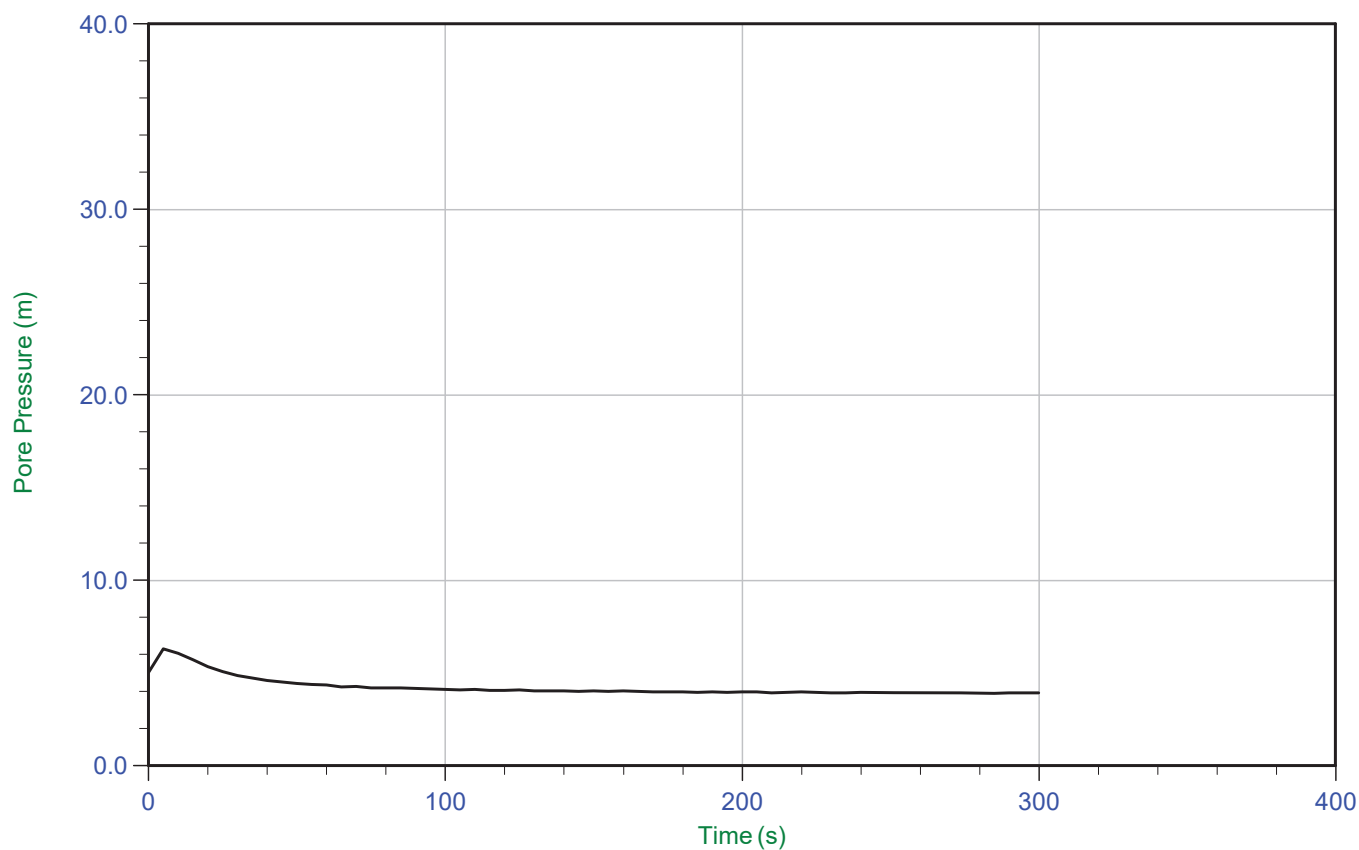
a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



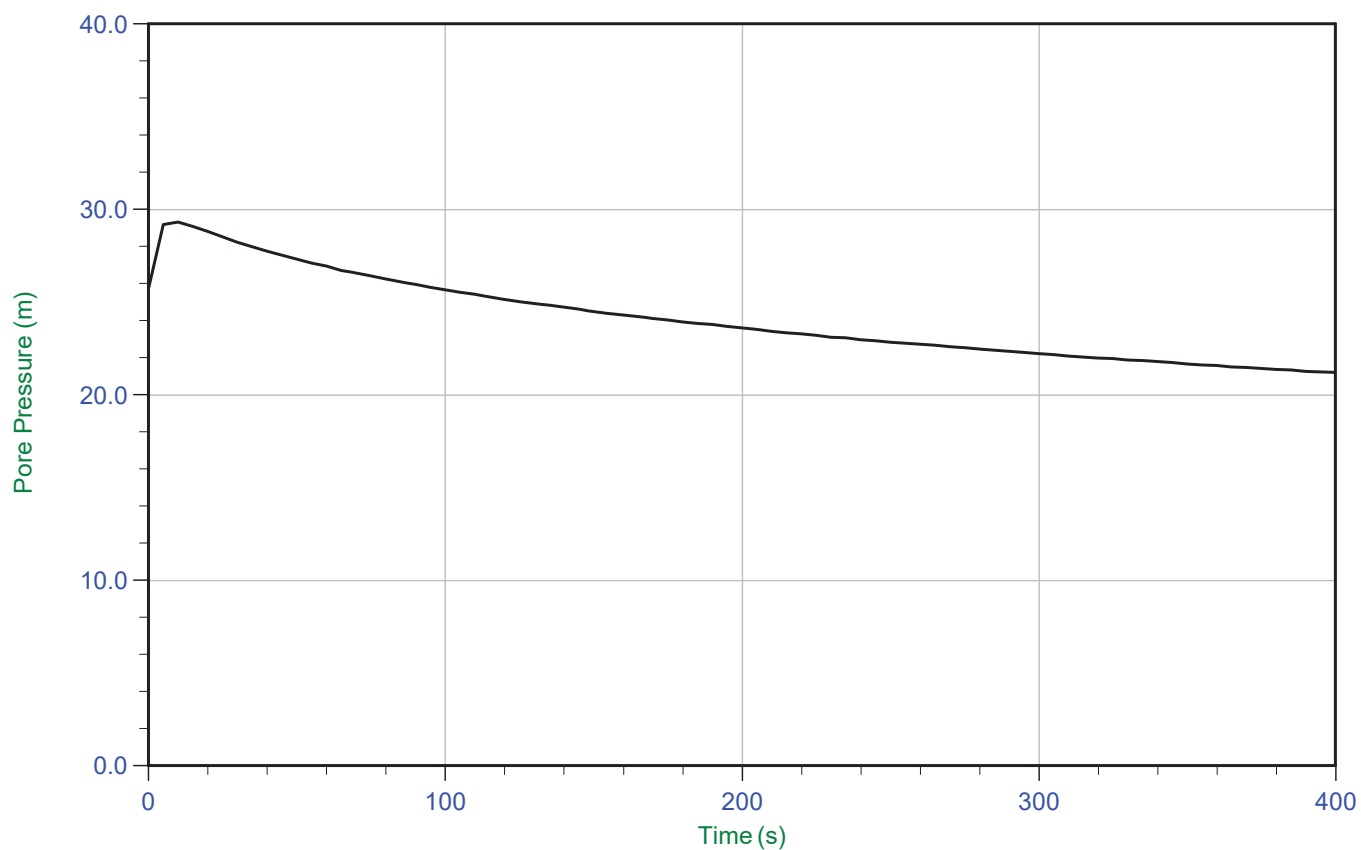
Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 3.9 m	WT: 1.382 m / 4.534 ft	T(50): 19.4 s
	Depth: 5.300 m / 17.388 ft	U Max: 6.3 m	Ueq: 3.9 m	Ir: 100
	Duration: 300.0 s		U(50): 5.11 m	Ch: 36.1 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



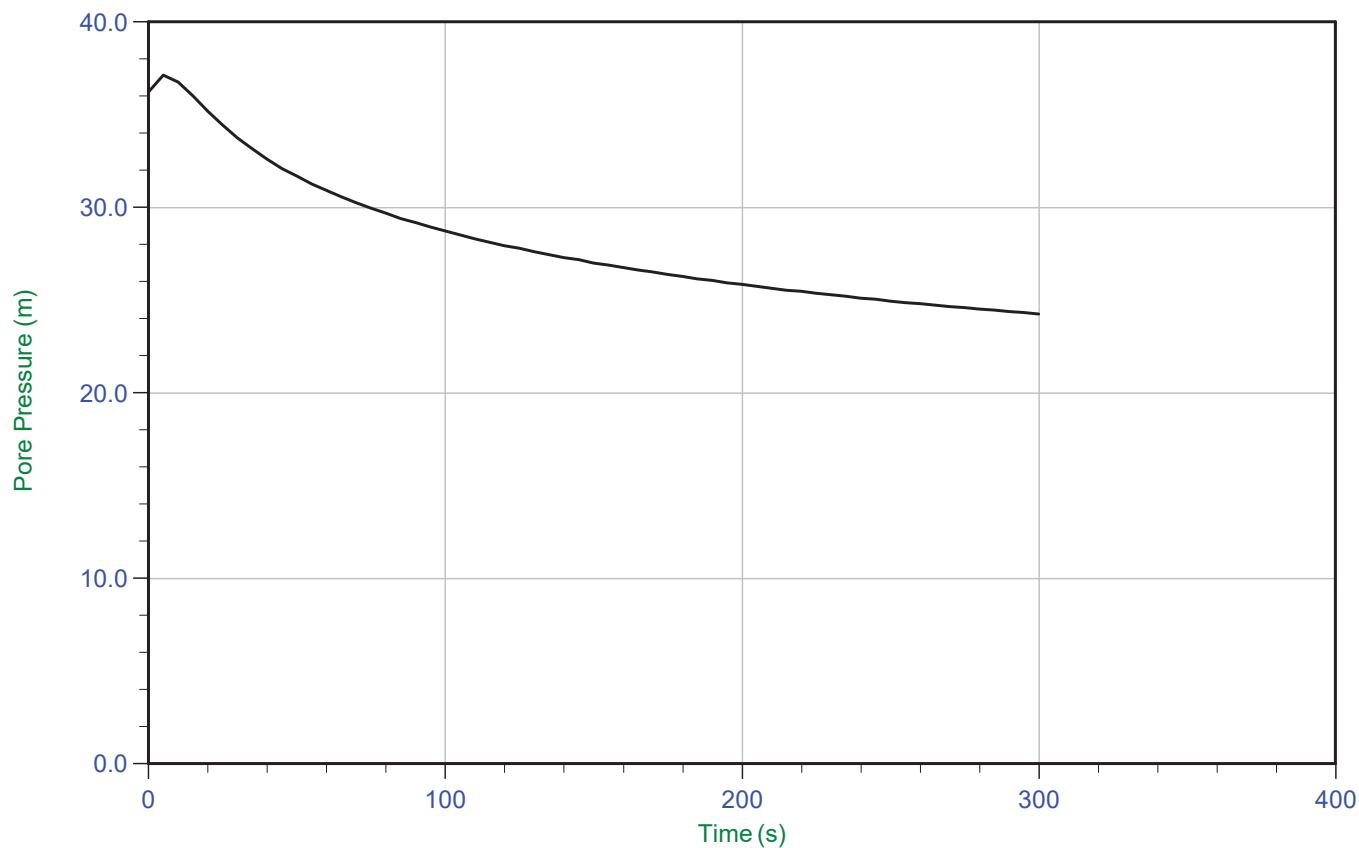
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 19.1 m WT: 1.382 m / 4.534 ft T(50): 598.6 s
 Depth: 11.300 m / 37.073 ft U Max: 29.3 m Ueq: 9.9 m Ir: 100
 Duration: 700.0 s U(50): 19.62 m Ch: 1.2 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



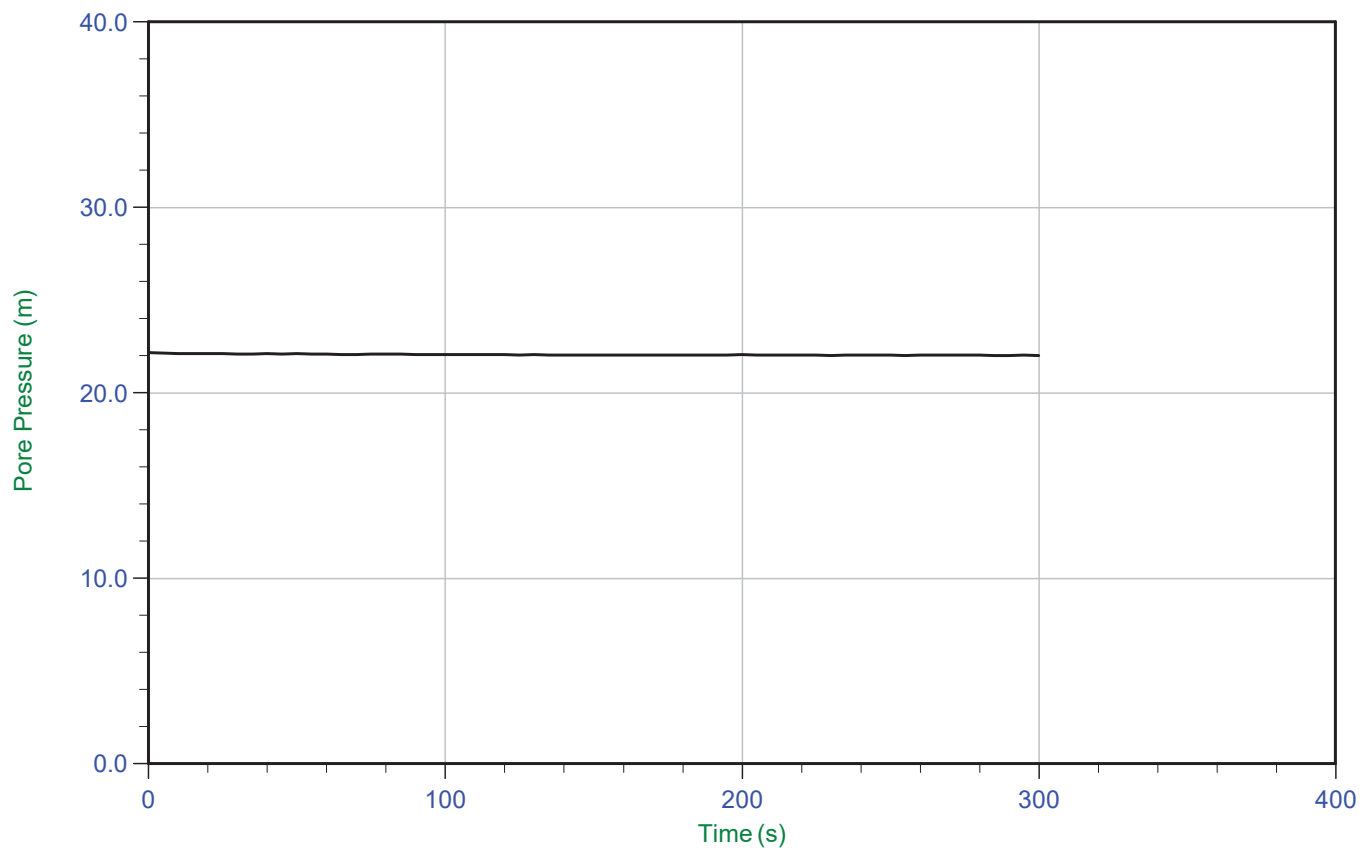
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 24.3 m WT: 1.382 m / 4.534 ft T(50): 164.6 s
 Depth: 17.300 m / 56.758 ft U Max: 37.1 m Ueq: 15.9 m Ir: 100
 Duration: 300.0 s U(50): 26.52 m Ch: 4.3 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



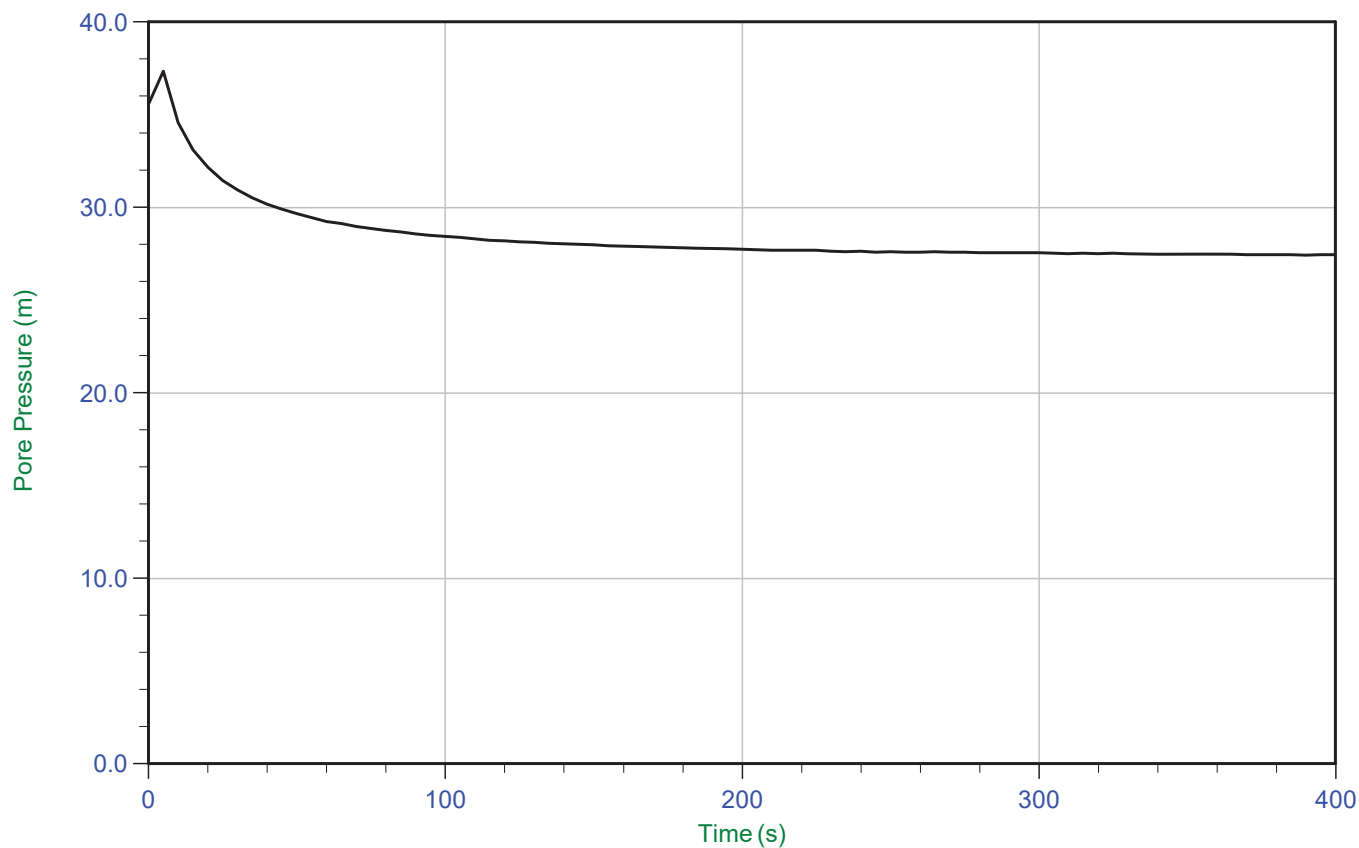
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 22.0 m WT: -1.713 m / -5.620 ft
Depth: 20.300 m / 66.600 ft U Max: 22.2 m Ueq: 22.0 m
Duration: 300.0 s



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



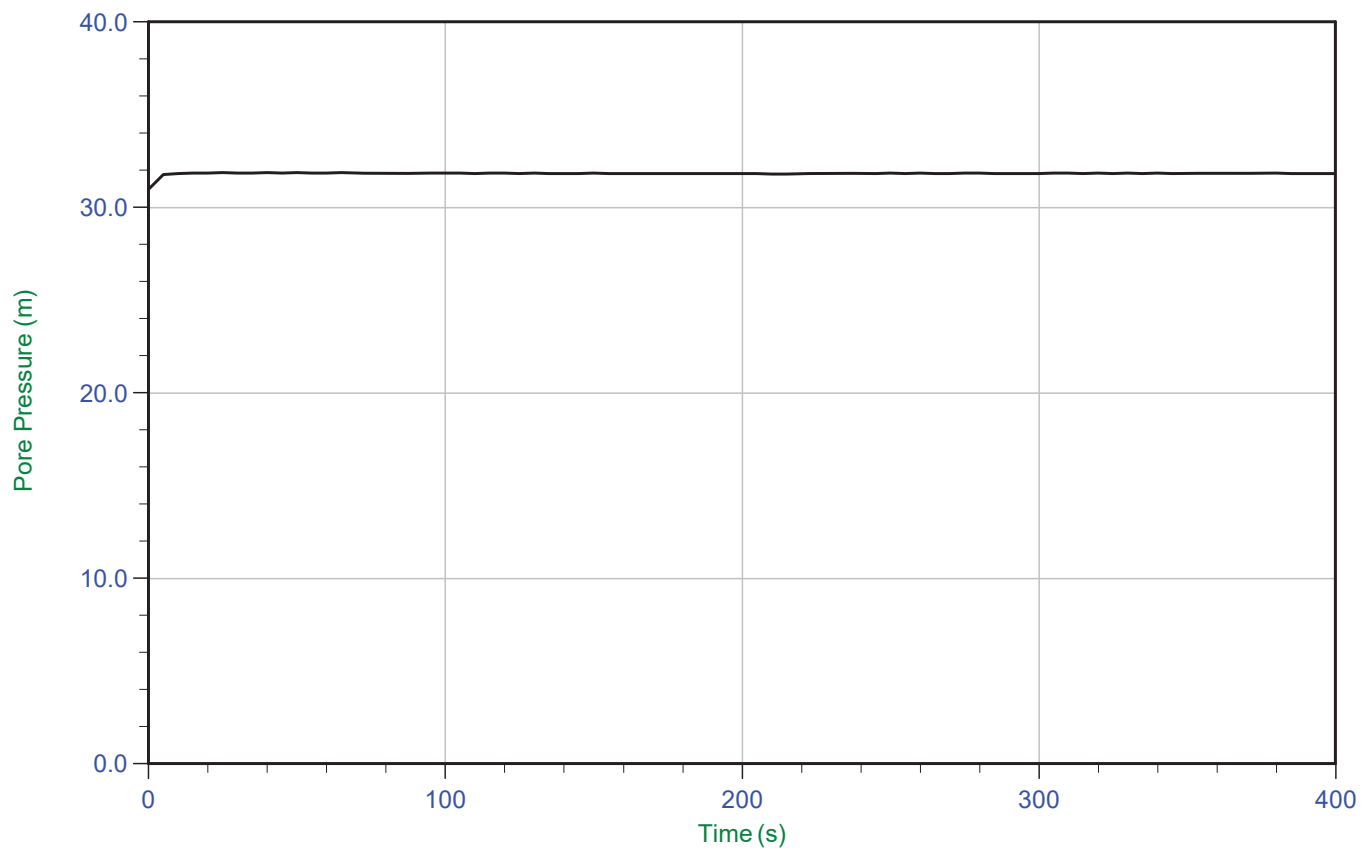
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 27.4 m WT: -2.059 m / -6.755 ft T(50): 14.1 s
Depth: 25.300 m / 83.004 ft U Max: 37.3 m Ueq: 27.4 m Ir: 100
Duration: 500.0 s U(50): 32.35 m Ch: 49.9 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 31.0 m	WT: -1.775 m / -5.823 ft
	Depth: 30.000 m / 98.424 ft	U Max: 31.9 m	Ueq: 31.8 m
	Duration: 400.0 s		

Appendix C

Photographs

BH15-01 and AH15-05

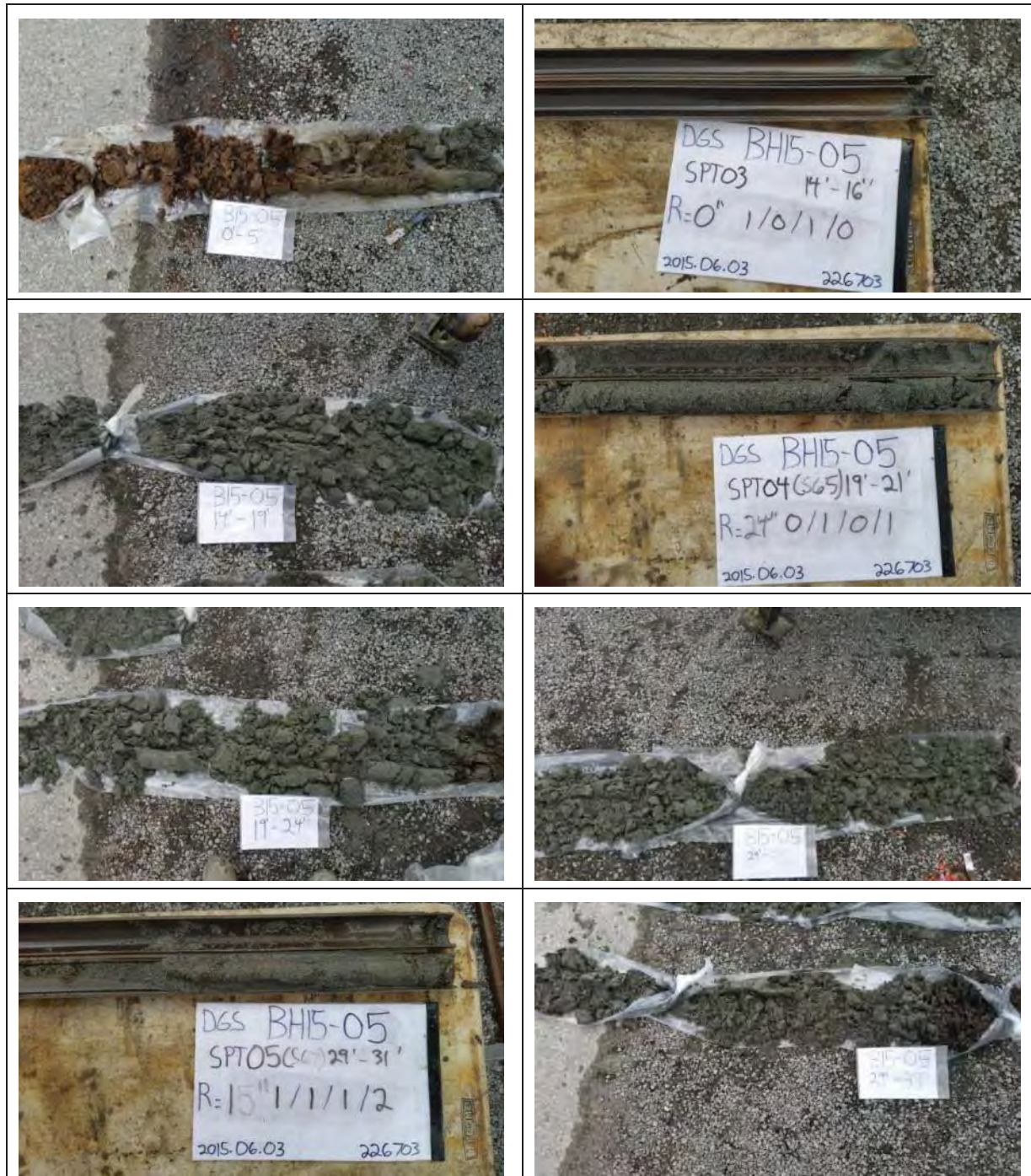
BH15-01







BH15-05







Appendix D

Atterberg Limits



Liquid Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	158.13	159.02	26.71			
Weight of Dry Soils + Pan:	153.93	155.67	23.12			
Weight of Pan:	146.43	149.43	15.99			
Weight of Dry Soils:	7.50	6.24	7.13			
Weight of Moisture:	4.20	3.35	3.59			
% Moisture:	56.00%	53.69%	50.35%			
N:	18	25	32			

Liquid Limit @ 25 Blows: 53.35%

Plastic Limit: 46.96%

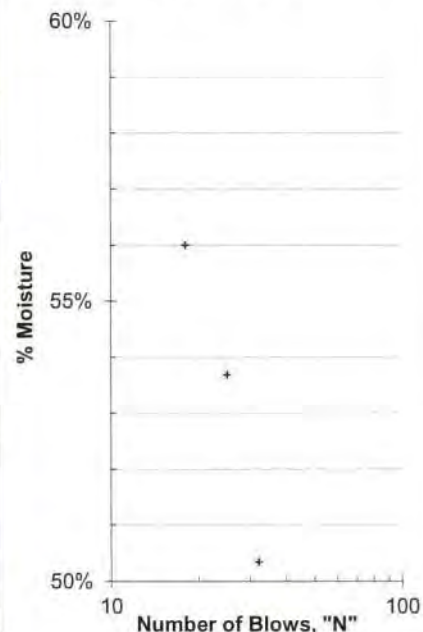
Plasticity Index, I_p : 6.39%

Moisture Content, M_C : 64.20%

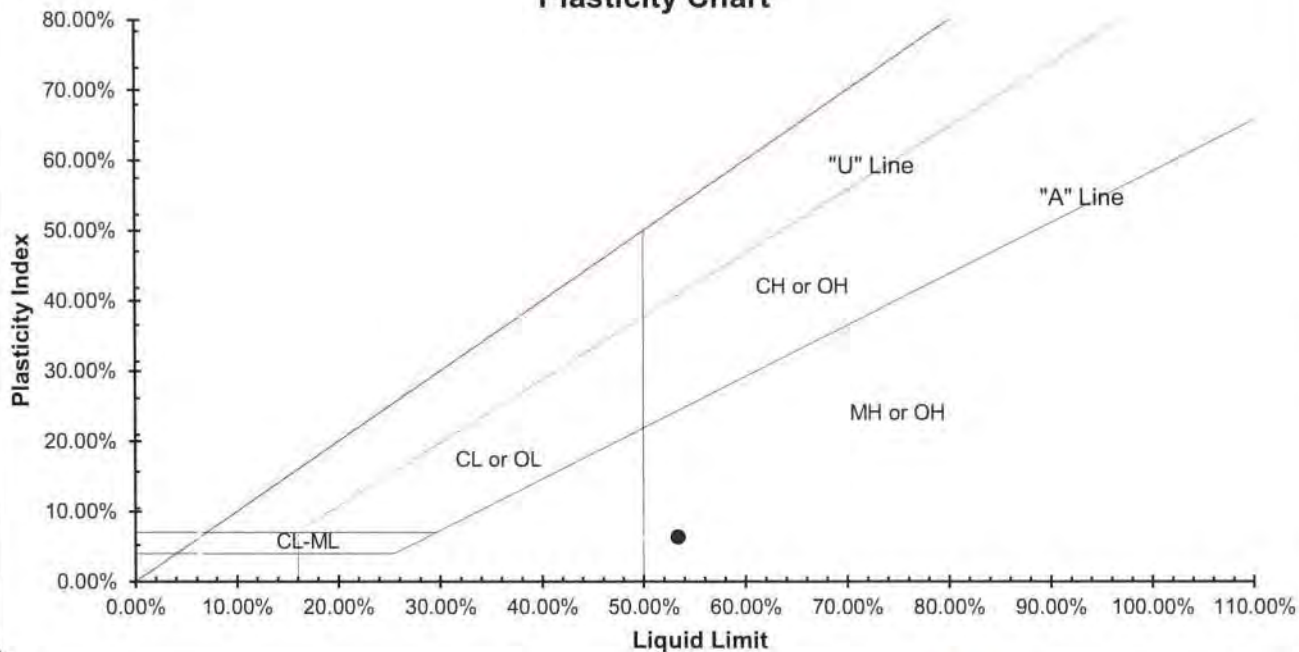
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	11.02	10.67				
Weight of Dry Soils + Pan:	8.77	8.52				
Weight of Pan:	4.01	3.91				
Weight of Dry Soils:	4.76	4.61				
Weight of Moisture:	2.25	2.15				
% Moisture:	47.27%	46.64%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech



Liquid Limit Determination

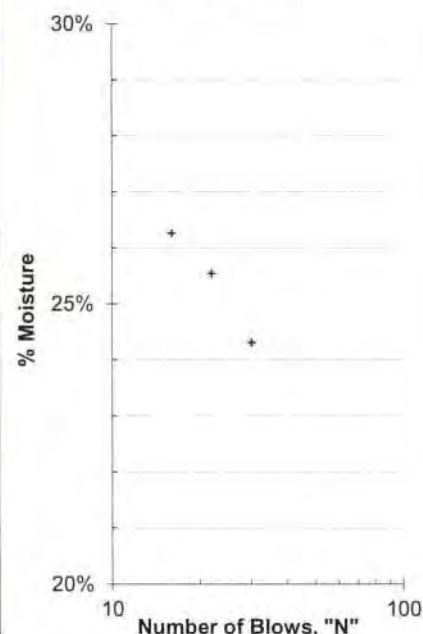
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	14.88	13.20	12.52			
Weight of Dry Soils + Pan:	12.59	11.31	10.85			
Weight of Pan:	3.87	3.91	3.98			
Weight of Dry Soils:	8.72	7.40	6.87			
Weight of Moisture:	2.29	1.89	1.67			
% Moisture:	26.26%	25.54%	24.31%			
N:	16	22	30			

Liquid Limit @ 25 Blows: 25.04%
Plastic Limit: 24.08%
Plasticity Index, I_p : 0.97%
Moisture Content, M_C : 26.50%

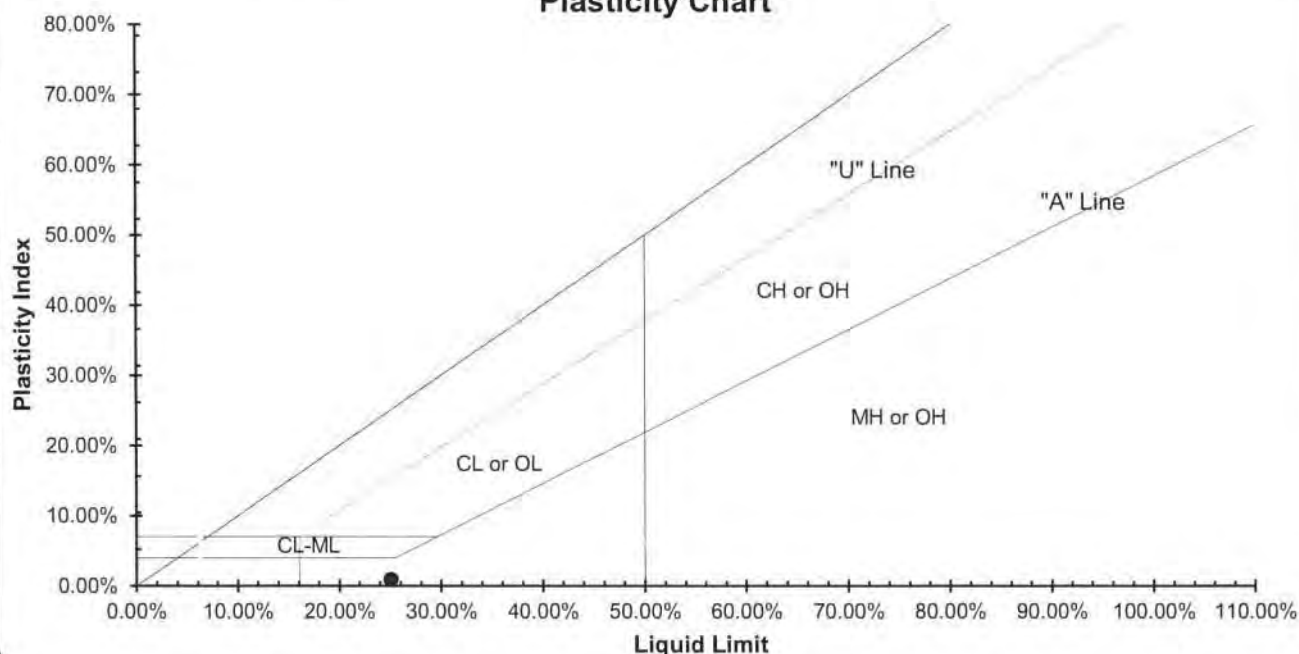
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	16.94	14.78				
Weight of Dry Soils + Pan:	14.50	12.64				
Weight of Pan:	4.32	3.79				
Weight of Dry Soils:	10.18	8.85				
Weight of Moisture:	2.44	2.14				
% Moisture:	23.97%	24.18%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech



Liquid Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	172.37	102.17	165.33			
Weight of Dry Soils + Pan:	168.77	98.71	161.80			
Weight of Pan:	162.48	92.51	155.42			
Weight of Dry Soils:	6.29	6.20	6.38			
Weight of Moisture:	3.60	3.46	3.53			
% Moisture:	57.23%	55.81%	55.33%			
N:	16	22	30			

Liquid Limit @ 25 Blows: 55.82%

Plastic Limit: 32.85%

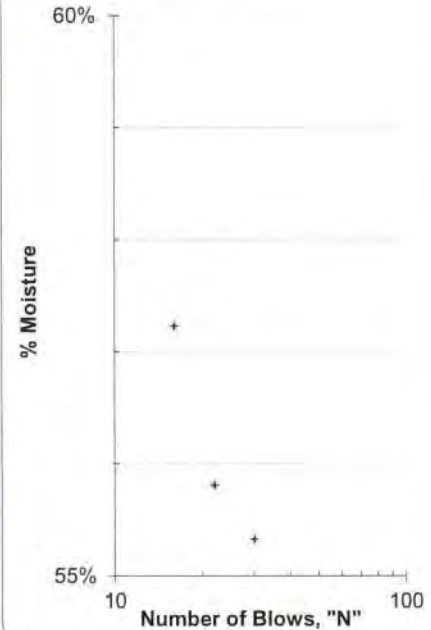
Plasticity Index, I_p : 22.97%

Moisture Content, M_C : 59.90%

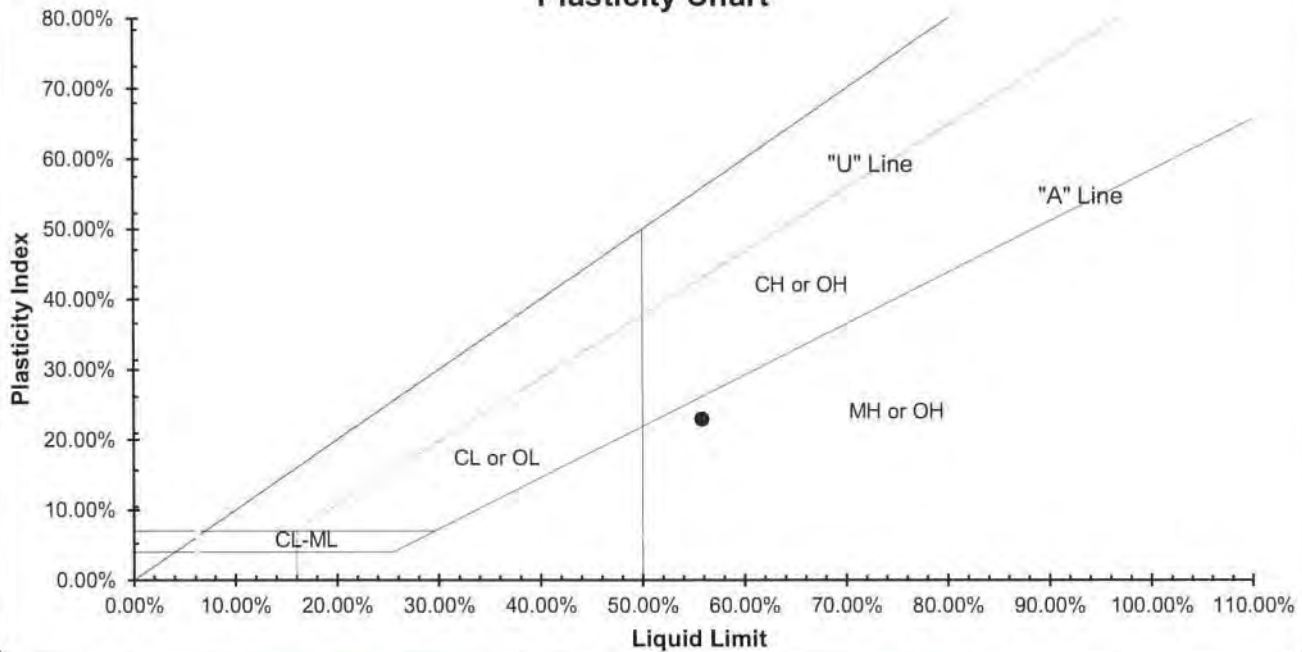
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	162.68	157.50				
Weight of Dry Soils + Pan:	160.12	155.33				
Weight of Pan:	152.39	148.67				
Weight of Dry Soils:	7.73	6.66				
Weight of Moisture:	2.56	2.17				
% Moisture:	33.12%	32.58%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech

Appendix E

Sieve Analysis Report



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

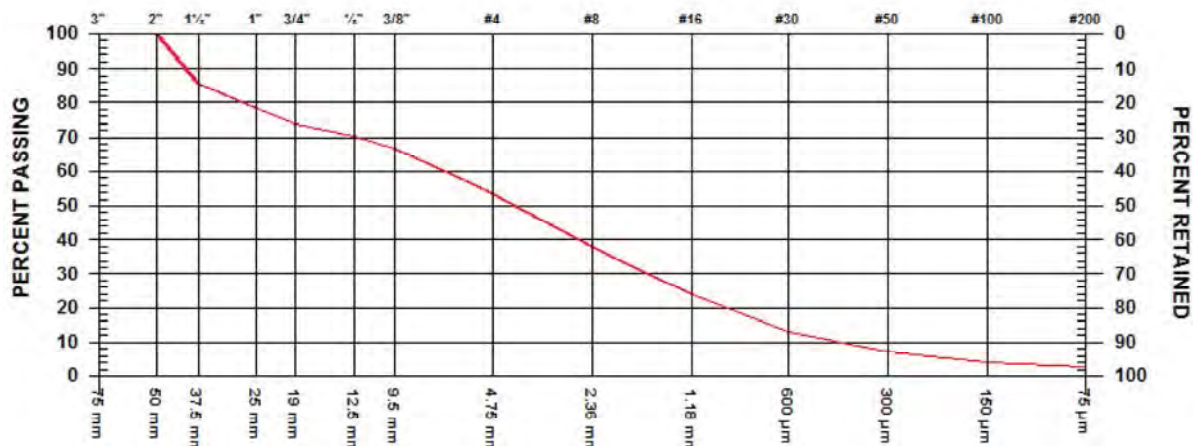
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 1 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE GRAVEL AND SAND, TRACE SILT

SAMPLED BY D.SILVERA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm	100.0	
2"	50	mm		
1 1/2"	37.5	mm		
1"	25	mm		
3/4"	19	mm		
1/2"	12.5	mm		
3/8"	9.5	mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	53.5	
No. 8	2.36 mm	37.9	
No. 16	1.18 mm	24.0	
No. 30	600 µm	13.1	
No. 50	300 µm	7.1	
No. 100	150 µm	4.0	
No. 200	75 µm	2.7	

COMMENTS

SAMPLE LOCATION: S12 BOREHOLE 15-01, 10.05M DEPTH. (34') (GB)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

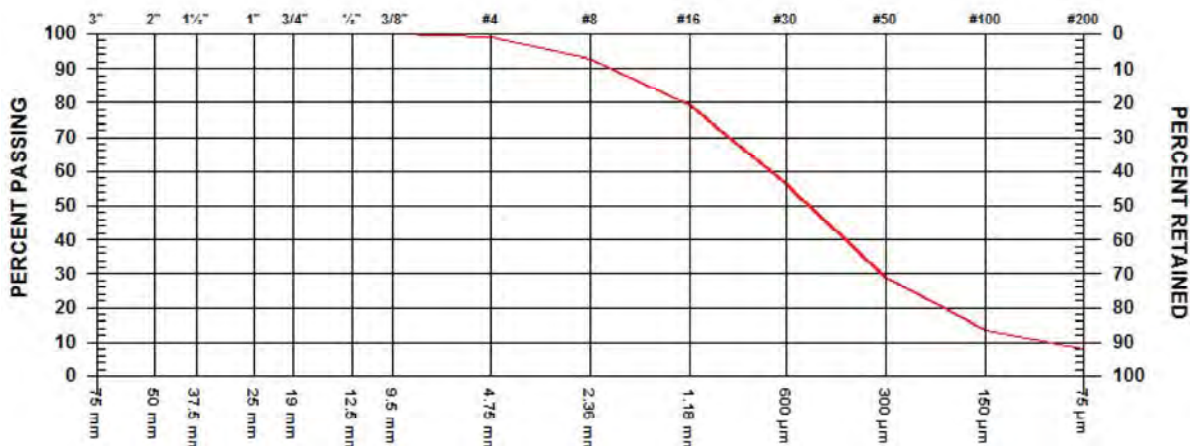
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 2 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND, TRACE SILT AND GRAVEL

SAMPLED BY D.SILVEIRA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm	100.0	
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm		
3/4"	19 mm		
1/2"	12.5 mm		
3/8"	9.5 mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	99.1	
No. 8	2.36 mm	92.9	
No. 16	1.18 mm	79.1	
No. 30	600 µm	56.5	
No. 50	300 µm	28.7	
No. 100	150 µm	13.7	
No. 200	75 µm	7.9	

COMMENTS

SAMPLE LOCATION: S10 - BOREHOLE 15-01, 5.79M DEPTH. (19') (SPT)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

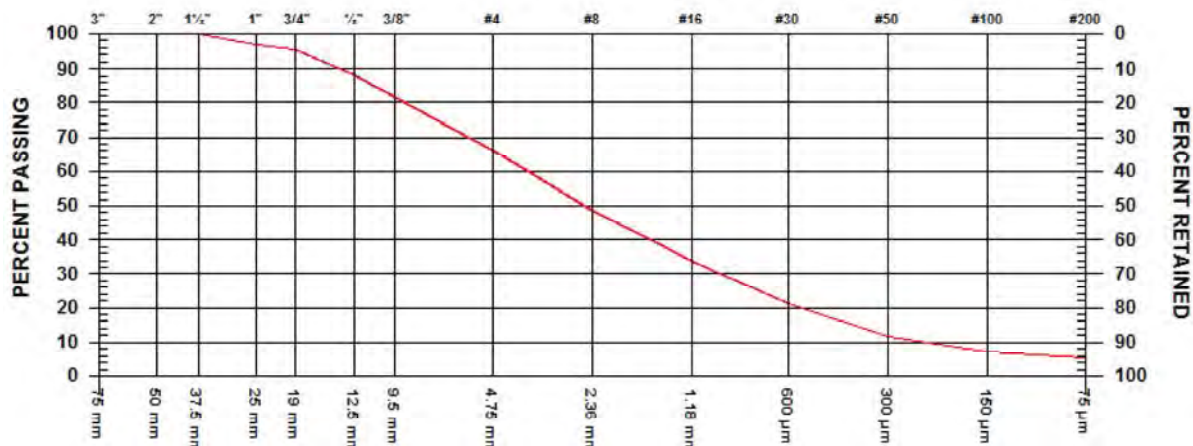
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 3 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND AND GRAVEL, TRACE SILT

SAMPLED BY D.SILVEIRA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm		
2"	50 mm		
1 1/2"	37.5 mm	100.0	
1"	25 mm	96.7	
3/4"	19 mm	95.3	
1/2"	12.5 mm	88.5	
3/8"	9.5 mm	81.6	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	66.2	
No. 8	2.36 mm	48.7	
No. 16	1.18 mm	33.7	
No. 30	600 µm	21.3	
No. 50	300 µm	11.5	
No. 100	150 µm	7.1	
No. 200	75 µm	5.3	

COMMENTS

SAMPLE LOCATION: S37 - BOREHOLE 15-02 3.35M DEPTH. (11')(GB)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

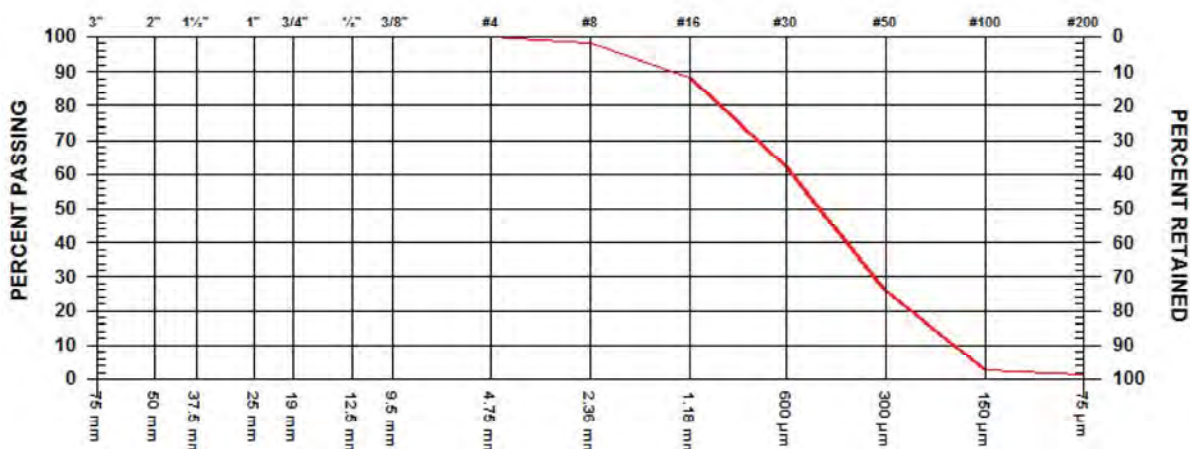
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 4 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND, TRACE SILT AND GRAVEL

SAMPLED BY D. SILVEIRA
TESTED BY R. MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm	100.0	
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm		
3/4"	19 mm		
1/2"	12.5 mm		
3/8"	9.5 mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	99.9	
No. 8	2.36 mm	98.0	
No. 16	1.18 mm	88.1	
No. 30	600 µm	62.2	
No. 50	300 µm	25.7	
No. 100	150 µm	2.7	
No. 200	75 µm	1.2	

COMMENTS

SAMPLE LOCATION: S64 - BOREHOLE 15-05, 4.57M (15') (GB)

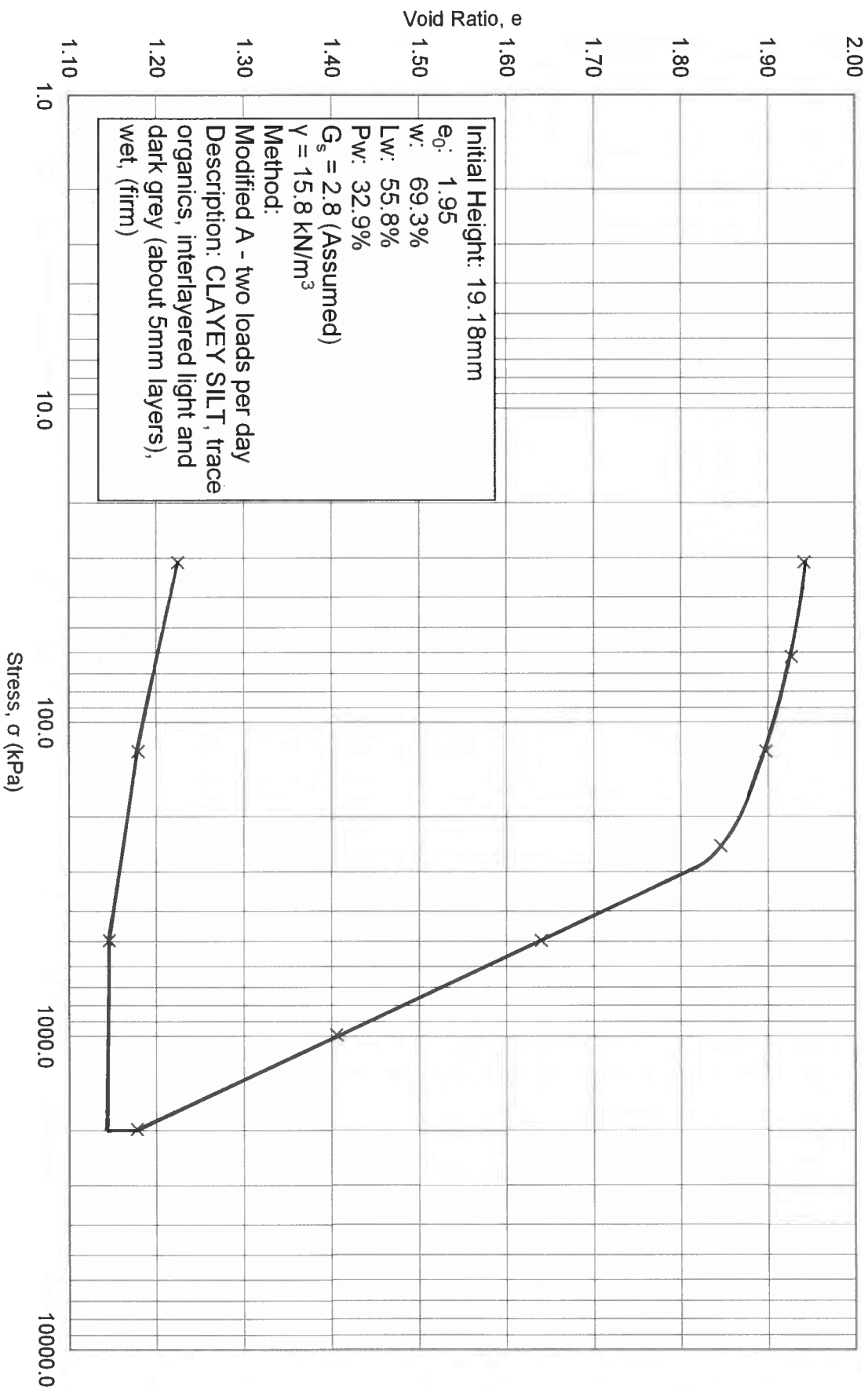
Appendix F

Consolidation Test Results



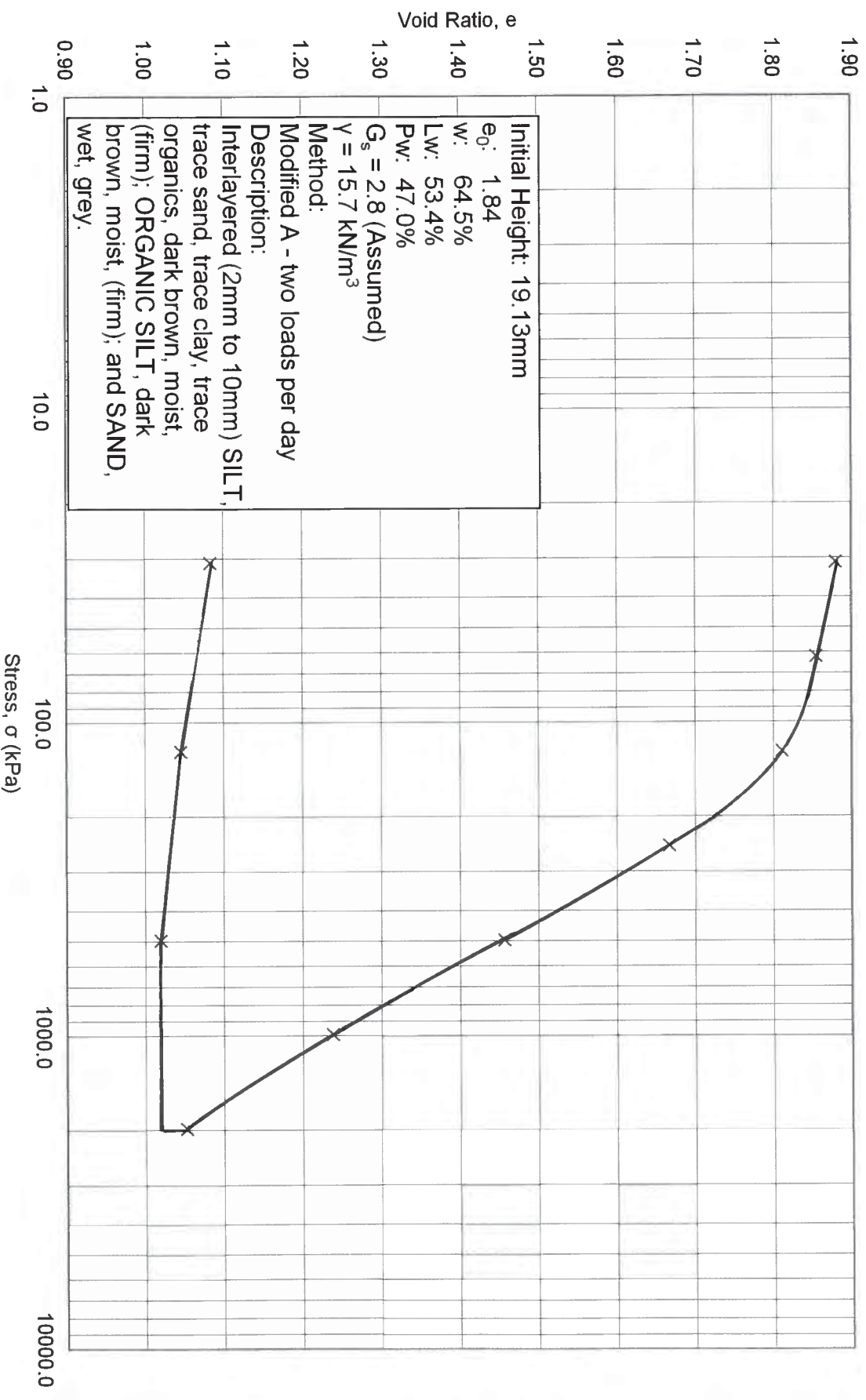
Consolidation: Void Ratio v. Applied Stress
BH15-05, Depth to Top of Tube: 27.1m, Depth of Sample: 27.38m

White Glacier Edgewater Resort
VAN-00226703-A0
2015-06-23 SCD



Consolidation: Void Ratio v. Applied Stress

BH15-01, Depth to Top of Tube: 14.94m, Depth of Sample: 15.48m



Appendix G

Topographic Survey

Appendix H

Draft Densification Specification

1. PART 1 - GENERAL

1.1 Description

- .1 The Work specified in this Section includes furnishing of all supervision, labour, materials, tools, plant and equipment, temporary facilities, permits, and related services to perform all ground improvement by vibro-replacement (stone columns) to be shown in a prepared Densification Plan.
- .2 The principal items of Work included in these Specifications are:
 - (i) Mobilization and demobilization of all equipment.
 - (ii) Construction of stone columns to the specified depth.
 - (iii) Densification of soil between stone columns to achieve the minimum electric Cone Penetration Test (CPT) resistances specified.
 - (iv) Furnishing crushed stone as required for the stone columns.
 - (v) Excavation and disposal of all Silt and other deleterious materials from the work area following completion of the vibro-replacement.
 - (vi) Furnishing labour, material, equipment, electrical power, and any other necessary items for stone column installation.
 - (vii) When necessary, furnishing lights and any other equipment for performing night work.
 - (viii) Control and disposal of surface water resulting from stone column construction operations.
 - (ix) Construction and removal of Silt settling ponds or similar facilities as required.
 - (x) When necessary, the removal of snow and ice from the surface to be treated.
 - (xi) When necessary, the dewatering of the site treated.
 - (xii) Clean up of Site.

1.2 Definitions

- .1 Stone columns referred to in this contract are constructed by means of the vibro-replacement technique.
- .2 The company chosen to construct the stone columns is referred to as the Contractor in this specification.
- .3 The working surface referred to in this section shall be prepared by others. The working surface shall consist of approved imported pit run or other approved granular material sufficiently compacted to allow access for the heavy-duty vibro-replacement densification equipment.

1.3 Extent of Densification

- .1 The working surface will be established with densification extending to geodetic elevation 615m.

1.4 Experience

- .1 The Contractor shall have a superintendent and foreman who have at least worked in that capacity on five (5) previous major projects using the proposed densification procedure. The superintendent shall be knowledgeable with the densification method, including: familiarity with the design procedures, limitations of the method, interpretation of test results, etc.
- .2 Resumes of the proposed superintendent and foreman giving their experience and listing the five (5) previous projects (with references) should be submitted with the tender.
- .3 Work shall not proceed with alternative personnel unless the alternative personnel have similar experience and are approved by the Geotechnical Engineer.
- .4 The superintendent for the densification work shall be available for on-site consultation and meetings within 24 hours notice. The foreman for the densification work shall be on-site at all times during the work.

1.5 Submittals

- .1 Within five (5) working days of award, submit a drawing to the Geotechnical Engineer indicating the spacing, location, depth, point (stone column) number and total number of vibro-replacement points to achieve the criteria outlined in these Specifications, and identify the source of water for stone column installation.
- .2 Within five (5) working days of award, submit details of the proposed facilities and operational procedures to be used for control and disposal of return surface water resulting from stone column construction operations. Vibro-replacement work shall not begin until the Geotechnical Engineer has approved the proposed facilities and procedures in writing. Approval of the facilities and procedures shall not relieve the Contractor of the responsibility to meet the environmental requirements for waste water treatment. Prior to disposal, conduct testing on the waste water in accordance with environmental requirements.
- .3 A log of the work completed by each rig on each shift shall be submitted to the Geotechnical Engineer by the Contractor within one (1) hour of the completion of each shift. The log shall include a record of the vibro-replacement point number, vibrator number, start/finish time of compaction, depth of treatment, backfill quantities, and relative amp-metre/pressure readings with depth.

- .4 Any proposed change in the vibro-replacement program shall be immediately submitted to the Geotechnical Engineer for review. No changes shall be implemented until approved by the Geotechnical Engineer in writing.
- .5 Submit technical specifications, including rated power and maximum amperage, for vibrators.

1.6 Ground Vibrations and settlement

- .1 The Contractor shall make good any damage to the existing buildings in the neighbouring properties caused by his negligence during the vibro-replacement densification work either due to settlement or vibration. The owner will be responsible for damages caused by the works carried out using approved, standard procedures.

1.7 Quality Requirements

- .1 At least one test section (to 20.0m depth), consisting of 12 to 15 vibro-replacement points, shall be conducted prior to beginning the final production vibro-replacement work in order to confirm that the Contractor's procedure results in a satisfactory performance.
- .2 The location of the test section shall be within the densification area.
- .3 At least five (5) working days shall be allowed, following completion of the test section(s) for testing and assessing the results of the test sections. No densification work shall be conducted until the Geotechnical Engineer has confirmed that the proposed procedure meets the performance criteria.
- .4 Where the test section indicates that the performance criteria is not achieved, the Contractor shall conduct additional test sections at his own expense with revised procedures until the performance criteria are achieved to the satisfaction of the Geotechnical Engineer. Regardless of soils penetration resistance achieved, the spacing of the stone column shall not be greater than 2.75m.
- .5 The intent of the test section is that the Contractor shall demonstrate that the procedures used for the test section are satisfactory and can be continued throughout the remainder of the work. If procedures are to be changed during test section evaluation or during production work, the Geotechnical Engineer shall be informed of the changes and the reasons for these changes.
- .6 All testing to determine specification compliance will be performed by a subcontractor approved by the geotechnical engineer and will consist of electric Cone Penetration Tests (CPT). Cost of CPT shall be included in the Contractor's price.

- .7 CPT test locations and testing times will be determined by the Geotechnical Engineer. A total of 15 CPTs to depths of 22m below the working surface shall be allowed, including the testing within the Test Section.
- .8 Zones of sandy SILT/SILT are indicated by a drop of cone tip resistance and increase in sleeve friction ratio. Interpretation of the fines content shall be carried out by the Geotechnical Engineer based on the CPT data. If a dispute arises regarding the fines content of any soil layer with a thickness in excess of 0.3 m, samples shall be obtained by drilling and the fines contents measured by laboratory testing at the Contractor's expense.
- .10 The Geotechnical Engineer will monitor progress and performance of the vibro-replacement Work. The monitoring may include but is not limited to any or all of the following: observance of the Contractor's procedures, recording of backfill quantities, recording of ammeter reading, and depth of stone columns. Monitoring by the Geotechnical Engineer does not relieve the Contractor of any responsibility for submittal of information under Part 1.5.3 and 1.5.4 and sole responsibility for proper execution of the work.

1.8 Restrictions

- .1 The Contractor shall take all necessary measures to protect existing services and structures within or adjacent to the densification area from damage caused by their operations. If the Contractor damages services or structures due to their negligence, make good at own expense.

1.9 Measurement for Payment

- .1 All work specified in this section and in the Drawing shall be included in the lump sum price tendered. Payment shall cover the supply of all labour, equipment, materials, electrical power and water.
- .2 No extra payment shall be approved for additional stone columns required to meet the minimum resistance criteria called for in the Specifications or for the time to advance probes from the working surface to the top of the densification zone.
- .3 Unit prices for addition and deletion per meter of stone column installed shall be provided.
- .4 For the purpose of evaluating and valuing changes in the Work under the general contract:
 - (i) Vibro-replacement shall be constructed down to a geodetic elevation of 615m, measured in meters of stone columns. This price shall include stone backfill to working surface, water, installation, and all work incidental thereto.
 - (ii) If tests indicate the specified CPT penetration is not achieved, additional testing to define the extent of the area requiring remediation and post-remediation testing shall

be required by the Geotechnical Engineer. The additional testing will be carried out at the Contractor's cost and is not included in the specified number of CPTs.

PART 2 - PRODUCTS

2.1 Stone Column Backfill

- .1 The Contractor shall be responsible for the quality of material used regardless of the source of supply. Only acceptable backfill materials shall be used in the construction of stone columns. The stone column backfill shall consist of clean, crushed hard rock or crushed gravel, free from organic materials, having not less than 25% split faces and meeting the following gradation limits:

<u>Sieve Size</u> <u>US Standard</u>	<u>Gradation Limits</u> <u>% Passing By Dry Weight</u>
75.0 mm (3 in nominal)	90 to 100
38.1 mm (1.5 in)	40 to 100
19.1 mm (0.75 in)	0 to 50
9.5 mm(0.375 in)	0 to 10
No. 4	0 to 5
No. 200 (*)	0 to 2

- (*) The percentage passing the No. 200 sieve is based on the dry weight of materials passing the 19.1 mm (0.75 in) sieve.

Stone column backfill which is in a frozen state or contains snow will not be accepted.

- .2 A sample and gradation curve of all proposed backfill material to be used must be submitted to the Geotechnical Engineer for approval at least seven (7) days before work begins. Periodic testing of the stone backfill during the course of the Work will be carried out by the Geotechnical Engineer. Whenever the backfill material source changes, submit backfill sieve analyses prior to delivering the materials to site. Remove and replace unacceptable backfill material from the site at the Contractor's expense.

PART 3 - EXECUTION

3.1 Site Layout

- .1 Establish all lines and grades required to set out the work from the benchmark and baselines provided by the General Contractor, and accurately stake out the treatment area.
- .2 The General Contractor will identify to the Contractor the benchmark and baselines from which the Contractor is to locate the vibro-replacement points.

- .3 Stone columns shall be laid out such that the centre-to-centre distance of stone are met.

3.2 Equipment and Procedures

- .1 Obstructions within the treatment area shall be removed by the General Contractor or by Others as directed by the General Contractor. The working surface (compacted) shall be made available to the vibro-replacement densification Contractor.
- .2 Refusal of vibrator penetration is defined as a penetration rate of less than 25 mm per 5 minutes or amperage draw of the vibrator greater than 90% of the maximum rated amperage for a period greater than 10 seconds at a minimum water flow of 1.9 m³/min (400 gal/min). If refusal is encountered within the upper 4 m due to obstruction, excavate the obstruction, backfill the excavation and proceed with the stone column installation at no additional cost to the Owner.
- .3 Stone columns shall be installed in a triangular grid pattern. Deviations in the actual treated length caused by vibrator refusal shall result in adjustment to the Contract Sum.
- .4 Compaction procedures used for the trial area meeting the specified minimum CPT resistances shall be used for constructing all remaining stone columns. Production work is not to proceed before full evaluation of the test sections and authorization by the Geotechnical Engineer.
- .5 Use a downhole electric vibrator with a minimum manufacturer's rated energy of 160 hp or hydraulic vibrator with a minimum manufacturer's rated energy of 200 hp and 30 tons of centrifugal force. The operating vibrator frequency must be in the range of 1500 rpm to 2500 rpm. After penetration to the treatment depth, the vibrator should be slowly retrieved in about 0.3 m increments to allow backfill placement.
- .6 The vibrator should be redriven through each fill increment into a recently treated depth interval to observe amperage buildup or increase.
- .7 Amperage buildup and backfill quantities are contingent on the type of vibrator, backfill, in situ subsoil conditions, and Contractor's procedure. Discussion between the Geotechnical Engineer and Contractor regarding particular equipment capabilities and expectations shall be conducted before the Work starts.
- .8 The contractor shall arrange and adjust the sequence of stone column installation as necessary to minimize the effects on the adjacent buildings. This may require sequencing the stone columns such that the densification front move away from the nearest buildings. The contractor shall submit his proposed sequence of stone column installation prior to the start of work.

- .11 The Contractor shall monitor and protect all underground services within 10 m from the densification zone during the densification work. The Contractor shall work and cooperate with the utility companies in carrying out densification adjacent to the utilities.

3.3 Required Soil Penetration Resistance

- .1 Densify foundation subsoils to achieve the following minimum cone tip resistances (CPT):

Depth	Cone Tip Resistance, q_c , (bar)		
(m)	Fines Content* = 5%	Fines Content* = 15%	Fines Content* = 35%
2.5	55	30	25
5.0	75	50	35
7.5	85	58	45
10.0	94	64	50
12.5	100	67	52
15.0	105	72	54
17.5	110	77	57
20.0	115	81	60

Notes:

* - Interpretation of the fines content shall be carried out by the geotechnical engineer based on the CPT data. If a dispute arises regarding the fines content of any soil layer with a thickness in excess of 0.3 m, samples shall be obtained by drilling and the fines contents measured by laboratory testing at the Contractor's expense.

** - Working surface at Elevation +641.0m (approximate).

***- Soils with >35% fines shall not have post densification cone tip resistance less than pre-densification values.

- .2 Notify the Geotechnical Engineer a minimum of three (3) days in advance when any testing is to be done or any monitoring is required, and assist the Geotechnical Engineer as required with any testing or monitoring.
- .3 Areas of the Site which do not meet the specified CPT values shall have additional stone columns and the area shall be retested by the Contractor at no additional cost to the Owner.

3.4 Site Completion and Cleanup

- .1 Following completion of the vibro-replacement work, all Silt and other deleterious materials resulting from the vibro-replacement process shall be excavated down to approved subgrade and disposed off-site. Excavation work shall include the full extent of vibro-replacement densification area, drainage ditches, and silt settling ponds.

END OF SECTION



May 20, 2016

Reference No. VAN-00226703-A0

Lamoureux Architect Inc.
3392 Marine Drive
West Vancouver, BC V7V 1M9

Attention: Mr. Brad Lamoureux

Email: Brad@lamoureuxarchitect.ca

**Re: Geotechnical Exploration Report
White Glacier, Site 2
Edgewater Resort, Whistler, BC**

Dear Sir:

1.0 INTRODUCTION

Exp Services Inc. (**exp**) has completed a geotechnical exploration program in accordance with our fee proposal for Site 2. The purpose of the study was to review the subsoil and groundwater conditions underlying the site and to provide geotechnical recommendations for site preparation and foundation design for the proposed development of Site 2. Based on our understanding of the conceptual design the proposed structure will be as at grade, two storey building.

The scope of services was limited to the provision of geotechnical engineering services only and does not include any provision for the investigation, analytical testing or assessment of the potential for soil and/or groundwater contamination at the site or possible bio-engineering considerations.

2.0 SITE AND PROJECT DESCRIPTION

The proposed development site is located about 350m southwest of the intersection Sea-to-Sky Hwy and Alpine Way. The proposed building is to be located North West of the main (Site 1) development area. Dimension and size of the proposed building were not available at the time of writing the report.

Alpine Way is aligned in north south direction on the west side of the proposed development. Green Lake is generally located on the east side of the proposed development. Whistler Executive Transportation office building is located on the south east side of the proposed development. It was understood that the proposed building will be a two storey residential building. Proposed finished grade in the area of site 2; is understood to be increased to an elevation greater than the flood construction level, to be determined by others. We understand this will result in a grade increase of 1 to 2m, based on preliminary discussions.

3.0 SCOPE OF SERVICES

Key geotechnical evaluation and design issues considered for this geotechnical assessment includes but is not limited to:

- a. Characterization of the subsurface soil and groundwater conditions;
- b. Provision of preliminary recommendations for foundation support of the proposed structure;

- c. Assess liquefaction potential and associated lateral and vertical displacement and differential movements, provide recommendations for possible ground improvement techniques;
- d. Provide recommendation for preloading;
- e. Provide lateral pressures for design of below grade walls.

4.0 SUBSURFACE CONDITIONS

4.1 Surficial Geology

Based on geological and Landslide Inventory of The Upper Sea to Sky Corridor (File No. 5324) the proposed site consisted of floodplain sediments; sand and silt, commonly including organic materials and underlain, in many places, by gravel; 1 to 3m thick.

4.2 Geotechnical Drilling and Subsurface Exploration

Exp's field work was carried out on April 13, 2016 and included the following:

- One (1) auger hole to depth about 9.1m, by sub-contractor Uniwide Drilling Co. Ltd., of Burnaby, BC.
- One (1) Dynamic Cone Penetration Test sounding (DCPT) to a depths about 9.1m, by sub-contractor Uniwide Drilling Co. Ltd., of Burnaby, BC.
- An electro-magnetic survey of the site was completed prior to drilling to locate buried utility lines. This survey was carried out by sub-contractor Western Locate Services Ltd., of Coquitlam, BC.

During the preliminary design of Site 1 (main building area), **exp's** field work was carried out on June 2 and 3, 2015. The closest bore holes to the subject site were BH15-01, BH15-02 and BH15-03 of the June exploration and has been used for interpretation of deeper soil deposit below 9.1m.

Locations of the test holes are shown on the attached Test Hole Location Plan, Figure 1. Bore hole logs from site 1 and site 2 are attached to this report.

4.2.1 Dynamic Cone Penetration Test (DCPT)

Dynamic Cone Penetration Tests (DCPT) provides a continuous record of soil resistance, and is carried out by dropping a weight to drive a steel cone into the ground. A 63.5 kg (140 lb) hammer, free falling a distance of 762mm (30"), was used in this test. The cone used in this test was 64mm in diameter with a 19mm diameter flat surface at the end and a 60 degrees apex (cone) angle.

DCPT "blow counts", the number of blows for each 300mm of penetration, is considered equivalent to SPT N values for tests within 10m to 15m depth (Canadian Foundation Engineering Manual, 4th Edition, 2006). The results of the DCPT are presented on the test hole logs in Appendix A. The DCPT data was utilized for interpretation of soil density/consistency at the test hole locations and for geotechnical analyses.

4.2.2 Auger Hole

The Continuous flight solid stem augers with an outside diameter of 152mm were used to advance the auger holes. The augers were drilled to depth in stages and withdrawn, allowing for visual soil classifications and sampling. The auger was advanced to a total depth of about 9.1m.

The auger hole was backfilled and sealed according to the regulations of the B.C. Ground Water Protection Act.

The log for the auger holes is provided in Appendix A.

4.3 Laboratory Tests

Laboratory tests were conducted on representative soil samples obtained from the auger holes. The tests included natural moisture content tests, Atterberg Limits tests on cohesive soils, sieve analysis on granular soils and consolidation tests on undisturbed cohesive soil samples. The following is a summary of the laboratory tests carried out.

4.3.1 Natural Moisture Content Test

Moisture content determinations were performed on select soil samples obtained from the exploration to assist in identification of soil types and to correlate with engineering design parameters. The tests were done in general accordance with the test procedures in ASTM D-2216. Results of the tests are shown on the auger hole log, provided in Appendix A.

4.3.2 Sieve Analysis

Sieve analysis was performed on select soil samples obtained from the exploration to determine the grain size distribution of the granular soil. Sieve analysis was conducted on four (4) select samples in general accordance with ASTM C-136 and ASTM C-117, respectively. The results of the tests are provided in Appendix B.

4.4 Sub soil Conditions

In general, based on the test hole completed within the subject site and boreholes completed on site 1 the following subsurface soil conditions, in order of increasing depth were present. It should be noted that the soil conditions may vary beyond drill hole locations and below the depth of exploration.

- | | |
|---------------|--|
| UNIT A | Soft to firm, wet/moist, dark brownish black PEAT/organic SILT, trace sand and silt. Thickness ranged between 3m and 4m. Moisture content varied from 150% to 430%. |
| UNIT B | soft to very soft, grey, Organic SILT, trace sand. Thickness is about 1m. Moisture content was about 68%. |
| UNIT C | compact, wet, sandy GRAVEL/SAND and GRAVEL, trace to some silt, encountered in test holes BH15-01 to 03. Thickness varied from 1.5 to 4m. At test hole BH15-02, this unit of |

soil was encountered to the bottom of the test hole (6.4m). Thickness at AH16-04 is more than 3m meter, end of auger hole was at 9.1m depth.

- UNIT D** soft to very soft, clay SILT, trace silt and peat/organic. Moisture content varied from 80% to 90%. Only encountered in test hole BH15-01, thickness was about 1.7m.
- UNIT E** loose, wet, sand, trace silt, about 3m thick in BH15-01
- UNIT C1** compact, wet, sandy GRAVEL/SAND and GRAVEL, trace to some silt, only encountered in test holes BH15-01. Thickness was about 3.4m between depth 8.8 to 12.2m.
- UNIT F** soft to stiff, SILT, some clay to clayey, occasional wood fragments/organics, with occasional .5m to 1.5m thick layers of sand in BH15-01. Moisture content varied from 30% to 80%. Thickness of this layer varied from 11m to 16.5m.
- UNIT G** compact, wet, sand, trace to some gravel and silt. About 3m thick in BH15-01 (end of the hole was 31.4m).

4.5 Groundwater Condition

Inferred groundwater depth at the time of drilling was measured at about 0.2 to 0.5m below the existing grade. Based on previous test hole depth of ground water was about 10m below the existing grade at the intersection of Sea-to-Sky Highway and Alpine Way.

It should be noted that groundwater conditions may vary and fluctuate seasonally in response to climate conditions, and possibly also due to precipitation, runoff, changes in land use, and other factors. Water level in the Green Lake could make a big influence on the water level in the surrounding area.

5.0 SEISMIC CONSIDERATIONS

5.1 Introduction

It is understood that the Resort Municipality of Whistler Building By-Law implements the criteria of the BCBC2012/NBCC2010 (“Building Code”) for the seismic assessment of their facilities. In the BCBC2012 and NBCC2010, an earthquake motion with a return period of 2475 years is specified. The philosophy for earthquake design in the Building Code is prevention of collapse, but to accept damage to structures. The expectation is that “typical” or “normal” structures will be near collapse and the building may not be repairable following the design earthquake. Implicit within the Building Code is the intent to limit damage during low to moderate level earthquake shaking.

5.2 Seismic Design Parameters

Site specific interpolated seismic design parameters for this site were obtained from the interactive website maintained by the Geological Survey of Canada (GSC). Table 1 presents the parameters in the form of response spectrum for motions at a hypothetical, “outcropping firm ground”, for the design 2475 year event.

**Table 1 - Response Spectrum for 5% Damping at
“Outcropping Firm Ground” (BCBC 2012)**

Periods, (s)	Acceleration Response Spectra (g)
0.2	0.63
0.5	0.47
1.0	0.281
2.0	0.156
PGA	0.285

The “outcropping firm ground” is specified as soils with average shear wave velocity in the range of 360 m/s to 750 m/s. Very dense soils or soft bedrock could be classified as “firm ground”.

The ground motions would be altered (amplified or attenuated) as earthquake induced shear waves propagate through the soils which overlie the “firm ground”. To develop site-specific-near- surface design ground motions and to carry out liquefaction assessment, a site-specific ground response analysis was carried out. The following sections describe the ground response analysis and the results

5.3 Seismic Ground Response Analysis

Site specific seismic ground response analysis was carried out for Site 1. In order to make standalone separate following sections are copy from the site 1 report.

5.3.1 Introduction

Seismic ground response analysis was carried out using the computer program PROSHAKE (Version 1.12) in order to develop site-specific seismic design parameters. The program PROSHAKE models the soil deposit as a 1-D column, allowing vertical propagation of the earthquake induced shear waves.

5.3.2 Input Earthquake Records

The analysis was carried out using eight earthquake records, input at the outcropping “firm ground”. The records were modified using the computer program SYNTH such that the response spectrum of each record matches that presented in Table 1.

5.3.3 Soil Parameters

The soil properties for the ground response analysis include shear wave velocity (V_s), unit weight, and relationships between shear modulus and damping with shear strain. Shear wave velocity profile obtained at test hole SCPT15-1 was used in the analysis and presented in Figure 2.

The “Elastic halfspace” for the SHAKE analysis was assumed at 60m depth, with a shear wave velocity of 555 m/s (mean Vs of the range recommended in NBCC 2010).

Shear modulus reduction and damping curves used in the analysis are from published data for similar soils (Seed and Idriss, 1970, for sand or sand and gravel; Vucetic and Dobry, 1991 for silts and clays). For sand layers, the upper bound modulus reduction and lower bound damping curves from Seed et al (1986) were used.

5.3.4 Near Surface Response Spectrum

Response spectra for 5% damping, for motions at ground surface and 2m below the ground surface were obtained from the ground response analysis are shown graphically in Figure 3 and 4, respectively. Figure 5 shows the response spectra for Site Class C, D, E, average from the shake analysis and the recommended response spectra if the ground improvement is not implemented. If the ground densification techniques are applied then the site could be used as Site Class E, with Fa and Fv of 1.24 and 1.92, respectively.

5.3.5 Peak Ground Acceleration (PGA)

PGA profiles obtained from the analysis for the six input records and the mean profile are shown in Figure No. 6. Based on the analysis the mean surface PGA for the 2475 year event is 0.11g for this site if the ground improvement is not implemented. If ground improvement such as densification technique is applied then surface PGA could be 0.35g.

5.3.6 Cyclic Stress Ratio (CSR)

CSR was calculated as $0.65 \cdot \tau_{\text{peak}} / \sigma'_{\text{v}}$, where τ_{peak} and σ'_{v} are peak of the cyclic shear stress and vertical effective stress respectively at a given depth. CSR profiles for the six input records and the mean profile are shown in Figure No. 7. The mean CSR profile was then used in liquefaction assessment as described in the next sub-section.

5.4 Liquefaction Assessment

Liquefaction susceptibility of the sub-soils was assessed using the procedures given in Youd et al (2001) with the CSR profiles described above. The cyclic resistance of the ground, expressed in the form Cyclic Resistance Ratio (CRR) was obtained using DCPT data according to the Youd et al (2001) procedure for SPT method.

Earthquake magnitude for this assessment was taken as 7.0 for the 1:2475 year event (Ref. Task Force Report, Geotechnical Design Guidelines for Buildings on Liquefiable Sites in Accordance with NBC 2005 for Greater Vancouver Region, May 8, 2007).

Factor of Safety against liquefaction (F.S.) was calculated as the ratio of CRR/CSR. Soil layers with a F.S. less than 1 are considered liquefiable for the 2475 year return period earthquake event. The extent

liquefiable layers were estimated to be about 15m and thickness of liquefiable layer could be in the order of 5 to 12m. The SILT/CLAY and organic silt/PEAT soils are likely to be liquefiable based on the guidelines of the Task Force Report (2007). Strain softening could occur during a high magnitude earthquake event. Liquefaction induced settlement was estimated based on procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5 Consequences of Liquefaction

Following liquefaction, the soils lose a significant portion of their shear strength and behave like a heavy liquid. Some of the consequences are: liquefaction induced settlement of the ground, lateral spreading of the ground and the overlying structures, flotation, tilting and/or shear failure of the foundations.

5.5.1 Post-liquefaction Settlement

Dissipation of the excess pore water pressure developed during shaking and liquefaction would cause settlement of the ground. As mentioned above, the sandy soil below water table is likely liquefiable. Cumulative thickness of liquefiable layers was estimated to be 5 to 12m. Post-liquefaction settlement due pore pressure buildup within the soil mass was estimated to be in the order of 200 to 400mm based on SPT and DCPT holes data and using the procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5.2 Lateral Spreading

As discussed before the sub-surface under the water table is liquefiable. Magnitude of lateral spreading of the ground was calculated using Youd et al (2002) procedure. The existing topography around this station is generally flat. However, the presence of Green Lake on the east side (a “ground slope” condition) would likely result in movement towards the lake. A survey of the Lake bottom by Doug Bush Survey Services Ltd. indicated a gently inclined slope. The analysis indicates that lateral ground movements in the order of 300mm to 500mm may occur following the design earthquake if ground improvements are not implemented. Note that Youd et al. (2002) procedure is highly empirical and great uncertainty exists in the calculated numbers. A range of half to twice the values given is recommended for design considerations.

5.5.3 Flotation

Note that the static groundwater level was potentially at the existing ground surface. Flood Construction Level (FCL) is assumed to be below first floor slab elevation, however if the slab is below FCL the following commentary applies.

Following liquefaction, the liquefied soil would behave like a heavy liquid, inducing added buoyancy forces on buried structures and possibly leading to floatation. The buoyancy force can be calculated using an equivalent fluid pressure of 18kN/m^3 for liquefied soils. The magnitude of the buoyancy force depends on the depth and thickness of the liquefiable soil layer. The uplift force due to buoyancy during liquefaction could be calculated using the equivalent fluid pressure for liquefied soils for the portion of the structure submerged below groundwater.

5.6 Consolidation Settlement

Based on BH16-4 there is soft compressible Peat/organic silt in the upper 3m to 4m and about 10 to 12m thick silt layer between 14.5 to 30m depth (Based on BH15-01). The soft compressible layers have potential for consolidation settlement if any surcharge load is applied. Preliminary settlement analysis was carried out using soil parameters derived from consolidation test results conducted on site 1. The computer program Settle 3D was used develop preliminary settlement values. Soil parameters used in the analysis will be provided in the final reporting. As final loads were not available at the time of writing this report, 2m (40kPa) to 3m (60kPa) surcharge loads were applied at the ground surface to estimate the total settlement. Table 2 below shows some preliminary settlement estimates for various surcharge loads. Total and differential settlement for site specific structure will be provided in the final design.

Table 2: Predicted settlements without Helical Screw Pile

Fill Height (m)	Predicted Settlement (mm)
2.0	About 1800
3.0	About 2300

Additional settlement analysis was carried with using 8m long helical screw pile. It is understood that screw pile will be installed after preload is being completed. Table 3 provides some preliminary settlement prediction.

Table 3: Predicted Long Term Settlements with Helical Screw Pile

Pile Length (m)	Predicted Settlement (mm)
8	25 to 50

Based on the above two tables it appeared that preload treatment is recommended to mitigate about 95% of the predicted settlement (Table 2). A 2m surcharge above finished grade for 6 to 12 months is expected to be required to achieve the primary consolidation settlement. Actual settlement monitoring data will be required to confirm the duration of preload. Additional settlement analysis is required to refine the settlement prediction as design progresses.

6.0 DISCUSSION AND RECOMMENDATIONS

Test holes encountered a peat/organic silt layer followed by a soil profile comprised of loose to compact sandy gravel/gravelly sand interlayered with clayey silt/organic silt to about 15m depth. Silt with occasional thin layer of sand was encountered between 15m to 31m depth. It is expected that a substantial silt layer would be present at greater depths. Further, bedrock is expected to be well in excess of 60m deep close to the lake, the depth of bedrock could be shallower to the west. Based previous test holes completed by **exp** for a project near the intersection at Sea-to Sky and Alpine Way the depth of bedrock was about 25m. The groundwater table at the proposed location of the building was approximately 0.2m to 0.3m below existing ground surface at the time of exploration, and is expected to fluctuate seasonally with higher levels in the winter/spring. Depth of groundwater was deeper towards the west, about 10m at the intersection of Sea-to-Sky Highway and Alpine Way area.

As discussed above, the site area was determined to have subsurface soil layers that are settlement sensitive. As the magnitude of settlement is high, preload with a surcharge should be considered to mitigate the post-construction settlement.

A Helical screw pipe pile could be considered as a foundation option. Three 0.5m diameter helix of 1m apart and 130mm diameter shaft is considered for preliminary design. Recommended depth of the bottom helix is recommended at about 8m from the existing ground.

As discussed above, the site area was determined to have subsurface soil layers that are susceptible to liquefaction under the design earthquake event. Significant lateral and vertical ground displacements (as described above) are expected to occur if soil layers beneath the site were to liquefy, with corresponding horizontal movements and differential settlements within the proposed project elements.

If the proposed structure can't tolerate the predicted post liquefaction settlement and movement then it should be noted that ground improvement would need to be employed to mitigate the seismic hazard by potential liquefaction. Ground improvement is commonly achieved by means of vibro-replacement (stone columns). However, with the limitation of ground improvement techniques that the ground densification can only mitigate and not completely eliminate the hazard of the earthquake induced ground movement.

It is recommended that the building could be designed on a raft type foundation with helical screw pile, with thickenings as required for concentrated loads, to limit the damage caused by earthquake induced ground movements. Static and post liquefaction seismic buoyancy has a significant impact on buried tanked structures. Static buoyancy could be mitigated by using soil anchors. Seismic buoyancy could be mitigated with ground improvements.

6.1 Site Preparation

Site preparation for the proposed residential building should include the cutting of all vegetation to the ground surface level and retention of the root mat. Grade reinstatement or increases to achieve flood construction elevations below the proposed raft slabs should be achieved by placement of structural fill consisting of well-graded shot rock placed in lifts with a maximum thickness of 900mm compacted with several passes of a heavy ride-on type vibratory roller. Structural should be placed on a layer of geogrid (BX1500) on the mown peat layer. We recommend that a layer at least 300mm thick of clear crushed gravel be placed immediately below the proposed raft slab for drainage, to provide a solid working platform, and for improved and more uniform bearing resistance. The clear crushed rock layer should be compacted to a dense state using vibratory methods.

As discussed earlier, preload surcharge is recommended to mitigate the consolidation settlement. A preload surcharge of 2m above the finished grade is recommended.

Due to the presence of the organic silt/PEAT in the upper 3 to 4m, there is potential for methane gas generation underneath the proposed building. Some provision for methane gas mitigation should be considered during final design. If the upper organic soil layer above water table is removed during preloading then provision for methane gas underside the building may not be required.

6.2 Excavation and Dewatering

No excavation is recommend before successful completion of preload due to presence of 3-4m thick Peat.

Depending on the actual excavation depths, the excavation could possibly be carried out by slope cutting method, which would be the least expensive if feasible. For preliminary planning purposes, we recommend assuming excavation side slopes no steeper than 1.5H:1V. If the extent of the excavation needs to be minimized, then a commonly used and generally effective method for the ground conditions at the site would involve sheetpile shoring. Various methods could be considered with the use of sheetpiles if it desired to minimize dewatering such as extending the sheetpiles to act as a groundwater cutoff, using a cofferdam method, or using an underwater installation method.

Ultimately, the design, operation, and maintenance of the dewatering and shoring system should be made the responsibility of the contractor. The contractor would need to determine the means and methods of dewatering and shoring necessary to meet the project requirements.

6.3 Foundation Design

Table 4 below provides bearing values which may be used for the design of the raft, strip and pad foundation.

TABLE 4: Bearing Pressures

Foundation Material	Factored Ultimate Bearing Resistance	Maximum Allowable Bearing Pressure
Non-densified soil or structural fill placed thereon	75 kPa	50 kPa

The bearing capacities provided above are subject to the following conditions:

- Raft foundation is setback a suitable distance from finished fill or cut slopes with locations approved by the Geotechnical Engineer;
- Site preparation is completed as described in Section 6.1 “Site Preparation” and load bearing surfaces are reviewed and approved by the Geotechnical Engineer;
- The perimeter of the raft foundation is placed a minimum of 600 mm below finished adjacent grade for frost protection and confinement purposes;
- Minimum width of strip and pad footing should be 0.45m and 0.6m respectively. A minimum embedment of 600 mm below finished adjacent grade for frost protection and confinement is recommended.

A modulus of subgrade reaction for raft slab design of 15,000 to 20,000 kN/m³ is considered appropriate for the subject property.

6.4 Pile Foundation Design

For preliminary design three 0.5m diameter helix of 1m apart and 130mm diameter shaft helical screw can be used. The ultimate axial capacity of the piles can be found in the attached Figure No 12 and 13. A resistance factor 0.5 should be used to calculate the ultimate factored capacity of the pile. A resistance factor 0.5 can only be used if Pile Load Tests are completed on some test/production piles. More details will be provided in the final report.

Preload should be completed in areas where piles are to be employed as the load is transferred to the lower silt layers.

6.5 Slab-on-Grade

Construction of raft slabs should comply with recommendations provided in Section 6.1 “Site Preparation”. Floor slabs constructed on backfill placed on top of the raft slab should be prepared by placement of well-graded free draining structural fill with less than 5% fines content (passing the No. 200 sieve). The material should be placed in maximum 300mm thick lifts compacted to at least 95% Modified Dry Proctor Density (ASTM D 1557). A 100mm thick layer of 19mm clear crushed gravel should be placed beneath concrete slabs in order to provide a drainage and bedding layer. A layer of 6 mil poly vapor barrier should be placed over the clear crushed gravel to protect it from concrete contamination and to limit dampness of the concrete slab from capillary moisture effects.

6.6 Backfill

Backfill used for perimeter fill or for support of exterior sidewalks, driveways, patios etc. should consist of well-graded granular material with less than 5% fines passing the #200 sieve. The backfill should be placed in thin lifts with a maximum thickness of 300mm compacted to at least 90% Modified Dry Proctor Density. The placement of the backfill should be monitored and density tested to confirm adequate compaction has been achieved for hardscaped areas.

6.7 Sub-Drainage

A perimeter drain should be installed in areas where floor slab is less than 150mm above adjacent finished grade consisting of a 150mm diameter perforated PVC pipe surrounded by 150 mm of 19 mm clear crushed gravel wrapped in non-woven filter fabric. The perimeter drain should be installed approximately 450 to 600mm below the top of the main floor slab. The perimeter drain should be connected to a pumped sump or suitable gravity outlet.

6.8 Below Grade Lateral Earth Pressures

Below grade walls should be backfilled with free draining, well graded granular soil hydraulically connected to the perimeter drain system. The backfill should be compacted to at least 95% Modified Proctor maximum dry density where surrounding area will be paved or have other settlement sensitive features. Otherwise, the backfill compaction can be limited to 90% of the same standard.

Recommended design lateral pressures for design of below grade walls considering active and at-rest pressure conditions are shown in the attached Figure 9 and 10, respectively.

6.9 Geotechnical Reviews

Geotechnical reviews are required to satisfy Letters of Assurance issued for building permits and to confirm general compliance with our designs and recommendations provided in this report. It is considered that geotechnical reviews will be required to address the following issues:

- confirmation of adequacy of stripping within the building envelope;
- review and confirmation of adequacy of ground densification;
- confirm adequate compaction effort of backfill and allowable bearing pressure of building foundation;
- review of backfill for sub-drainage system;
- review of perimeter backfill;
- Pile driving.

7.0 CLOSURE

Please be advised that the contents of this report are based on information (structural and survey drawings, etc.) provided to **exp** by others and **exp's** understanding of the proposed development as described in this report. If the development plans change, or if during construction the soil conditions are noted to be different than those described in this report, **exp** Services Inc. must be notified promptly and the recommendations on the geotechnical aspects of the proposed development reviewed and adjusted accordingly. This report assumes that **exp** will complete field reviews during construction.

This report was prepared for the exclusive use of our client and designated consultants or agents, and may not be used by other parties without the written permission of **exp** Services Inc. **Exp** should be permitted to review the final architectural and structural plans.


Contractors should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions. This geotechnical report should not be included in contract specifications without suitable qualifications and prior review by **exp** Services Inc. However, the geotechnical report may be used as an attachment to contract specifications, for information purposes only.

Exp's "Interpretation & Use of Study and Report Instructions" is attached. These instructions form an integral part of this report and should be included with any copies of this report.

If you have any questions regarding the contents of this report, please call the undersigned.

Sincerely,

exp Services Inc.


Ujjal Chakraborty, P.Eng.
Geotechnical Engineer

Reviewed by:


Evan Sykes, P.Eng.
Senior Geotechnical Engineer

Enclosures: Interpretation & Use of Study and Report
Site Plan A1.0
Figure 1 – Testhole Location Plan
Figure 2 – Shear Wave Velocity Profile
Figure 3– Acceleration Response Spectra for Near Surface
Figure 4 – Acceleration Response Spectra at 2m below Grade
Figure 5 – Acceleration Response Spectra Recommended
Figure 6 – Peak Ground Acceleration Vs Depth Plot
Figure 7 – Cyclic Stress Ratio Vs Depth Plot
Figure 8 – Liquefaction Assessment Plot
Figure 9 – Lateral Earth Pressure for Yielding Wall
Figure 10 – Lateral Earth Pressure for Non-Yielding Wall
Appendix A – Bore Hole Logs (BH15-01 to BH15-03 and AH16-04)
Appendix B – CPT Data and Interpretation Plots
Appendix C – Photographs From Bore Hole BH15-01
Appendix D – Atterberg Limits
Appendix E – Sieve Analysis Report
Appendix F – Consolidation Test Results
Appendix G – Topographic Survey

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INTERPRETATION & USE OF STUDY AND REPORT

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental consulting unless specifically stated in the engineering report.

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 THE REPORT

The Report has been prepared for the specific site, development, building, design or building assessment 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.

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The information and opinions expressed in the Report, or any document forming 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 unauthorised use of the Report.

5. INTERPRETATION OF THE REPORT

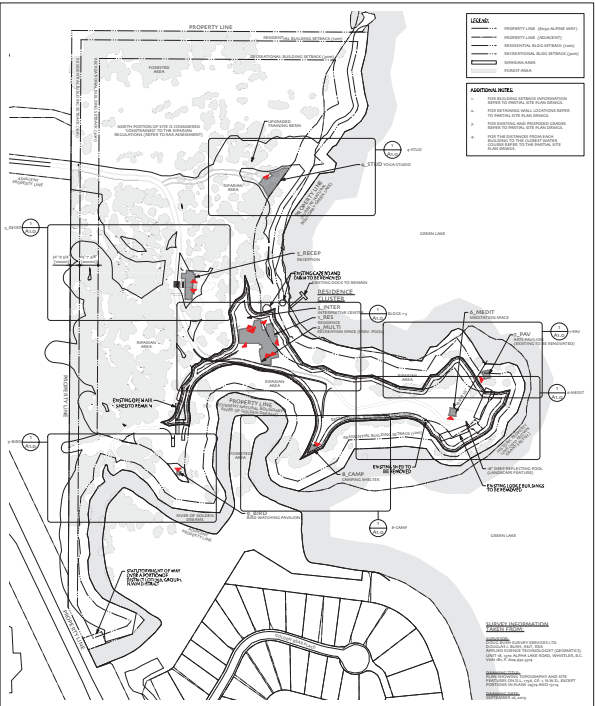
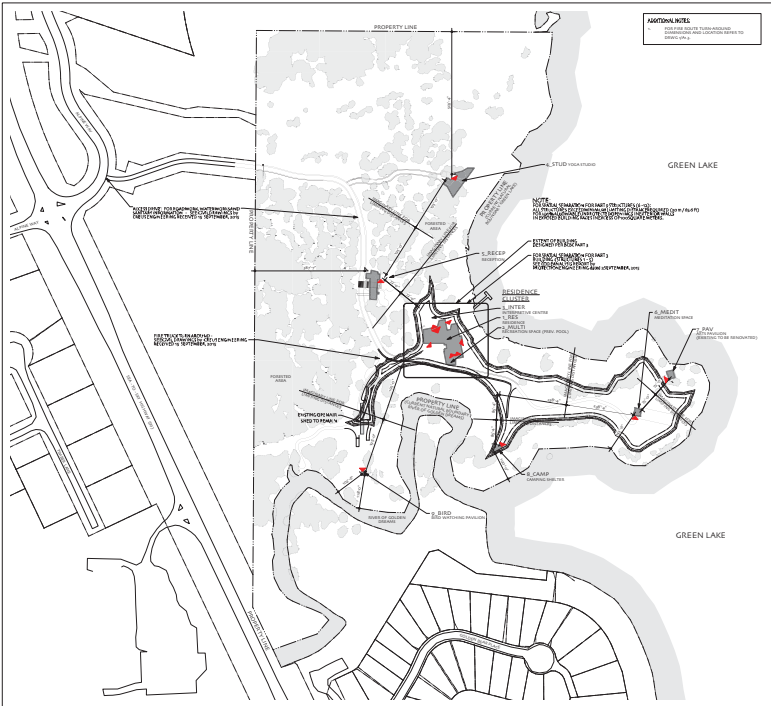
- a. Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising 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.
- 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 us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- c. To avoid misunderstandings, **exp** Services Inc. (**exp**) should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by **exp**. Further, **exp** should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with **exp's** recommendations. Any reduction from the level of services normally recommended will result in **exp** providing qualified opinions regarding adequacy of the work.

6.0 ALTERNATE REPORT FORMAT

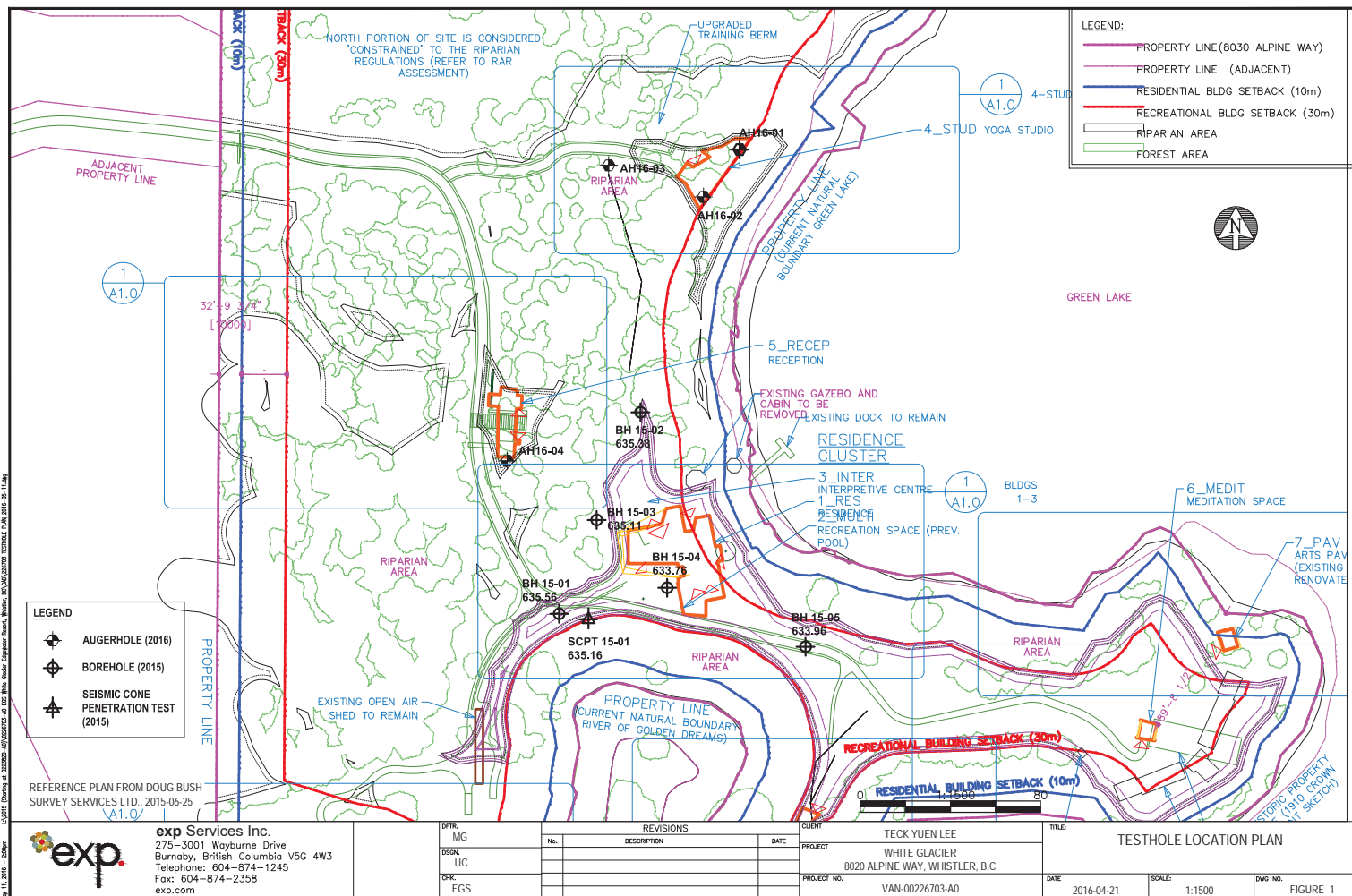
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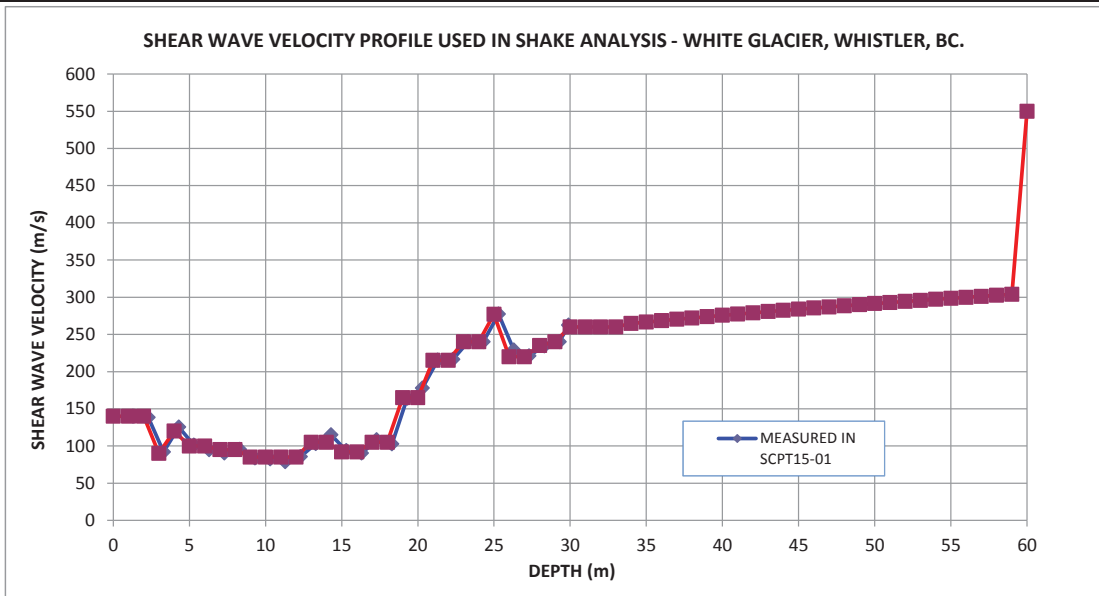
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BUILDING SEPARATION PLAN ②										SITE PLAN ①									
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exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:
 Teck Yuen Lee c/o Lameoureaux Architec Inc.

PROJECT
 White Glacier - Edgewater Resort

PROJECT NO.
 226703

DFTR.
 UC

DSGN.
 UC

CHK.
 EGS

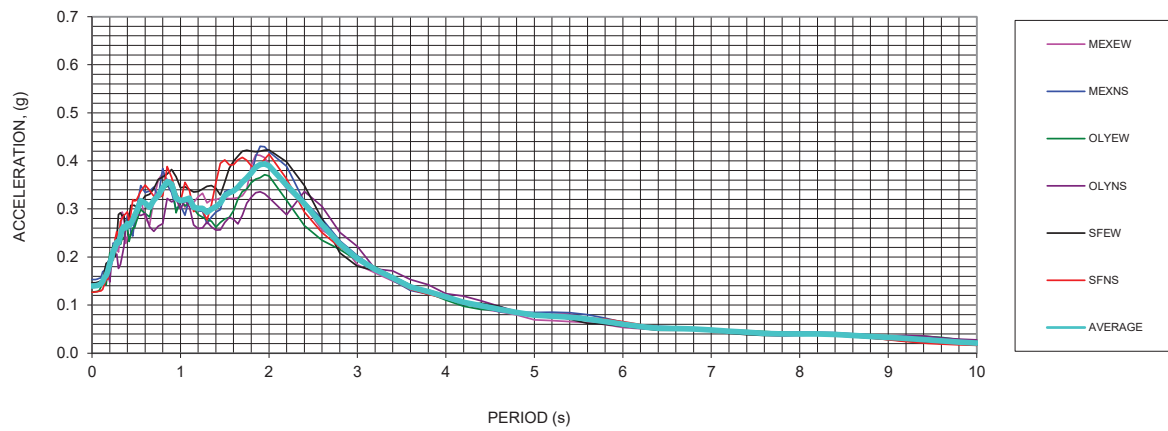
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 SHEAR WAVE VELOCITY PROFILE USED IN SHAKE ANALYSIS

DATE:
 7/13/2015

SCALE:
 NTS

FIGURE: 2

ACCELERATION RESPONSE SPECTRA AT GROUND SURFACE 1:2475 YEAR EVENT, 5% DAMPING



exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

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PROJECT
 White Glacier - Edgewater Resort

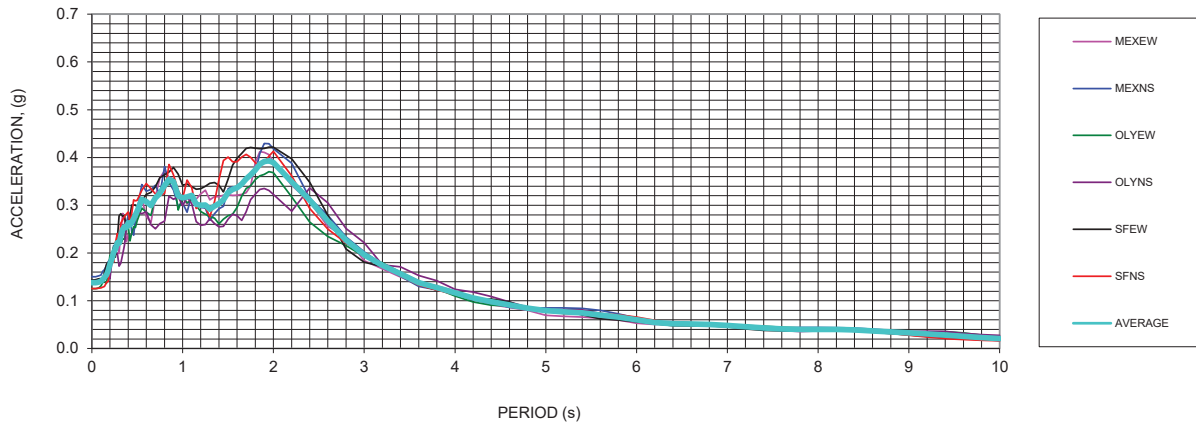
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:

ACCELERATION RESPONSE SPECTRA OF NEAR-SURFACE

DATE: 7/13/2015	SCALE: NTS	FIGURE: 3
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ACCELERATION RESPONSE SPECTRA 2m BELOW GROUND SURFACE SURFACE 1:2475 YEAR EVENT, 5% DAMPING



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 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:
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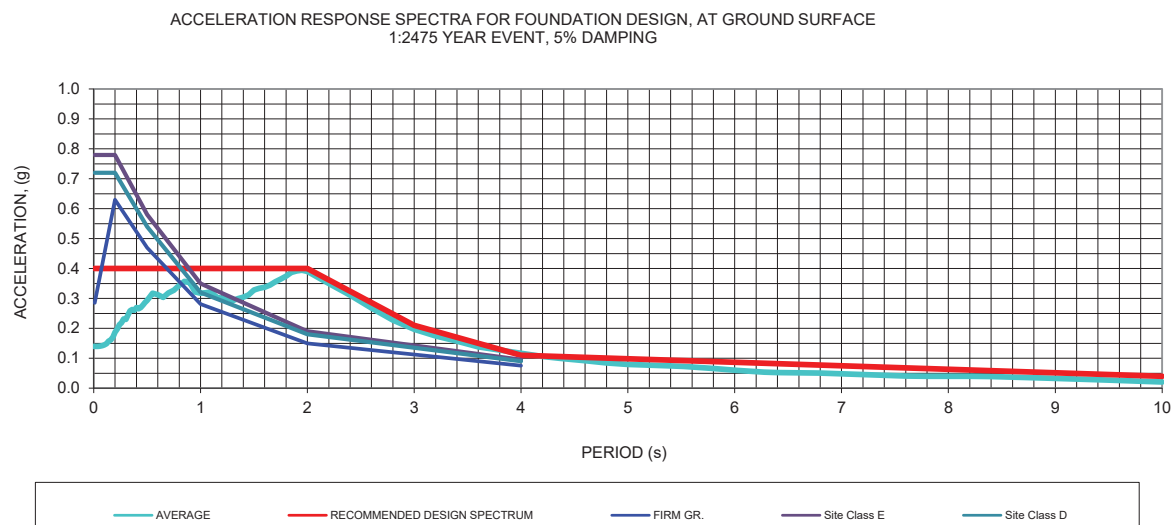
PROJECT
 White Glacier - Edgewater Resort

PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:

ACCELERATION RESPONSE SPECTRA AT 2M BELOW
 GROUND SURFACE

DATE: 7/13/2015	SCALE: NTS	FIGURE: 4
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exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5A 1X7
Tel: 604-874-1245
Fax: 604-874-2358
exp.com

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PROJECT NO.
226703

DFTR.
UC

DSGN.
UC

CHK.
EGS

TITLE:

ACCELERATION RESPONSE SPECTRA FOR FOUNDATION
DESIGN

DATE:

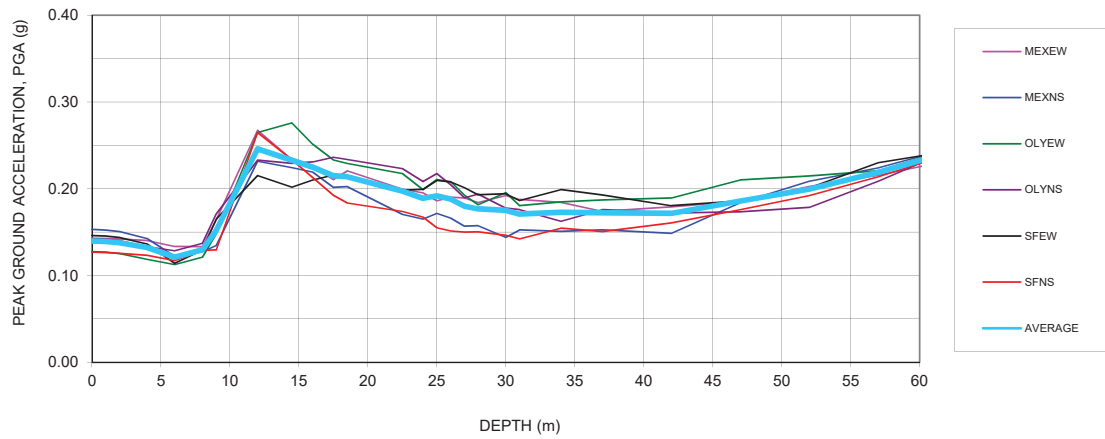
7/13/2015

SCALE:

NTS

FIGURE: 5

RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475 EVENT



exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

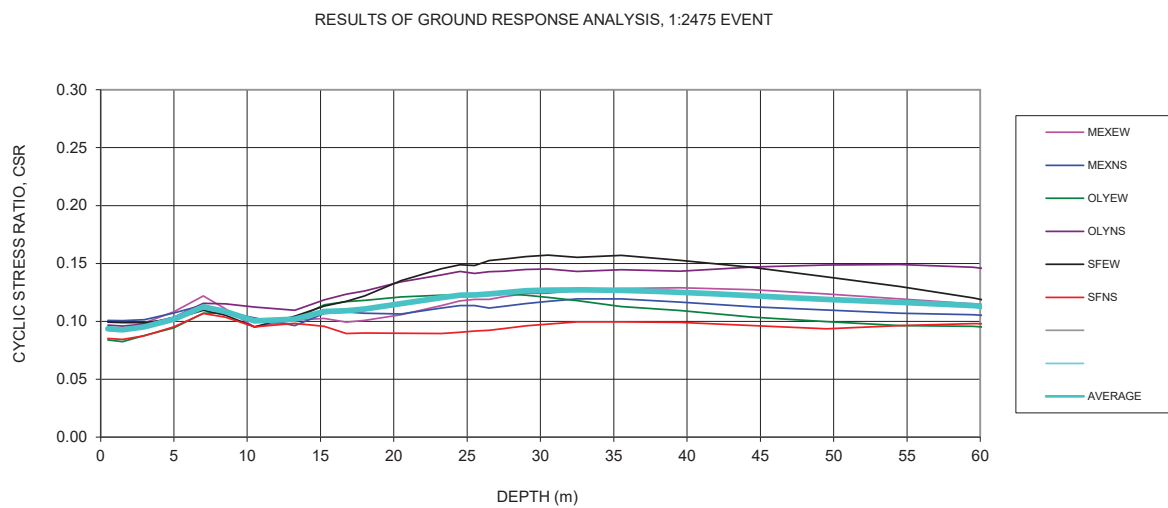
CLIENT:
 Teck Yuen Lee c/o Lameoureaux Architec Inc.

PROJECT
 White Glacier - Edgewater Resort

PROJECT NO.	DFTR.	DSGN.	CHK.
226703	UC	UC	EGS

TITLE:
 RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, PGA

DATE:	SCALE:	FIGURE:
5/9/2016	NTS	6



exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:
 Teck Yuen Lee c/o Lameoureaux Architec Inc.

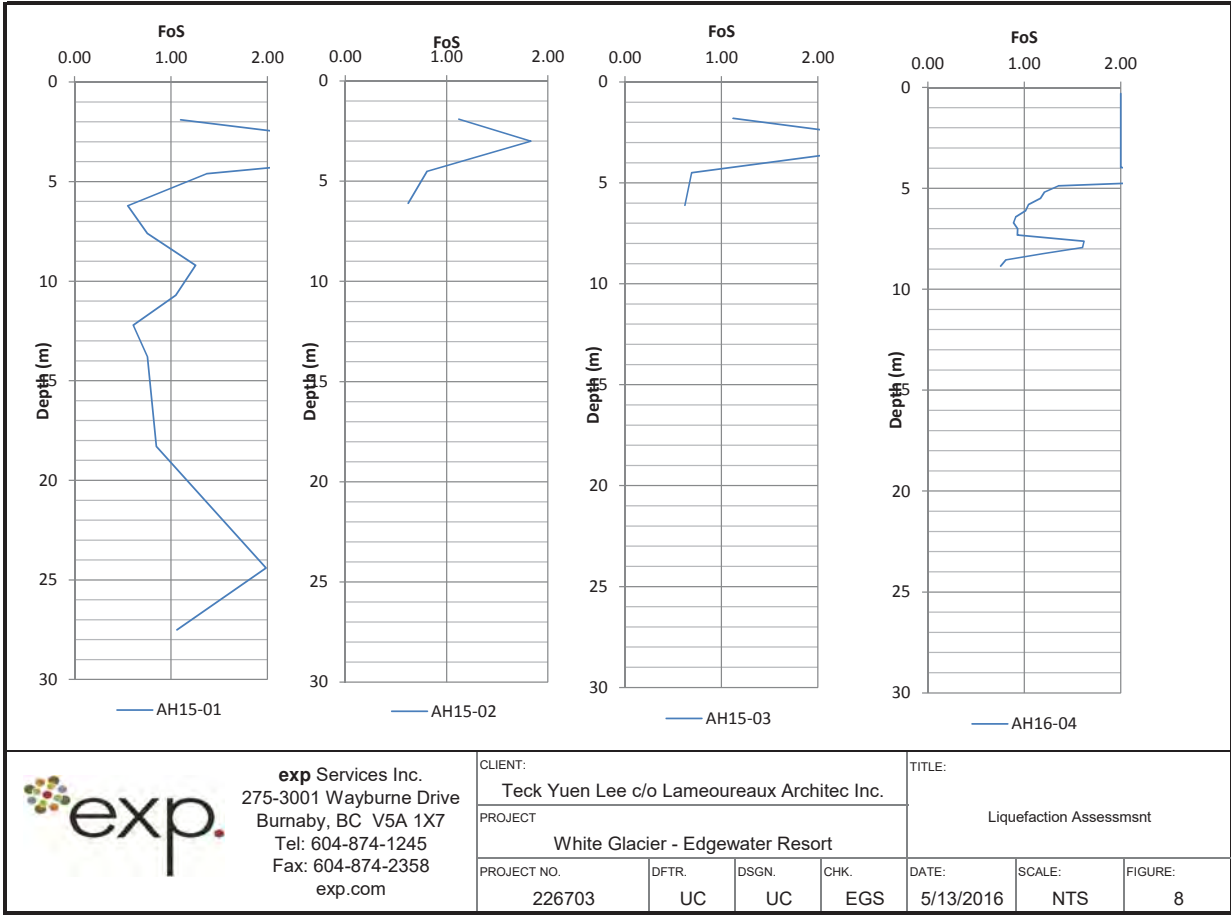
PROJECT
 White Glacier - Edgewater Resort

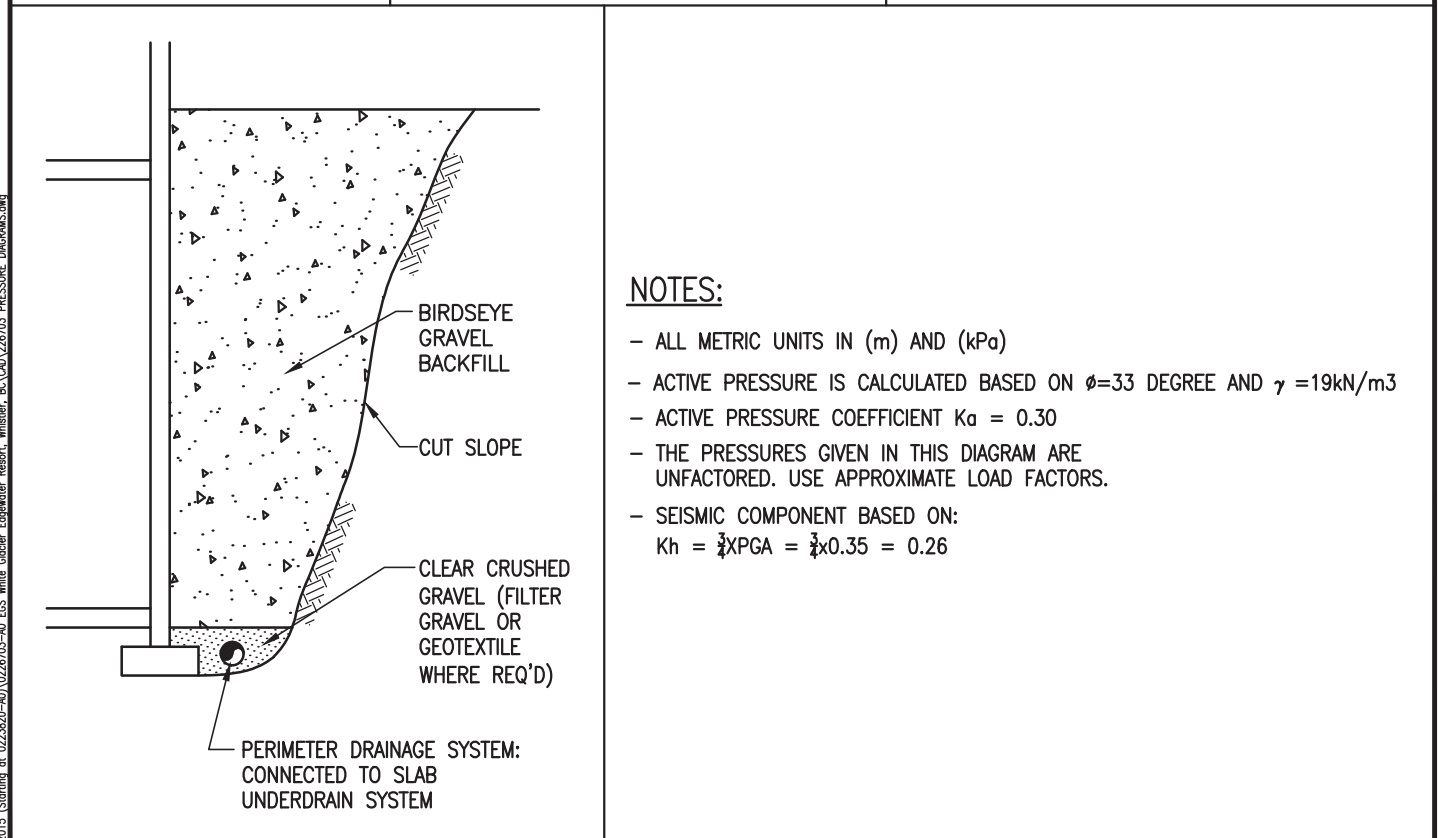
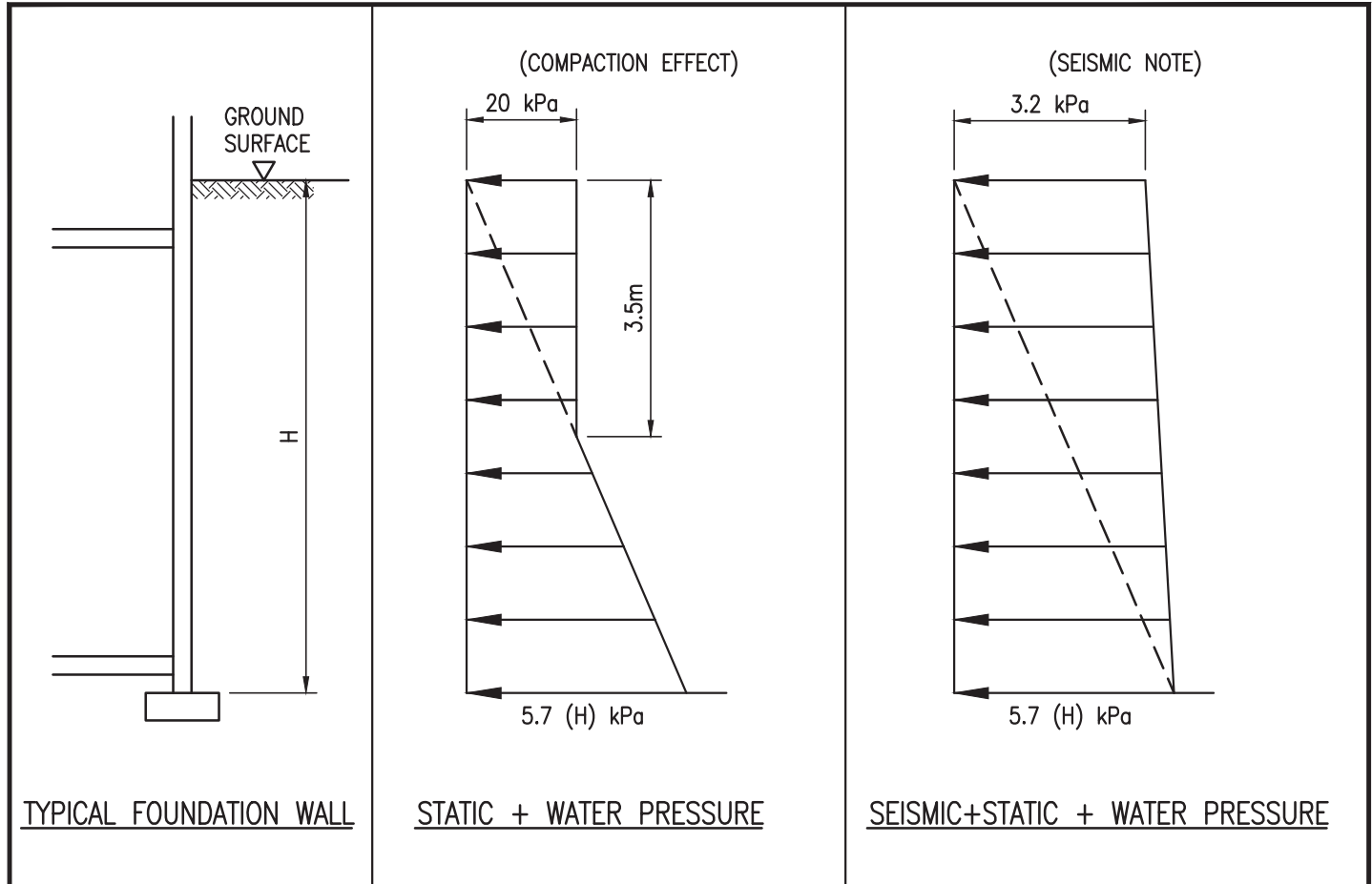
PROJECT NO. 226703	DFTR. UC	DSGN. UC	CHK. EGS
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TITLE:
 RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, CSR

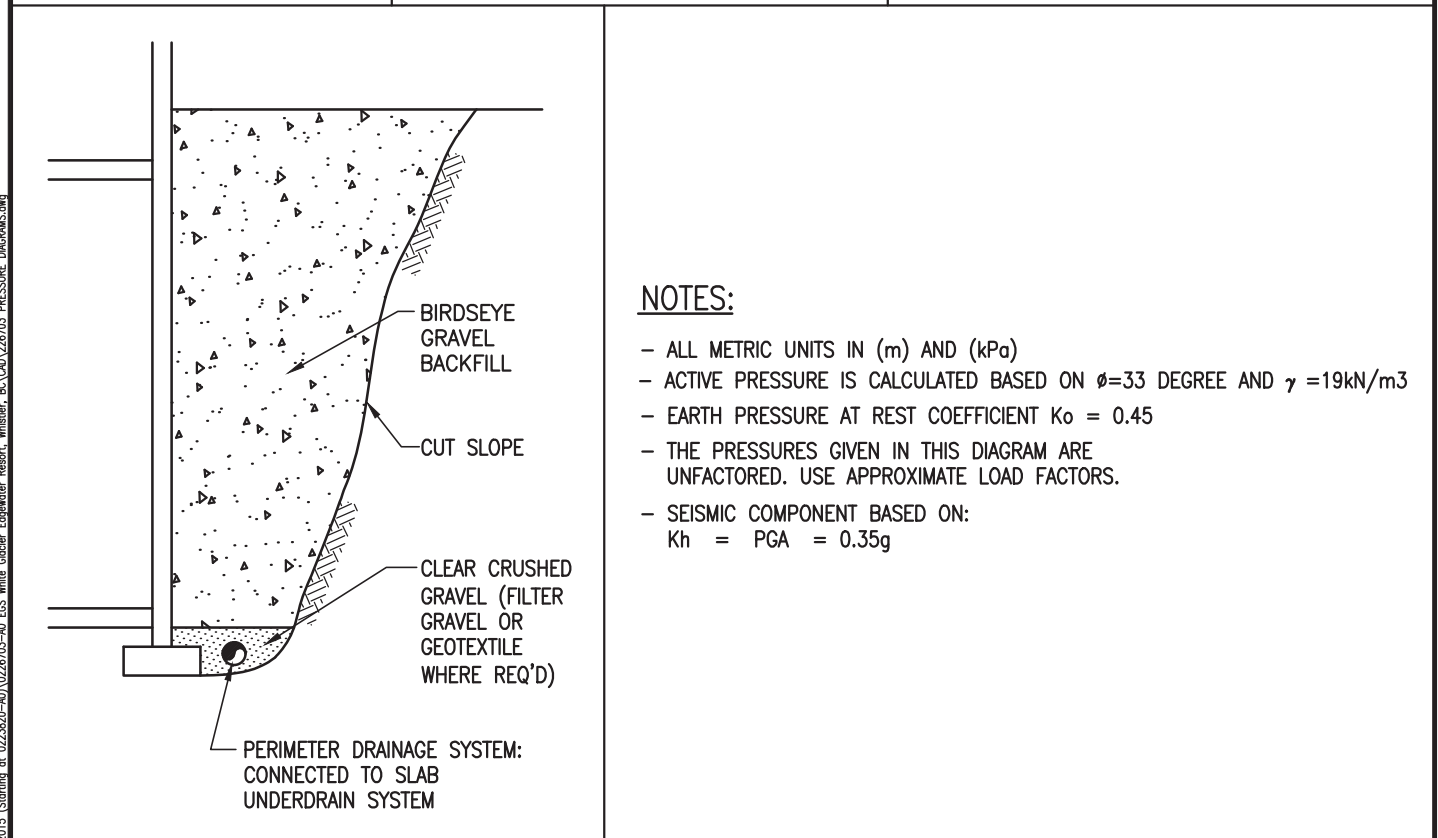
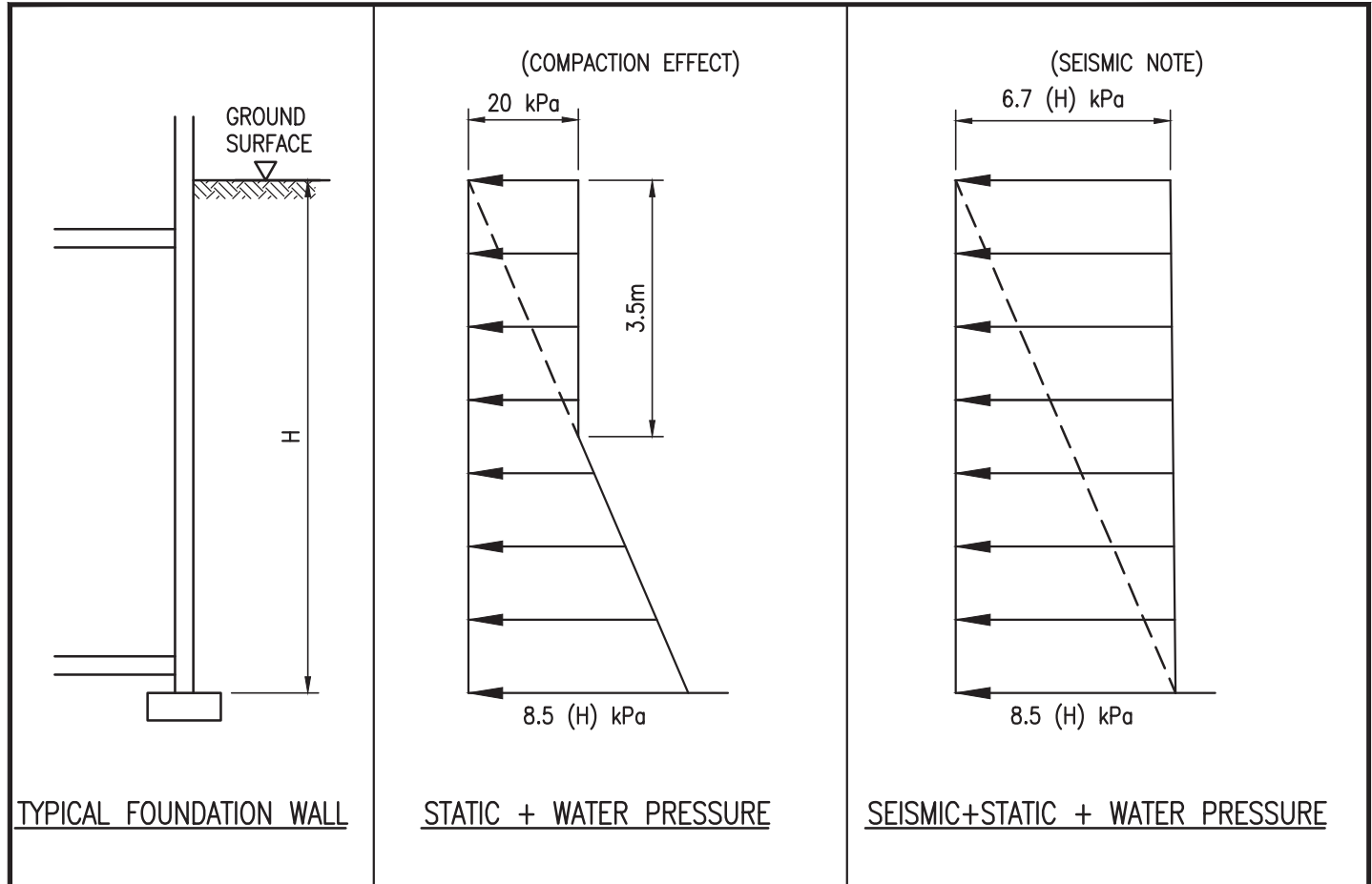
DATE: 7/13/2015	SCALE: NTS	FIGURE: 7
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L:\2015 (Starting at 0223820-A0)\0226703-A0 EGS White Glacier Edgewater Resort, Whistler, BC\4.3 Design\White Glacier\Liquefaction Plotting.xlsx2475 for site 2





CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE ON YIELDING WALLS, 2475 E		
PROJECT WHITE GLACIER - EDGEWATER RESORT WHISTLER, B.C.						
PROJECT NO. VAN-00226703-A0	DFTR. MG	DSGN. UC	CHK. EGS	DATE 2015-07-08	SCALE: NTS	DWG NO. FIGURE



CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE ON NON-YIELDING WALLS, 2475 E		
PROJECT WHITE GLACIER - EDGEWATER RESORT WHISTLER, B.C.						
PROJECT NO. VAN-00226703-A0	DFTR. MG	DSGN. UC	CHK. EGS	DATE 2015-07-08	SCALE: NTS	DWG NO. FIGURE 10

Appendix A

Bore Hole Logs

BH15-01 to BH15-05 and AH16-04

4Ä"; 11 Ä35 % Ä H(BJVQQT LVNV)(
4Ä"; 11 Ä0 5 ' F;:ÄÄ36: 0
#Ä-' '- /Ä#0 1 QVPSJVTJVQÄ;,
#Ä-' '- /Ä"1 Ä011 "Ä YG5ÄWÄ 034/ÄC, MÄ&:5M
#Ä-' '- /Ä 5 18"# ÄÄ: 6ÄC0.
2 3-45 .1 Ä64 ! WNVQÄW68ÄYG4:5ÄÄ4: 6Ä!03
" " // #Ä %6 !ÄÄ I& 17 #Ä %6)Ä Ä

! ' - .1 #. 68ÄÖ.4Ä&..

4Ä"; ! 1Ä"! 01.-. OVQVÄ(4.Ä' 1DÄ' F+;30ÄD/

%Ä&" Ä"!0 1.-. B ÄSSSRUORMPTÄÄÄÄPQPMVVVR

'90 1.-. TNSMSTÄ-

/Ä"3.#Ä 8 01 ÄÄ 9' : (▽ Ä1Ä-5 Ä\$ÄÄ-' -./ PMS-ÄÄÄ00.5

▽ 01Ä.#Ä\$ ÄÄÄ-' -./ JJJ

▽ 0\$1 ÄÄÄ-' -./ JJJ

[illegible]

4Ä"; !1 Å35 % Ä H(BJMVQQTLVNY(

! - .1 #. 68A 6.4A&..

4A" ; !1 A0 5 ' F::AA316: 0

4Ä"; !1Ä"!01-". OVQVÄ(4.Ä' 1DÄ'F+;30*ÄV

#Ä-' ' -. /Ä#0 1 QVPSJVTJVQÄ;

% "Ä &"" Ä " !0 1-". B ÄSSSRUORMPTÄÄÄNPQPMVVR

#Ä-' ' -. /Ä!"1 Ä0!1 "Ä Y G5ÄVÄ 034/ÄC, MÄ&;5M

' 90 1-". TNSMSTĀ-

#Ä-' ' -./Ä 5 1&"# Ä,4: 6ÄÇ0.

1A3.8 801 A9' : (Δ A1A5 A\$A-' -/ PMS-AA00.5

2 3-45 .1 Å64 ! WNQVÅ#68ÅYG4;.5ÅÄ,4: 6Å!03

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				ÄBZYW)@	Ä#?\$	Ä)C H)@ ?Ä[QV RV TV OV	PVW Q/V NW RVV	QV RV TV OV
							! ? B(Y %ÄC B) W& ' Ä^VM	>%Ä IÄH(B) ÄX)(@Ä<\$S1=	\$\$(Ä# %Ä)Ä%Z%Ä%# Y %Ä#Z @ Ä B #) B#
						QV RV TV OV	\$ 18 @ - , \$ PVW Q/V NW RVV	\$& YC && QV RV TV OV	
PP		Ä(B! Ä Ä @ H) &*Ä+,-Ä6,773.+*Ä;016Ä+3*Ä/0.DÄ9*Ä<3.-Ä+145 145Ä/012 Ä10.Ä33/015.5Ä145Ä+G7J0,G45.5Ä;Ä14103 JE0.bG.4;Ä00+Ä,EÄ5Ä145Ä,0/14:6Ä0.-414;+	TQSMS	ÄPQ	ÄW				
				ÄPN	Ä\$#	QS			QO
				ÄPR	ÄW				NV
PQ		J/012 Ä145Ä9,5Äc1--.5Ä: 4ÄtÄ,EÄ+1-I30	TQNMR						
PN		Ä(B! *Ä+,-Ä+3*Ä00+Ä145Ä+1+Ä,EÄ+Ä00+Ä,EÄ5Ä145Ä,0/14:6* /0.DÄ9,FÄ768Ä00+*Ä9,*Ä<3.=	PQMQ		Ä\$#	V			
			TQNMP						
			PQMS	ÄPS	ÄW				SQ
PR				ÄPT	Ä\$#	LS			LU
				ÄPL	ÄW				
			TQPMMP						
PS		Ä%#*Ä+,-Ä63DÄ;Ä6D DÄ+1-+Ä,EÄ+145*Ä,66Ä13Ä9,5ÄE01/- .4;+* 5108Ä145Ä3Ä/0.D*Ä+;0E5*Ä-.; +*Ä6Ä;Ä+EE=Ä;Ä31+;6	PRMS						
				ÄPO	Ä#	UT			RL
				ÄPU	ÄW				OV
PT		JÄF.37DÄÄ-I3 . ÄQ--Ä;ÄPV--Ä: 4;03D0+Ä,EÄ8#Ä;016.Ä+145*Ä0 63DÄ;016.Ä,0/14+*Ä5108Ä70Ä-.; +;dÄ@Ä(B%Ä%&#Ä5108ÄÄÄ* -.; +;dÄ145ÄB! *Ä9;*Ä/0.DMÄÄÄ/MLN*ÄÄÄ/MVO*ÄÄÄPLV8\$1							
PL									
PO		Ä%#?Ä(B! *Ä+,-Ä,0/14: 6+*Ä;016.Ä/012Ä9;*Ä/0.D*Ä<2DÄ;+. =	TPOMV						
			PLMS						
PU		Ä%#*Ä+,-Ä63DÄ;Ä6D DÄ,661+Ä13ÄI,68;+Ä145Ä+1-+Ä,EÄ+Ä+145* 7368Ä145Ä/0.DÄ: 41;5*Ä-.; +*Ä<+;E;Ä0ÄÄ+3F;ÄI3+;6	TPLMQ	ÄQV	Ä\$#	PVV			QU
			POMR	ÄQP	Ä\$#				OV
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QV				ÄQQ	ÄW				

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[illegible]

4Ä"; !1 Å35 % Ä H(BJMVQQTLVNY(

! - .1 #. 68Āᄁ.4Ā&..

4Ä" ; !1 Ä0 5 ' F;..ÄÄ36: 0

4Ä"; !1Ä"!01-". OVQVÄ(4.Ä' 1D'Ä' F+;30*ÄV

#Ä-' ' -. /Ä#0 1 QVPSJVTJVQÄ;

% "Ä &"" Ä"!0 1-". B ÄSSSRUORMPTÄÄÄNIPQPMVVR

#Ä-' ' -. /Ä!"!1 Ä0!1 "Ä YG5ÄWÄ 034/ÄC, MÄ&;5M

' 90 1-" . TNSMSTĀ-

#Ä-' '-./Ä 5 1&"# Ä,4:6ÄÇ0.

1A"3.#A 8 01 AA 9' : (∇ A1A-5 A \$A-A-' -J PMS-AAE00.5

2 3-45 .1 Å64 ! WNQVÄ#68ÄYG4;5ÄÄ,4: 6Ä!03

01Ä.#Ä"\$ ÄÄ-' '-./ JJJ

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QQ		Ä(B! *Ä,016.Ä*Ä/0.DÄ-,: +;*Ä<8Ä;Ä6,-16;=							
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QR		Ä%#*Ä;016.Ä83Ä/0.DÄ-,: FÄF;Ä,32. Ä0.4ÄI,68.;+*Ä-,: +;*Ä<8Ä;Ä2D +;EE=					ÄQS	AW	
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QT				ÄQL	AW			UT ⊙	NP ⬠
QL									LQ ⊙
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.\$ AA) AA/QTWNJNMA\$A)`\$ÄÄ#! MA!#ÄÄVL"PS

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4Ä"; !1 Ä0 5 ' F;: ÄÄ36: 0

#Ä-' - /Ä#0 1 QVPSJVTJVNÄ;,,

#Ä-' - /Ä!" 1 Ä011 "Ä YG5ÄWÄ 034/ÄC, MÄ&5M

#Ä-' - /Ä 5 18"# ÄÄ: 6ÄC0.

2 3-45- 1 Ä64 ! VNVQVÄÄ 68ÄYG4: 5ÄÄ4: 6Ä!03

' " // #Ä %6 !ÄÄ 1& 17 #Ä %6)Ä Ä

! ' - .1 #. 68ÄÇ.4Ä&..
4Ä"; ! 1Ä " ! 01-". OVQVÄ 4.Ä' 1DÄ F-; 30*ÄW
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'90 1-". TNSMNOÄ-
/Ä"3.#Ä 8 01 ÄÄ 9' : (∇ Ä 1Ä 5 Ä \$ÄÄ-' - / QMR-ÄÄÄ00.5
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#Ä-' - /Ä 5 1&"# Ä4:6ÄC0.
2 3-45 .1 Ä64 ! VNVQVÄ#68ÄYG4;5ÄÄ4:6Ä!03
'" //Ä# %6 !ÄÄ !& !7 #Ä %6 _JA Ä

!' - .1 #. 68ÄÄ.4Ä&..
4Ä"; !1Ä"!01". OVQVÄ4.Ä' 1DÄ' F+:30*ÄV
%"Ä&" Ä"10 1". B ÄSSSVQSMRLRÄÄVNPMLMTRN
'90 1". TNSMPÄ-
/Ä"3.#Ä 8 01 ÄÄ 9' : (∇ Ä1Ä-5 Ä\$ÄÄ-' - / PMQ-ÄÄ00.5
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		\$) (#?Ä @Ä(BÄCÄ%#Ä+1-+Ä,EÄEÄ+145*Ä0.55FÄ70,9*ÄÄ0,G+* 9.;*Ä<20Ä+,E;Ä,Ä+,E;=	TNNMU PMQ						PU
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N	R	Ä@ H) &&?ÄÄ B! *Ä+,-Ä+3*Ä/0.DÄ;FÄ70,9Ä145ÄÄ;Ä+1-+*Ä9.;* <6,-116;=Ä/012. 3Ä+14/GÄ0*Ä145ÄÄ-5: G-Ä,Ä6,10+Ä/014.5	TNQMR QML	ÄRR	Ä\$#	SR	PN		PQ
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				ÄRT	Ä\$#	SU			TV
S	T			ÄRL	AW				
		Ä%#Ä,016.ÄÄÄÄ+1-+Ä,EÄEÄ+145*ÄÄ 41;5*Ä/0.DÄ45Ä768*Ä<+,E;= +3;F,3DÄÄ+;6	TQUMQ SMU TQOML	ÄRO	Ä\$#	PVV			SU

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Appendix B

CPT

CPT Data and Interpretation Plots

PRESENTATION OF SITE INVESTIGATION RESULTS

Green Lake, Whistler

Prepared for:

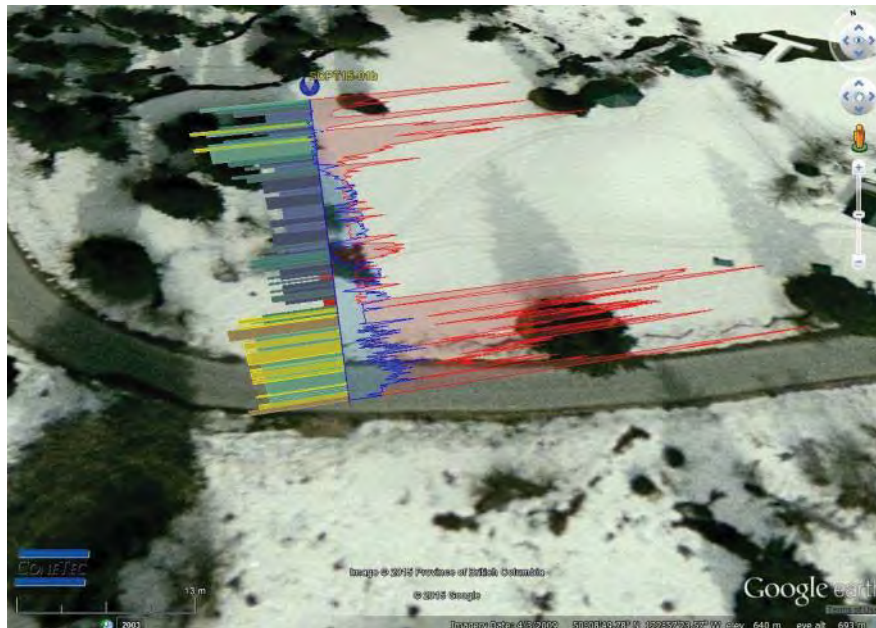
exp Services Inc – Burnaby, BC

ConeTec Job No: 15-02049

Project Start Date: 02-Jun-2015

Project End Date: 02-Jun-2015

Report Date: 03-Jun-2015



Prepared by:

ConeTec Investigations Ltd.

12140 Vulcan Way
Richmond, BC V6V1J8

Tel: (604) 273-4311

Fax: (604) 273-4066

Toll Free: (800) 567-7969

Email: insitu@conetec.com

www.conetec.com

www.conetecdataservices.com



Introduction

This report presents the data gathered by ConeTec Investigations Ltd. on June 2nd 2015. The work, which consisted of 1 SCPT sounding, was conducted next to Green Lake along Alpine Way in Whistler, BC.

Project Information

Project	
Client	exp Services Inc - Burnaby, BC
Project	Green Lake, Whistler
ConeTec project number	15-02049

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Track Rig (M5T)	14 ton rig cylinder	SCPT

Coordinates			
Test Type	Collection Method	EPSG Number	Comments
SCPT	Consumer Grade GPS	32610	Coordinates were collected using a consumer grade GPS device; elevations are not reported

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	Seismic and Advanced, Su (Nkt)
Additional comments	

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm ²)	Sleeve Area (cm ²)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
328:T1500F15U500	AD328	15	225	1500	15	500
Cone AD328 was used for all CPT soundings.						

Interpretation Tables	
Additional information	The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997) was used to classify the soil for this project.

Limitations

This report has been prepared for the exclusive use of exp Services Inc - Burnaby, BC (Client) for the project titled "Green Lake, Whistler". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Investigations Ltd. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm² and 15 cm² tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm² penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm² piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u₂" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

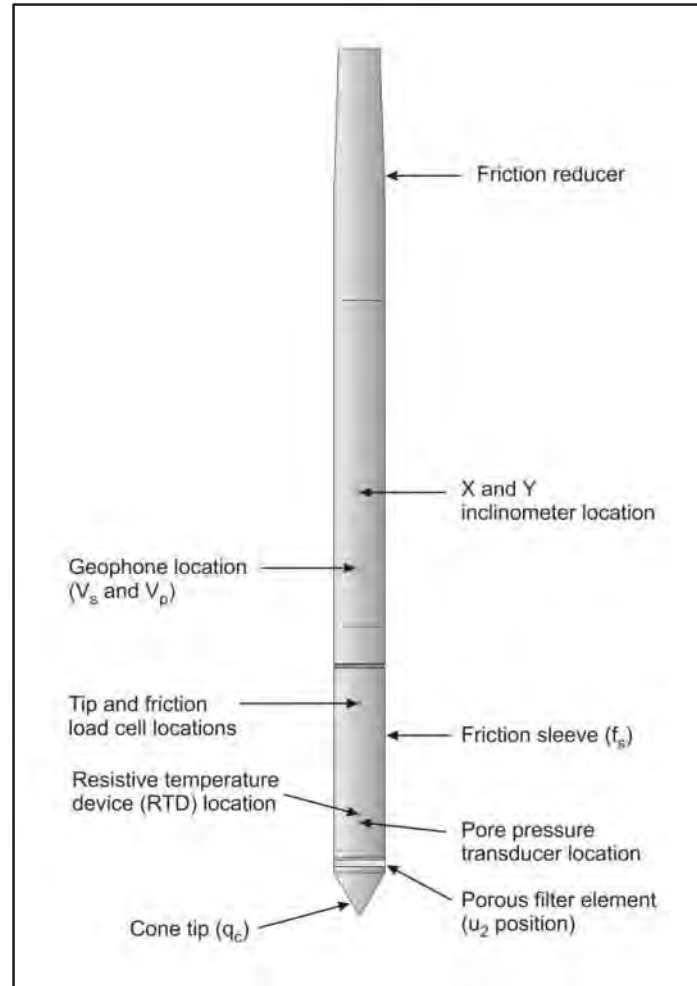


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerine or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerine under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behaviour type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where: q_t is the corrected tip resistance

q_c is the recorded tip resistance

u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)

a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (V_p) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

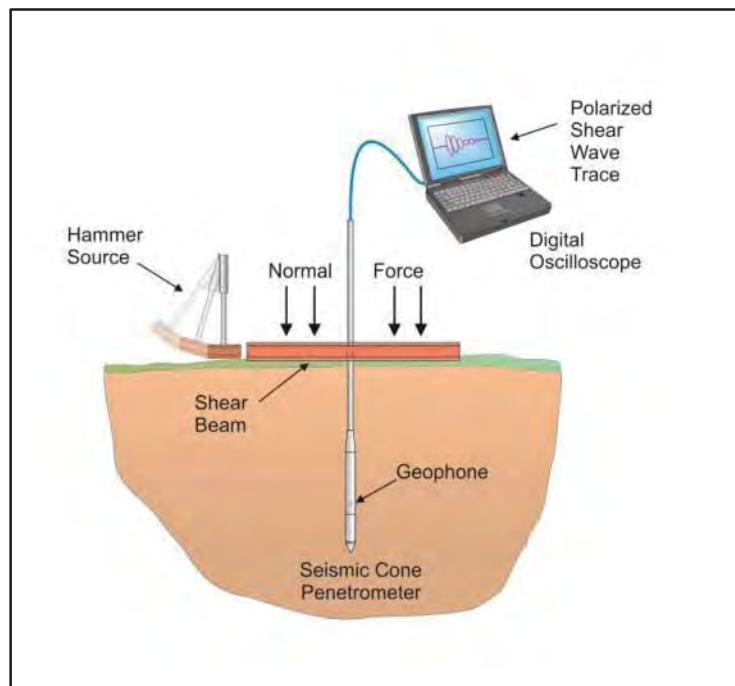


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

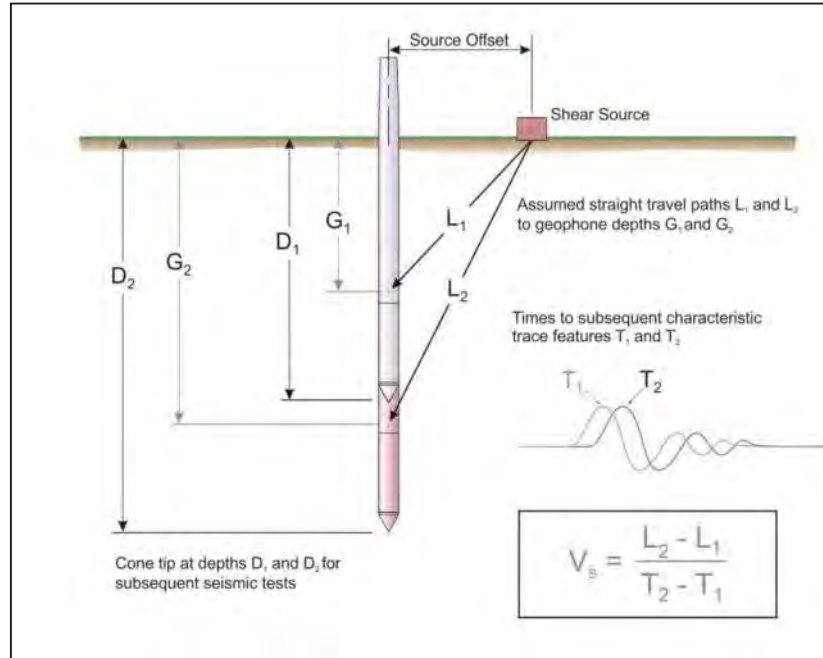


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 30 meters (V_{s30}) has been calculated and provided for all applicable soundings using an equation presented in Crow et al., 2012.

$$V_{s30} = \frac{\text{total thickness of all layers (30m)}}{\sum(\text{layer traveltimes})}$$

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

Crow, H.L., Hunter, J.A., Bobrowsky, P.T., 2012, "National shear wave measurement guidelines for Canadian seismic site assessment", GeoManitoba 2012, Sept 30 to Oct 2, Winnipeg, Manitoba.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

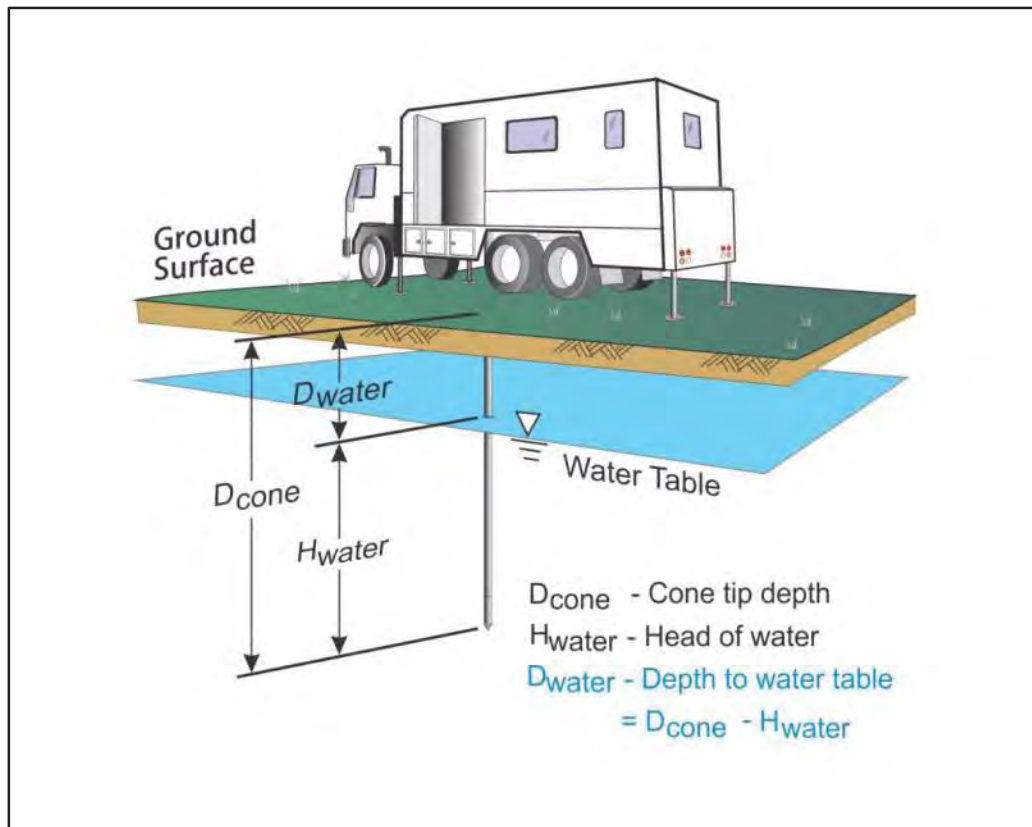


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behaviour.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

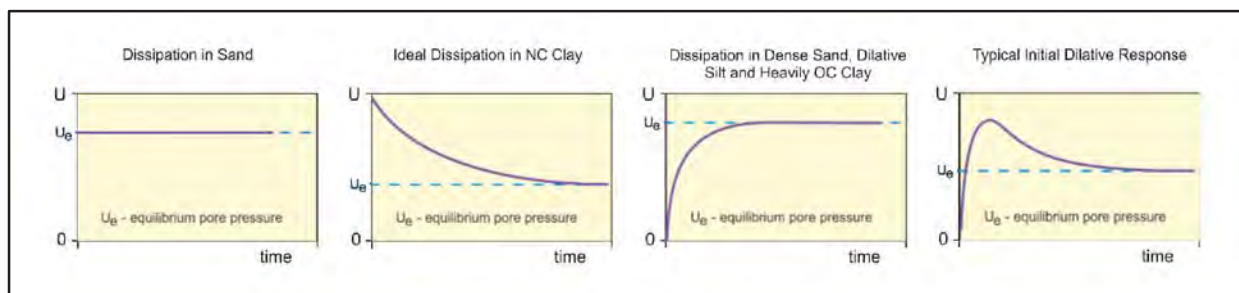


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100} . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100} . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T^*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- T^* is the dimensionless time factor (Table Time Factor)
 a is the radius of the cone
 I_r is the rigidity index
 t is the time at the degree of consolidation

Table Time Factor. T^* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50} , dissipation tests must be taken to a pressure less than u_{50} . The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100} . To estimate u_{50} , both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50} . In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r , the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50} , other methods should be applied to confirm the results for c_h .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots, S_u (Nkt)
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface ¹ (m)	Final Depth (m)	Northing ² (m)	Easting (m)	Refer to Notation Number
SCPT15-01b	15-02049_SCP01b	02-Jun-2015	AD328:T1500F15U500	1.4	30.00	5554986	503134	

1. Assumed phreatic surface based on pore pressure dissipation tests. The equilibrium pore pressure profile was used for the interpretation tables.

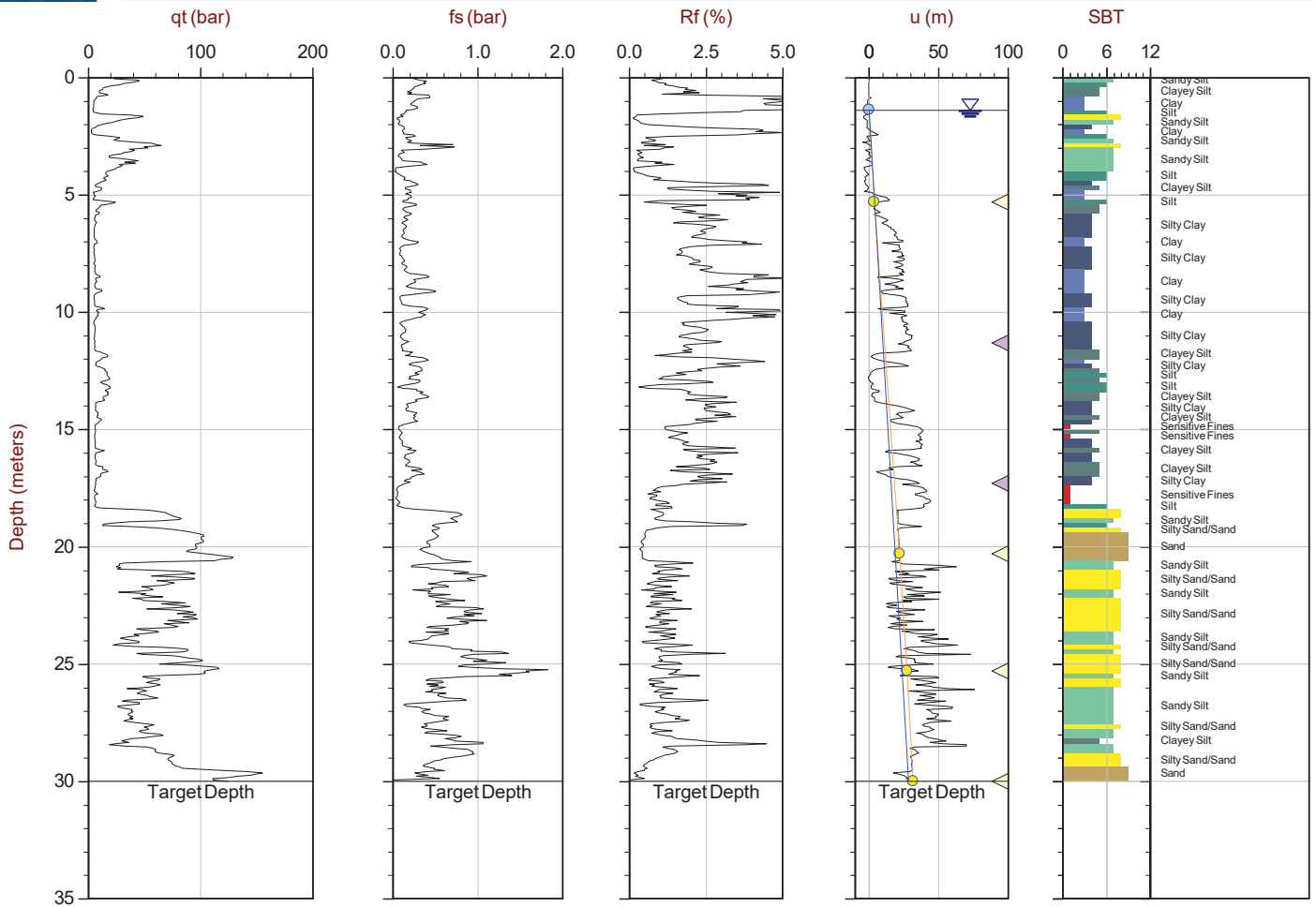
2. Coordinate were collected using a consumer grade GPS device with datum WGS84/UTM Zone 10 North.



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 15-02049_SCP01B.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

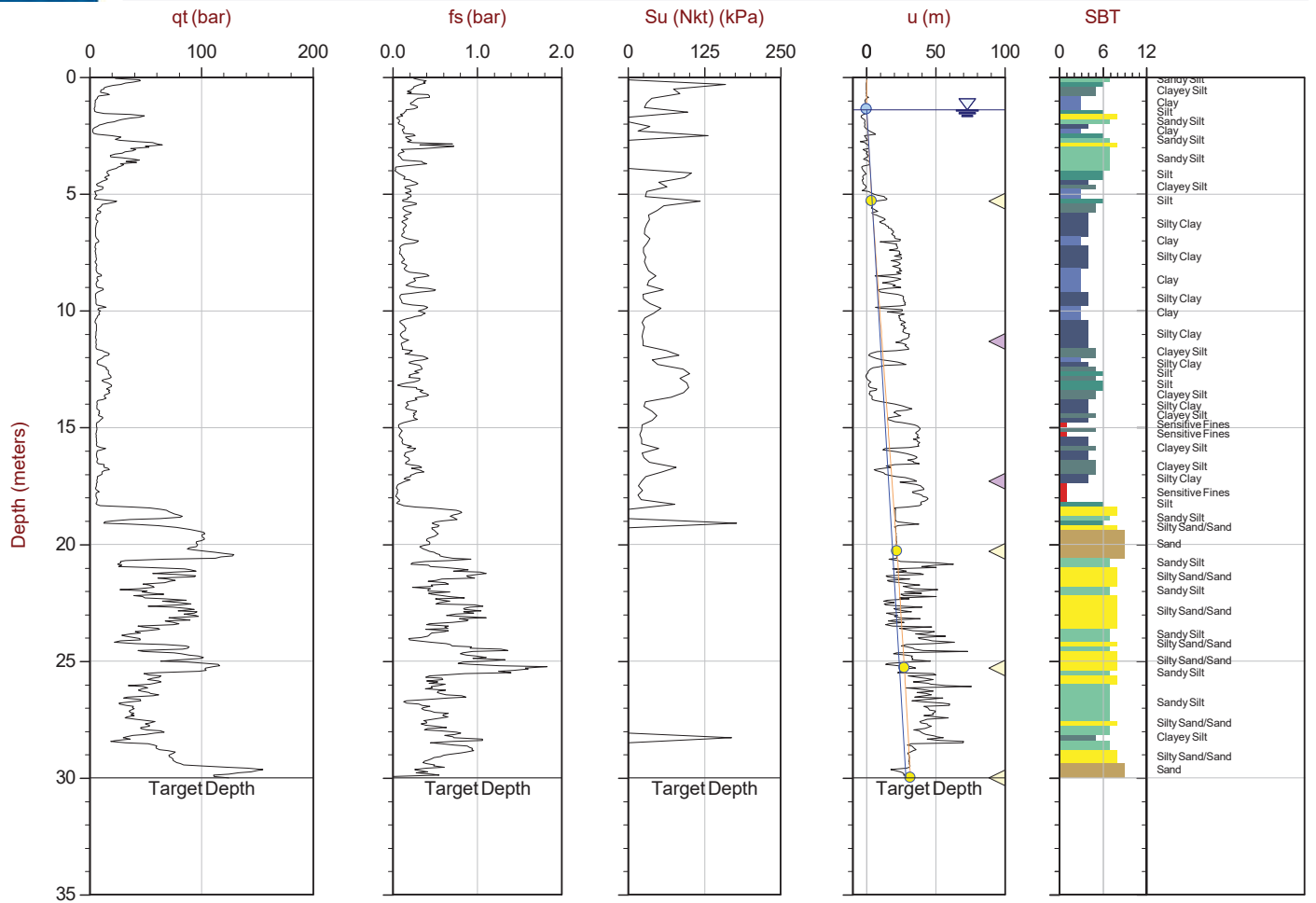
Advanced Cone Penetration Test Plots Undrained Shear Strength (Nkt)



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft

File: 15-02049 SCP01B.COR
Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Avg Int: 0.200m Su Nkt: 15.0 ● Assumed Ueq ● Ueq — Hydrostatic Line — Ueq Profile ▲ PPD, Ueq achieved ▼ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

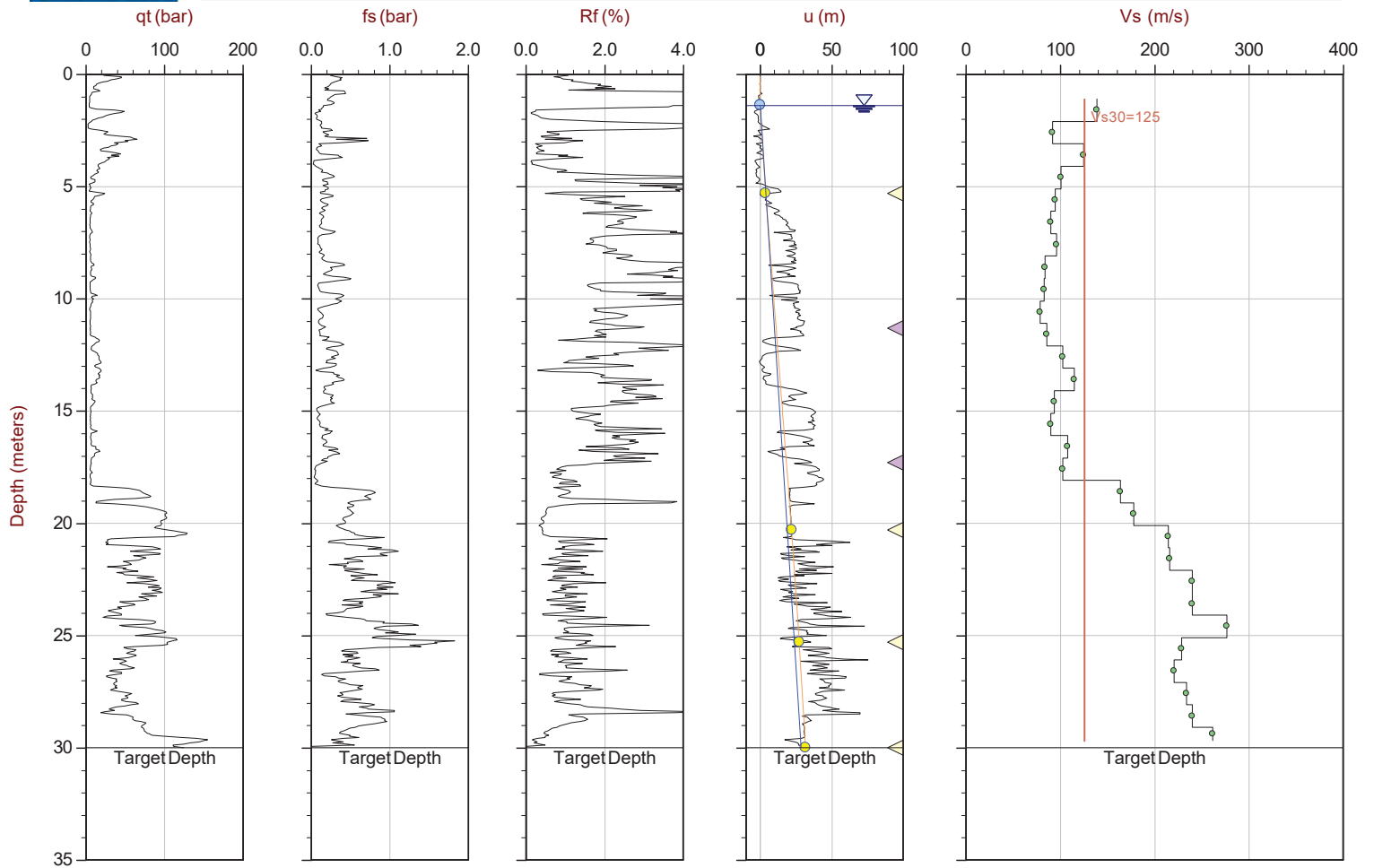
Seismic Cone Penetration Test Plots



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 15-02049 SCP01B.COR
UnitWt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
1.30	1.10	1.17			
2.30	2.10	2.14	0.97	6.98	139
3.30	3.10	3.13	0.99	10.74	92
4.30	4.10	4.12	0.99	7.92	125
5.30	5.10	5.12	1.00	9.85	101
6.30	6.10	6.11	1.00	10.52	95
7.30	7.10	7.11	1.00	11.05	90
8.30	8.10	8.11	1.00	10.46	96
9.30	9.10	9.11	1.00	11.95	84
10.30	10.10	10.11	1.00	12.09	83
11.30	11.10	11.11	1.00	12.71	79
12.30	12.10	12.11	1.00	11.65	86
13.30	13.10	13.11	1.00	9.70	103
14.30	14.10	14.11	1.00	8.68	115
15.30	15.10	15.11	1.00	10.65	94
16.30	16.10	16.10	1.00	11.07	90
17.30	17.10	17.10	1.00	9.23	108
18.30	18.10	18.10	1.00	9.73	103
19.30	19.10	19.10	1.00	6.10	164
20.30	20.10	20.10	1.00	5.62	178
21.30	21.10	21.10	1.00	4.64	215
22.30	22.10	22.10	1.00	4.62	216
23.30	23.10	23.10	1.00	4.17	240
24.30	24.10	24.10	1.00	4.16	240
25.30	25.10	25.10	1.00	3.61	277
26.30	26.10	26.10	1.00	4.37	229
27.30	27.10	27.10	1.00	4.52	221
28.30	28.10	28.10	1.00	4.27	234
29.30	29.10	29.10	1.00	4.17	240



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
29.90	29.70	29.70	0.60	2.29	262

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm ²)	Duration (s)	Test Depth (m)	Estimated Equilibrium Pore Pressure U _{eq} (m)	Calculated Phreatic Surface (m)	Estimated Phreatic Surface (m)	t ₅₀ ^a (s)	Assumed Rigidity Index (I _r)	c _h ^b (cm ² /min)
SCPT15-01b	15-02049_SCP01b	15	300	5.30	3.9	1.4		19	100	36.2
SCPT15-01b	15-02049_SCP01b	15	700	11.30	9.9		1.4	599	100	1.2
SCPT15-01b	15-02049_SCP01b	15	300	17.30	15.9		1.4	165	100	4.3
SCPT15-01b	15-02049_SCP01b	15	300	20.30	22.0	-1.7			100	
SCPT15-01b	15-02049_SCP01b	15	500	25.30	27.4	-2.1		14	100	49.91
SCPT15-01b	15-02049_SCP01b	15	400	30.00	31.8	-1.8			100	

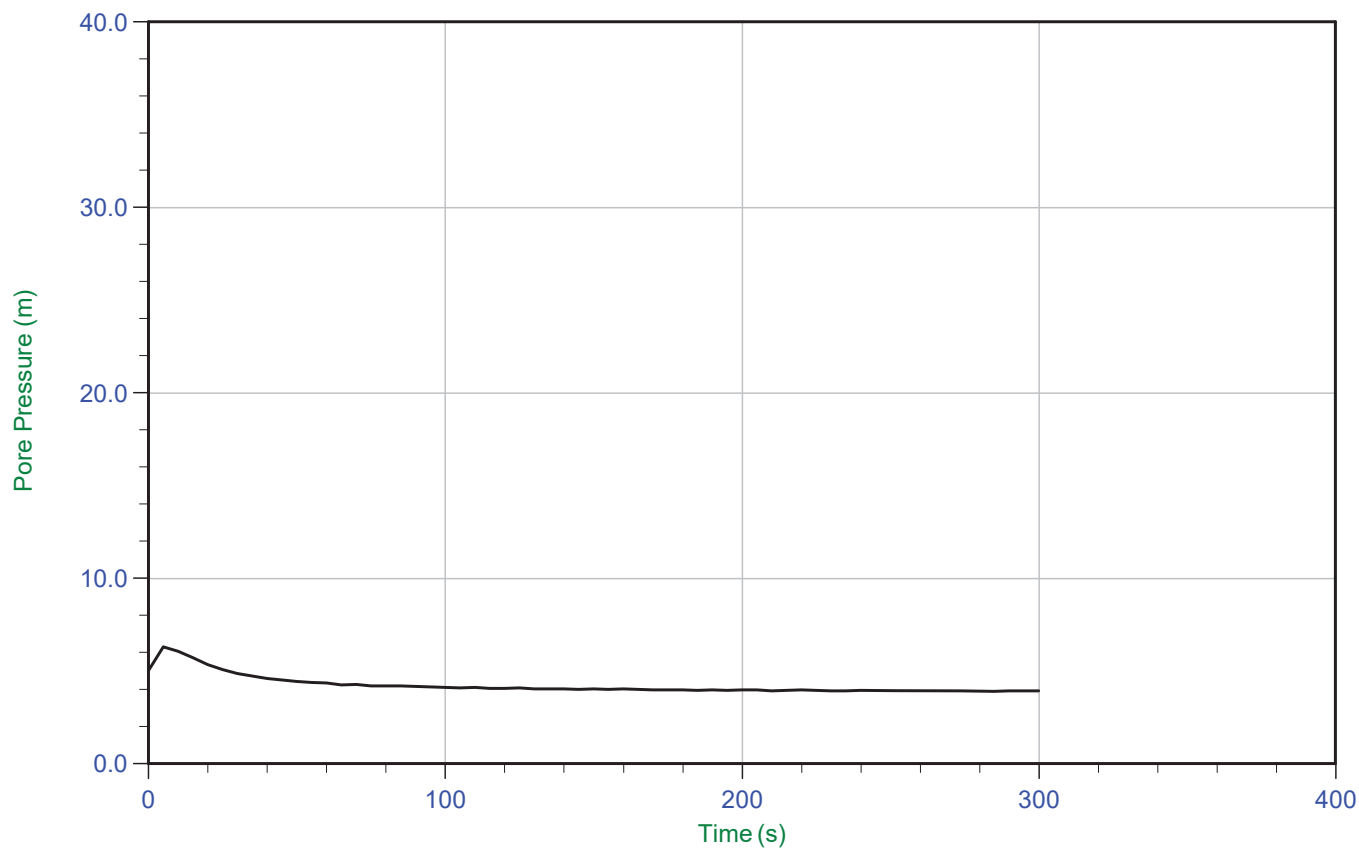
a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



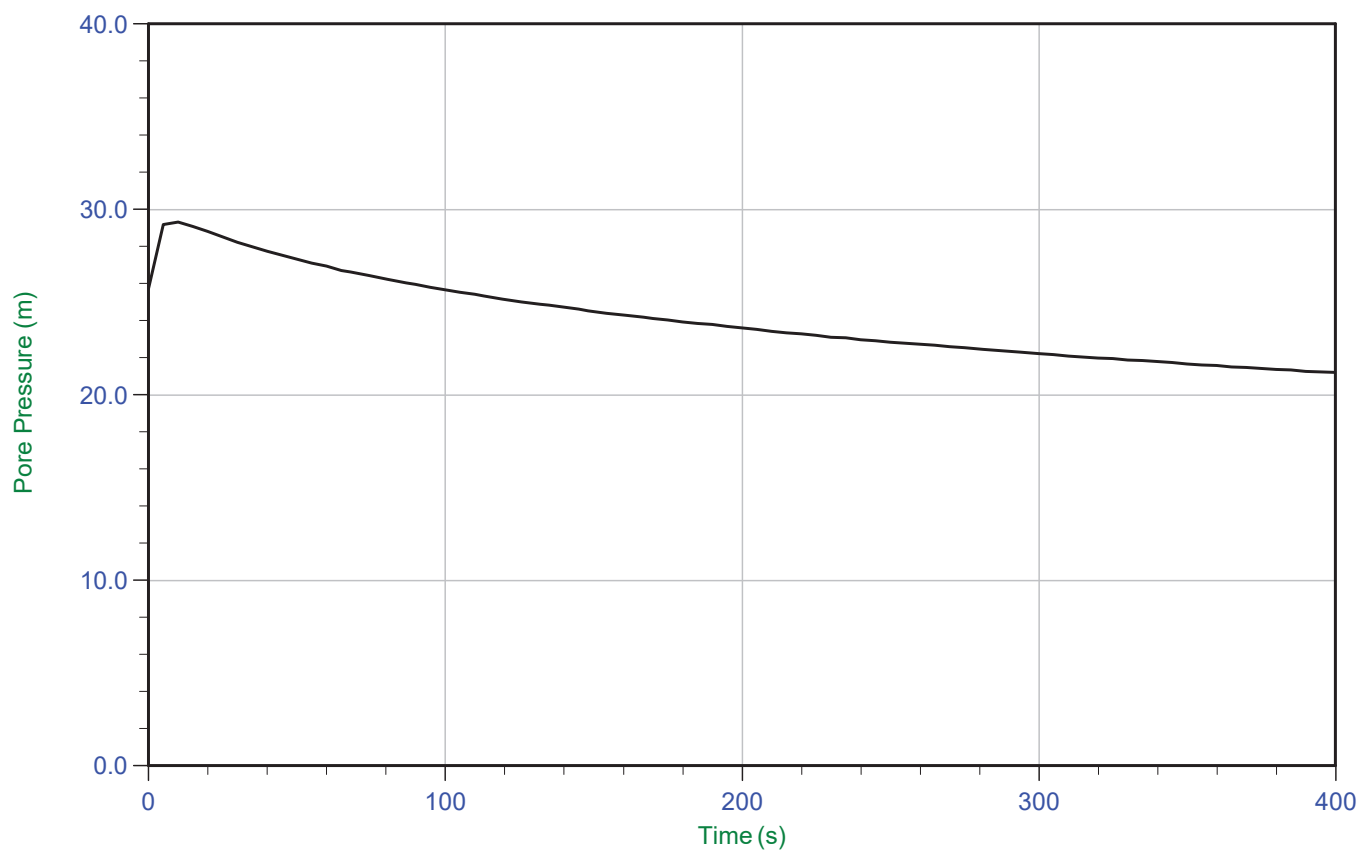
Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 3.9 m	WT: 1.382 m / 4.534 ft	T(50): 19.4 s
	Depth: 5.300 m / 17.388 ft	U Max: 6.3 m	Ueq: 3.9 m	Ir: 100
	Duration: 300.0 s		U(50): 5.11 m	Ch: 36.1 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



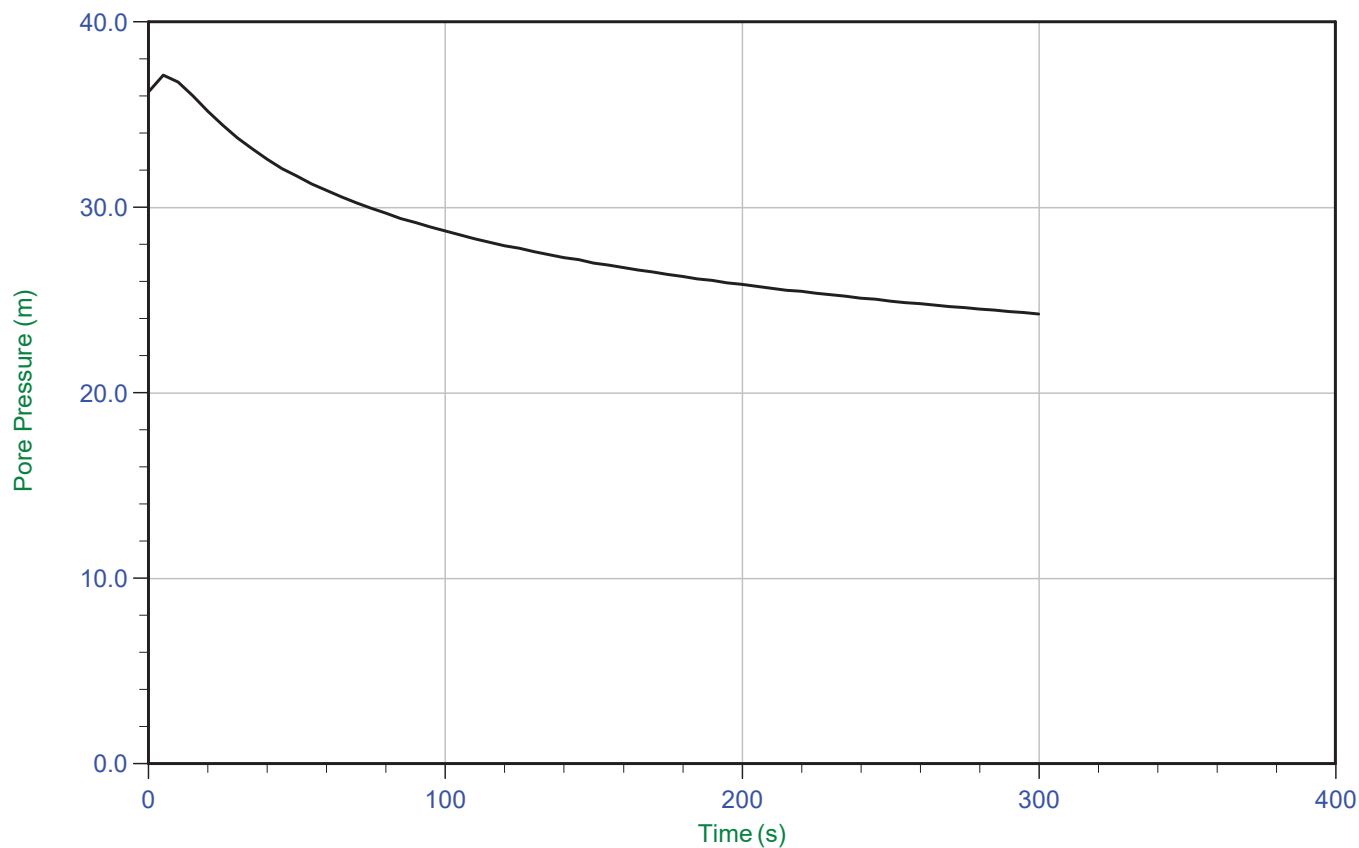
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 19.1 m WT: 1.382 m / 4.534 ft T(50): 598.6 s
 Depth: 11.300 m / 37.073 ft U Max: 29.3 m Ueq: 9.9 m Ir: 100
 Duration: 700.0 s U(50): 19.62 m Ch: 1.2 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



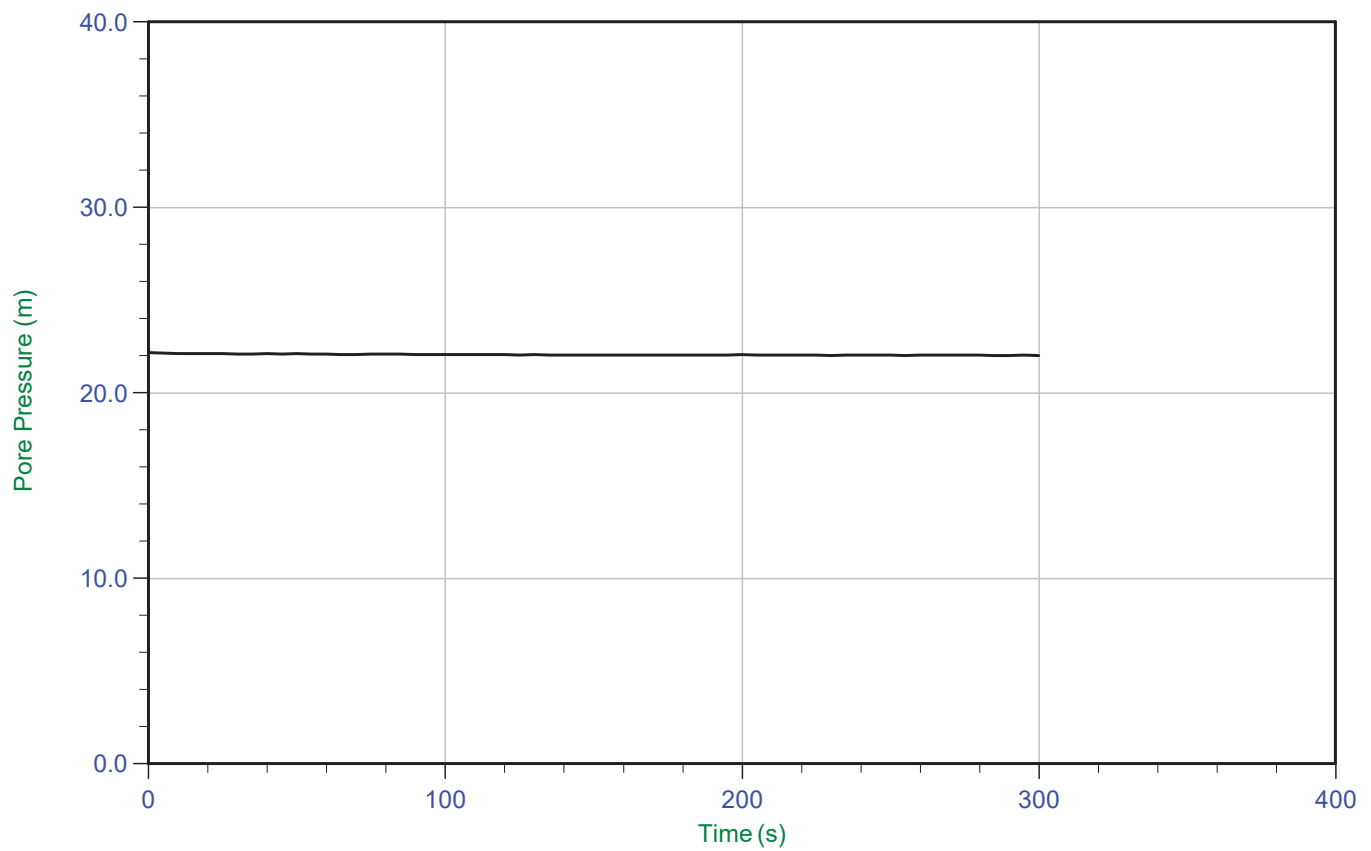
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 24.3 m WT: 1.382 m / 4.534 ft T(50): 164.6 s
 Depth: 17.300 m / 56.758 ft U Max: 37.1 m Ueq: 15.9 m Ir: 100
 Duration: 300.0 s U(50): 26.52 m Ch: 4.3 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



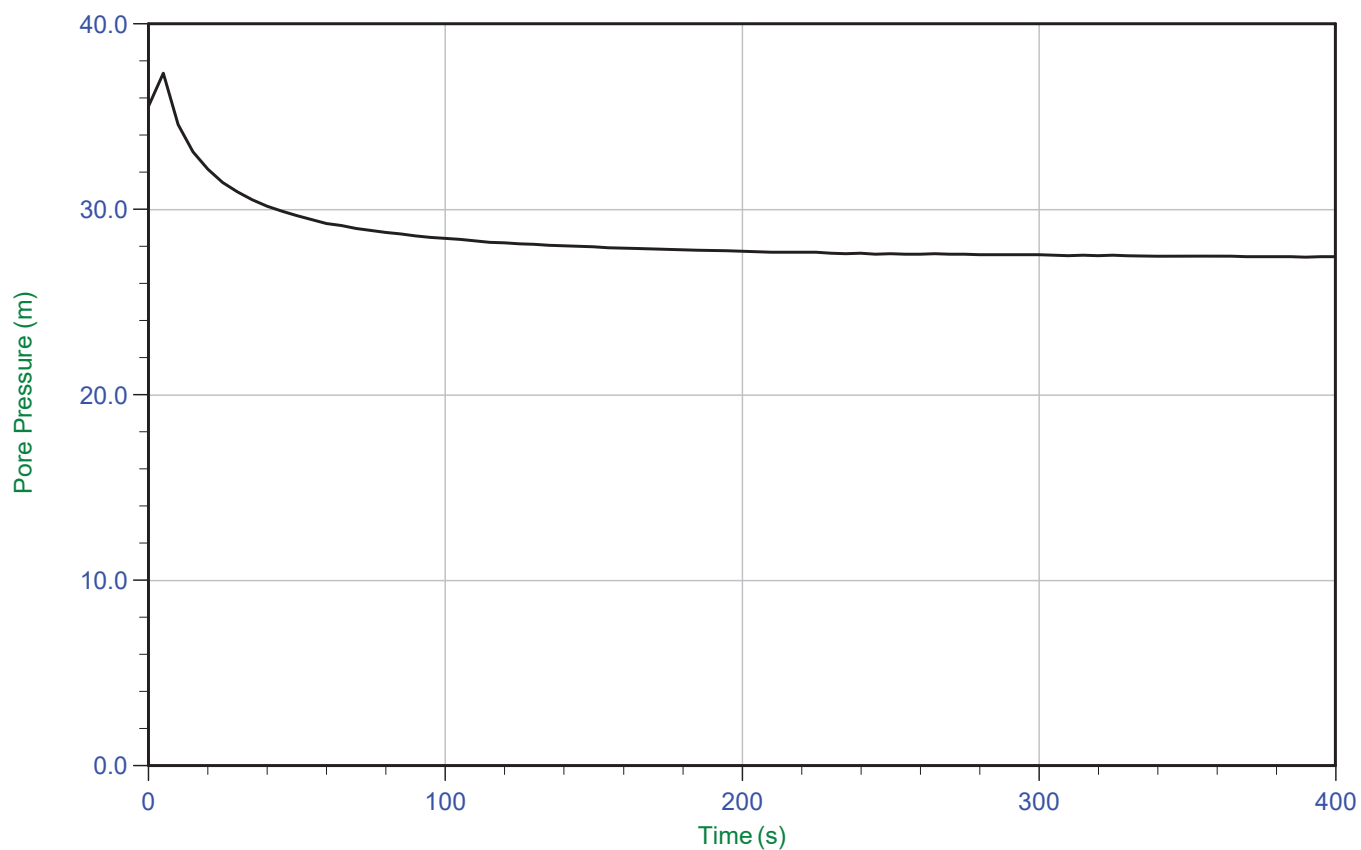
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 22.0 m WT: -1.713 m / -5.620 ft
 Depth: 20.300 m / 66.600 ft U Max: 22.2 m Ueq: 22.0 m
 Duration: 300.0 s



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



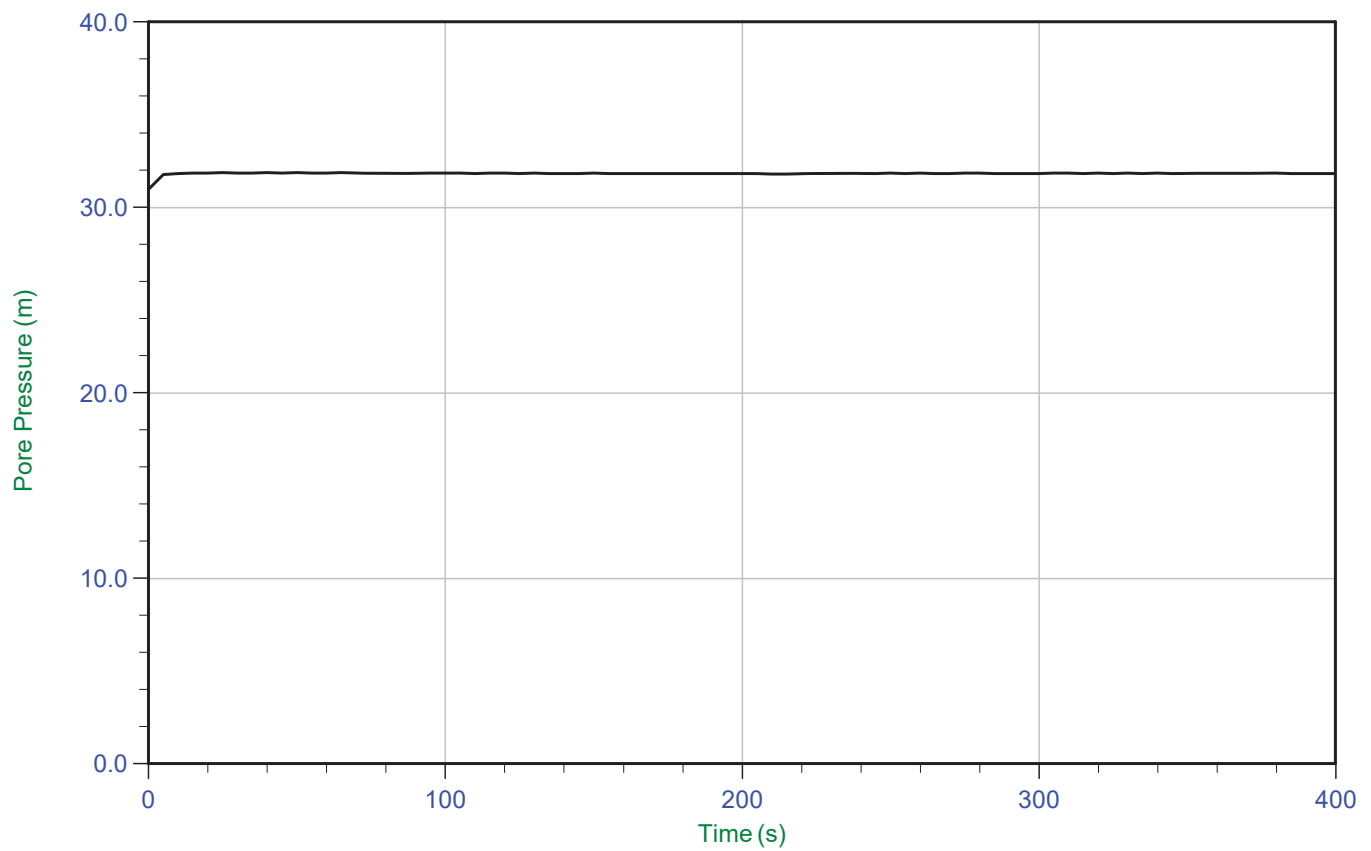
Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 27.4 m	WT: -2.059 m / -6.755 ft	T(50): 14.1 s
	Depth: 25.300 m / 83.004 ft	U Max: 37.3 m	Ueq: 27.4 m	Ir: 100
	Duration: 500.0 s		U(50): 32.35 m	Ch: 49.9 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 31.0 m WT: -1.775 m / -5.823 ft
 Depth: 30.000 m / 98.424 ft U Max: 31.9 m Ueq: 31.8 m
 Duration: 400.0 s

Appendix C

Photographs

BH15-01 and AH15-05

BH15-01







Appendix D

Atterberg Limits



Liquid Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	158.13	159.02	26.71			
Weight of Dry Soils + Pan:	153.93	155.67	23.12			
Weight of Pan:	146.43	149.43	15.99			
Weight of Dry Soils:	7.50	6.24	7.13			
Weight of Moisture:	4.20	3.35	3.59			
% Moisture:	56.00%	53.69%	50.35%			
N:	18	25	32			

Liquid Limit @ 25 Blows: 53.35%

Plastic Limit: 46.96%

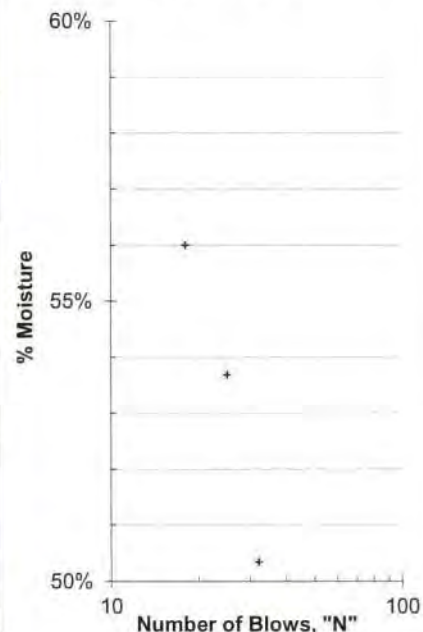
Plasticity Index, I_p : 6.39%

Moisture Content, M_C : 64.20%

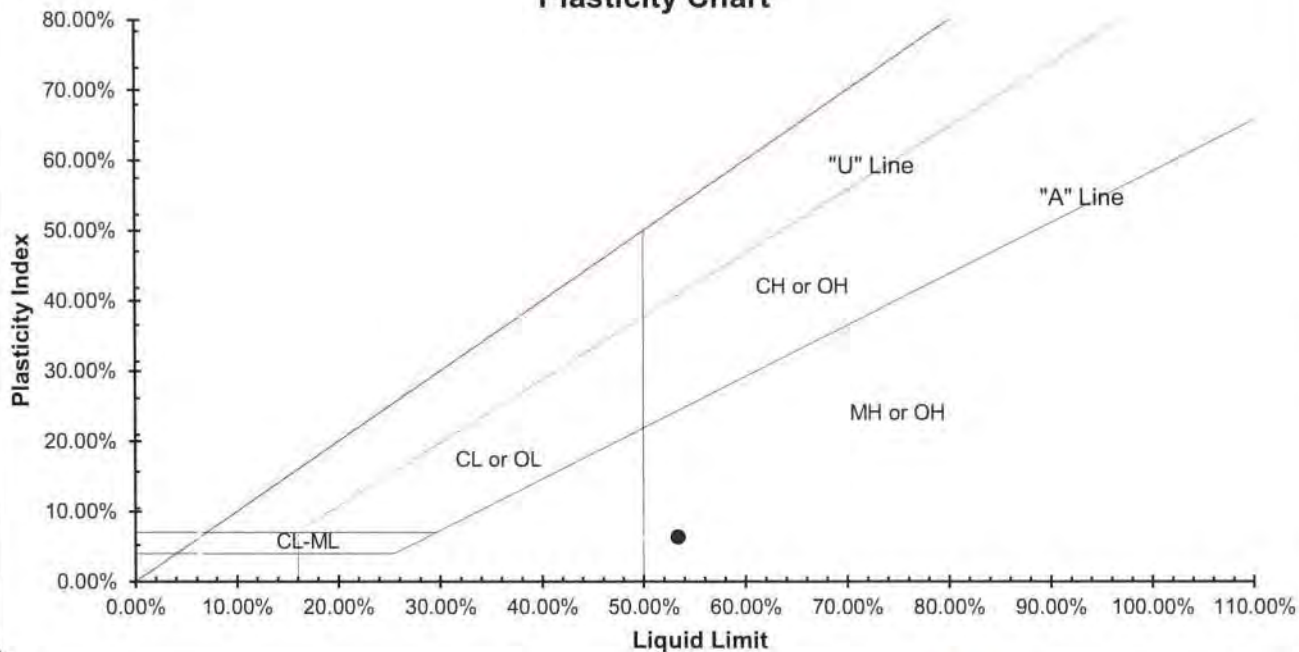
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	11.02	10.67				
Weight of Dry Soils + Pan:	8.77	8.52				
Weight of Pan:	4.01	3.91				
Weight of Dry Soils:	4.76	4.61				
Weight of Moisture:	2.25	2.15				
% Moisture:	47.27%	46.64%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech



Liquid Limit Determination

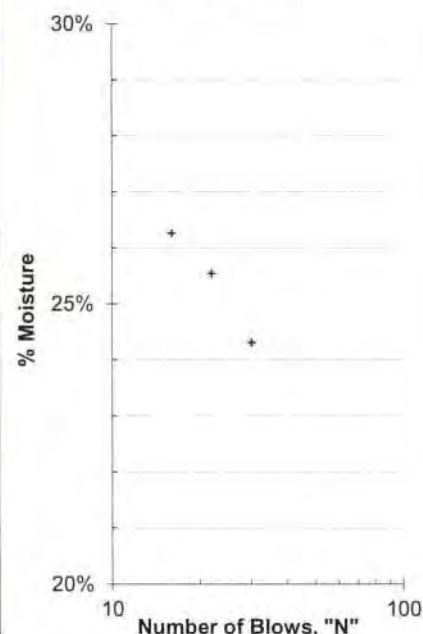
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	14.88	13.20	12.52			
Weight of Dry Soils + Pan:	12.59	11.31	10.85			
Weight of Pan:	3.87	3.91	3.98			
Weight of Dry Soils:	8.72	7.40	6.87			
Weight of Moisture:	2.29	1.89	1.67			
% Moisture:	26.26%	25.54%	24.31%			
N:	16	22	30			

Liquid Limit @ 25 Blows: 25.04%
Plastic Limit: 24.08%
Plasticity Index, I_p : 0.97%
Moisture Content, M_C : 26.50%

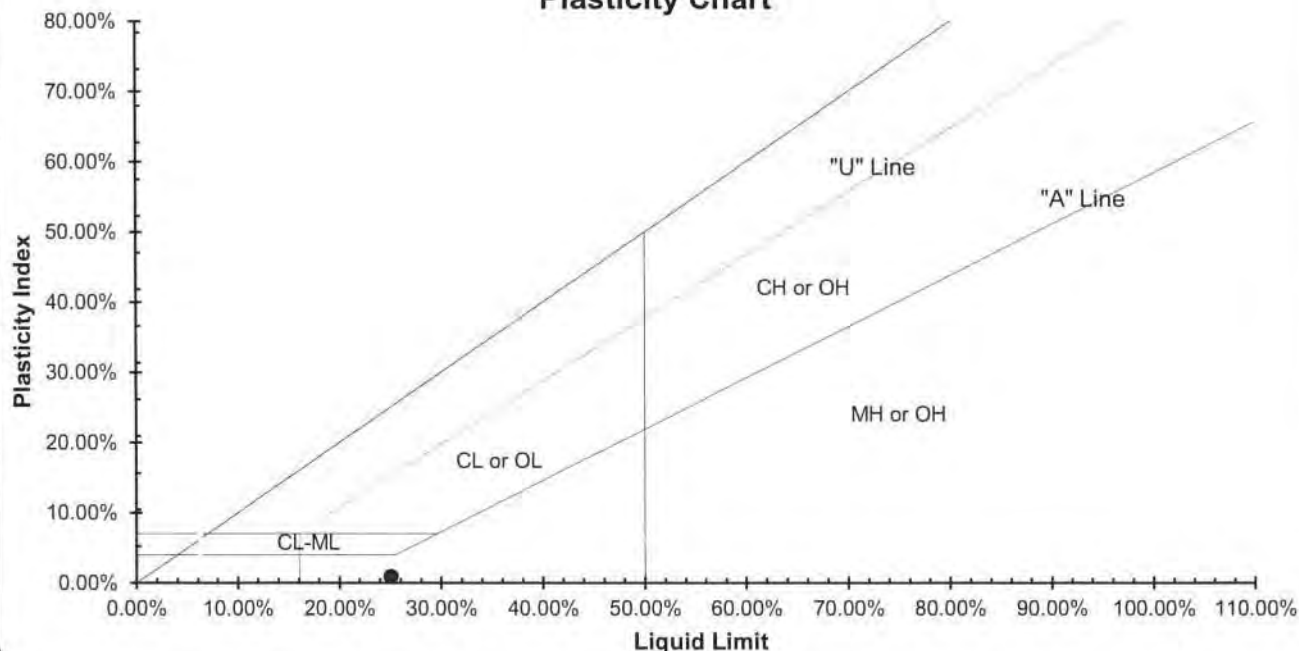
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	16.94	14.78				
Weight of Dry Soils + Pan:	14.50	12.64				
Weight of Pan:	4.32	3.79				
Weight of Dry Soils:	10.18	8.85				
Weight of Moisture:	2.44	2.14				
% Moisture:	23.97%	24.18%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech

Appendix E

Sieve Analysis Report



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

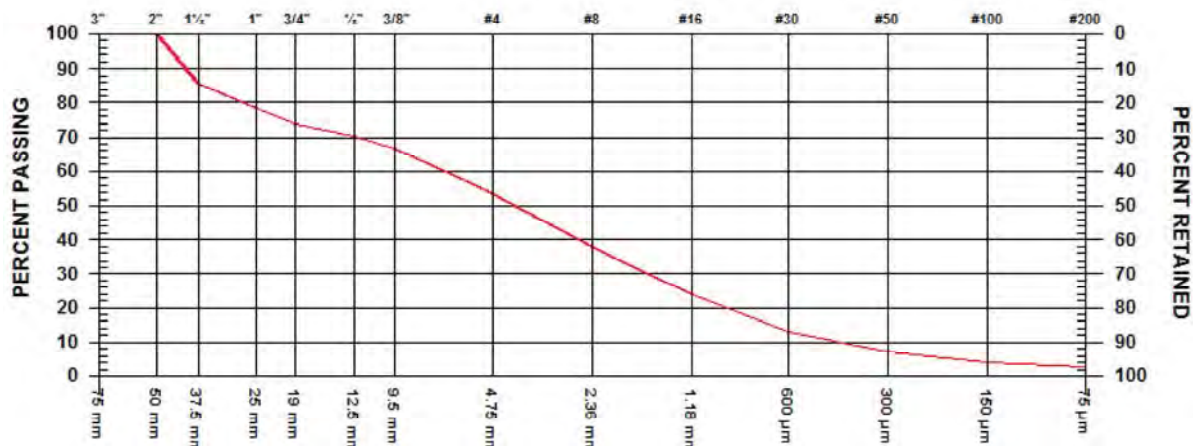
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 1 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE GRAVEL AND SAND, TRACE SILT

SAMPLED BY D.SILVERA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm	100.0	
2"	50	mm		
1 1/2"	37.5	mm		
1"	25	mm		
3/4"	19	mm		
1/2"	12.5	mm		
3/8"	9.5	mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	53.5	
No. 8	2.36 mm	37.9	
No. 16	1.18 mm	24.0	
No. 30	600 µm	13.1	
No. 50	300 µm	7.1	
No. 100	150 µm	4.0	
No. 200	75 µm	2.7	

COMMENTS

SAMPLE LOCATION: S12 BOREHOLE 15-01, 10.05M DEPTH. (34') (GB)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

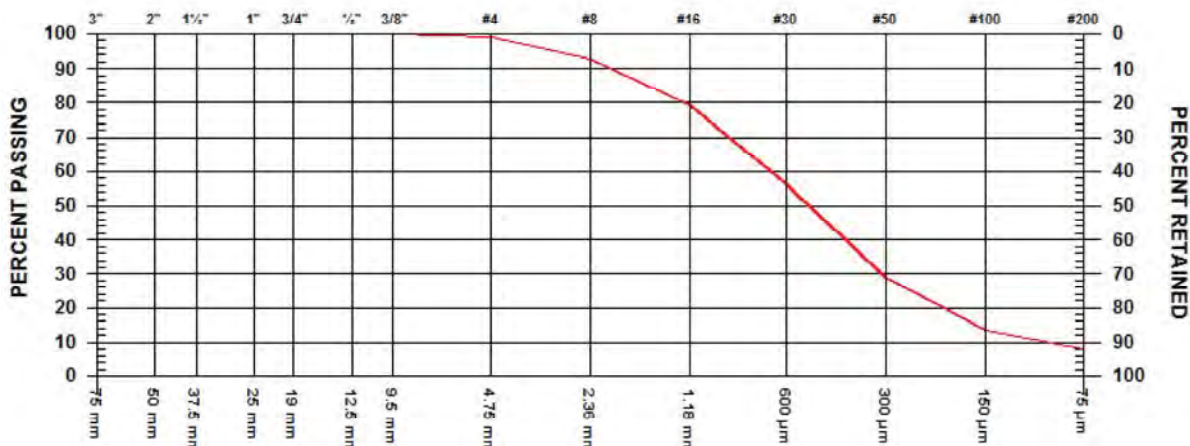
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 2 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND, TRACE SILT AND GRAVEL

SAMPLED BY D.SILVEIRA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm	100.0	
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm		
3/4"	19 mm		
1/2"	12.5 mm		
3/8"	9.5 mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	99.1	
No. 8	2.36 mm	92.9	
No. 16	1.18 mm	79.1	
No. 30	600 µm	56.5	
No. 50	300 µm	28.7	
No. 100	150 µm	13.7	
No. 200	75 µm	7.9	

COMMENTS

SAMPLE LOCATION: S10 - BOREHOLE 15-01, 5.79M DEPTH. (19') (SPT)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

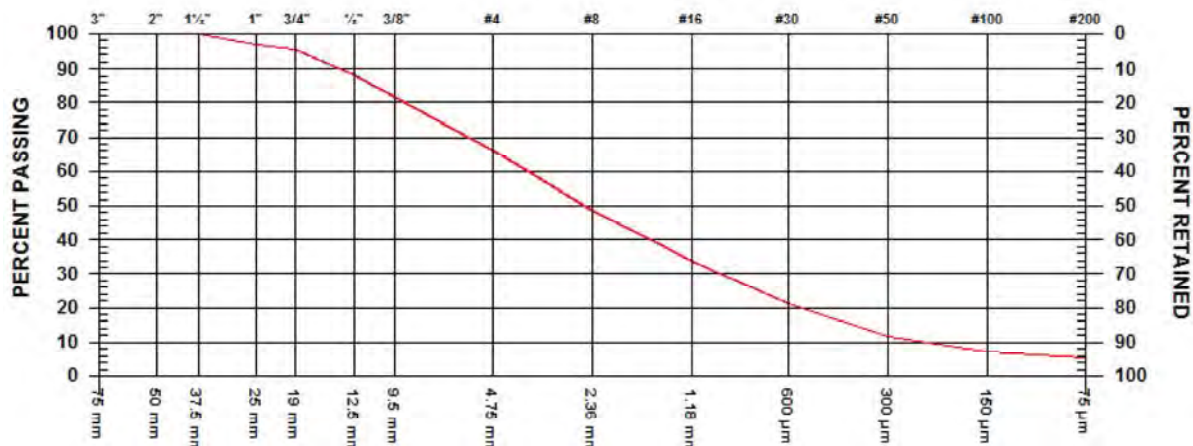
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 3 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND AND GRAVEL, TRACE SILT

SAMPLED BY D. SILVEIRA
TESTED BY R. MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm		
2"	50 mm		
1 1/2"	37.5 mm	100.0	
1"	25 mm	96.7	
3/4"	19 mm	95.3	
1/2"	12.5 mm	88.5	
3/8"	9.5 mm	81.6	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	66.2	
No. 8	2.36 mm	48.7	
No. 16	1.18 mm	33.7	
No. 30	600 µm	21.3	
No. 50	300 µm	11.5	
No. 100	150 µm	7.1	
No. 200	75 µm	5.3	

COMMENTS

SAMPLE LOCATION: S37 - BOREHOLE 15-02 3.35M DEPTH. (11')(GB)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
exp - EVAN SYKES

ATTN: EVAN SYKES

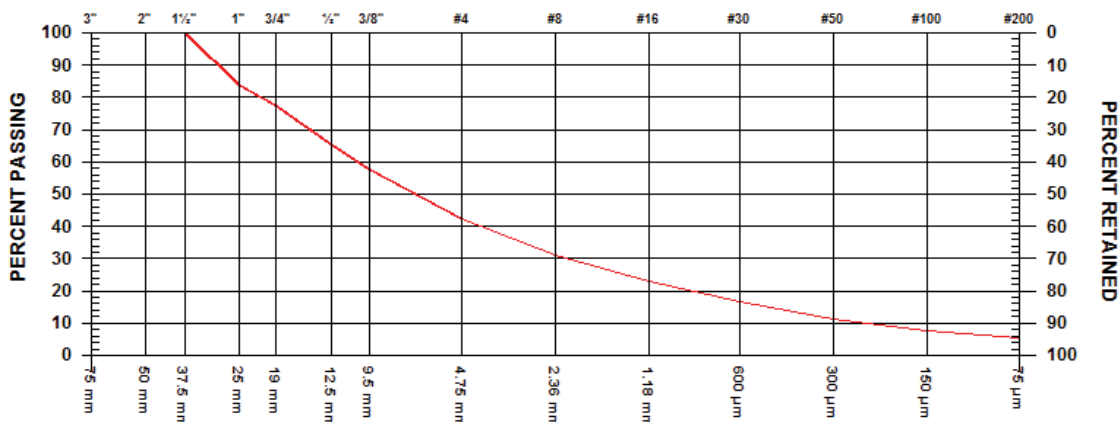
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 7 DATE RECEIVED Apr 25, 2016 DATE TESTED Apr 26, 2016 DATE SAMPLED Apr 13, 2016

SUPPLIER SITE
SOURCE AH16-04 S38 @ 5.1M
SPECIFICATION
MATERIAL TYPE SANDY GRAVEL, TRACE SILT

SAMPLED BY D. SILVEIRA
TESTED BY L. JEAN, ASCT
TEST METHOD WASHED



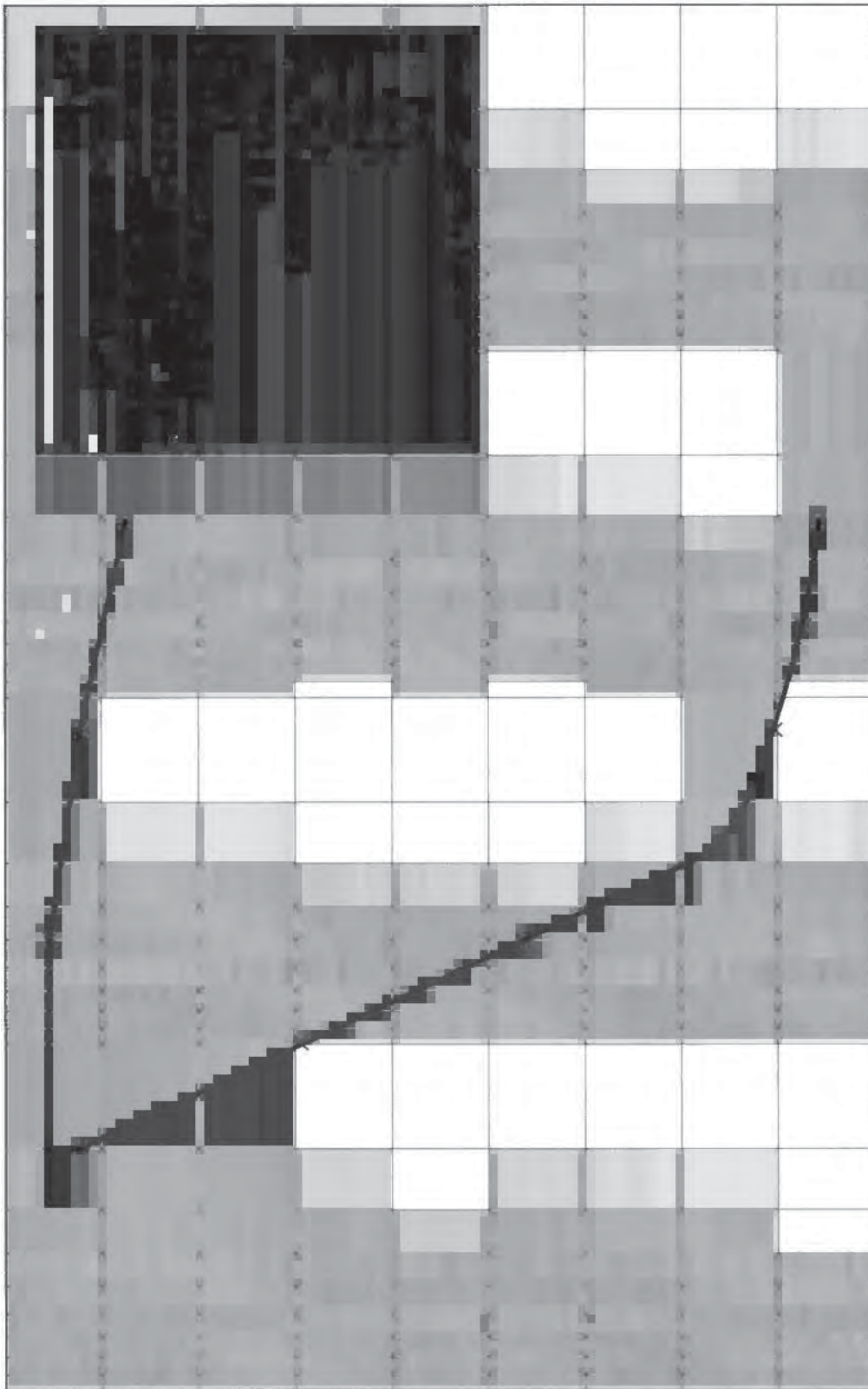
GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS	SAND SIZES AND FINES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm	100.0		No. 4	4.75	mm	42.4	
2"	50	mm			No. 8	2.36	mm	31.3	
1 1/2"	37.5	mm			No. 16	1.18	mm	23.2	
1"	25	mm			No. 30	600	µm	16.9	
3/4"	19	mm			No. 50	300	µm	11.4	
1/2"	12.5	mm			No. 100	150	µm	7.6	
3/8"	9.5	mm	57.7		No. 200	75	µm	5.5	

COMMENTS

TEST METHOD: ASTM C136, C117.

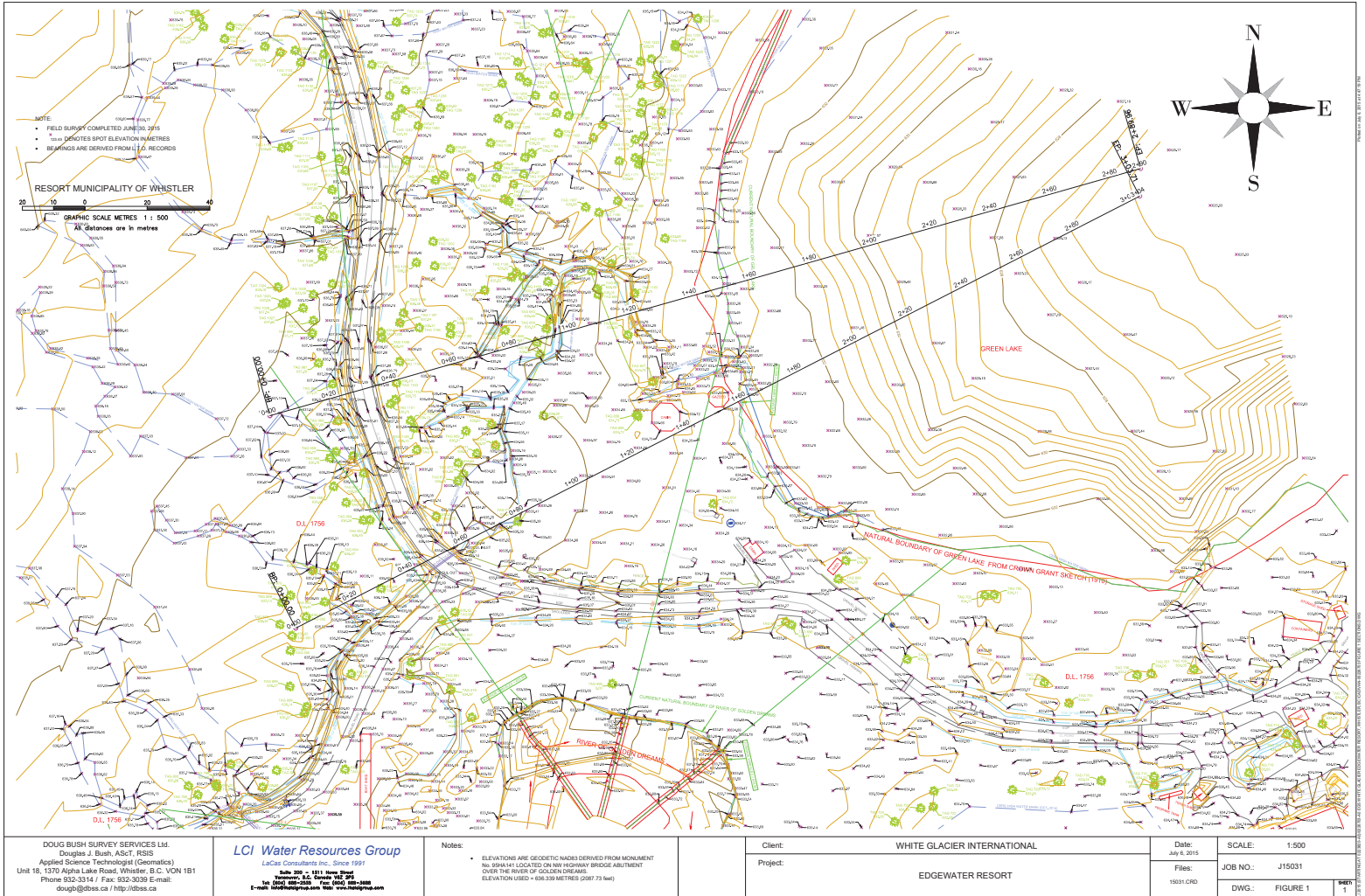
Appendix F

Consolidation Test Results



Appendix G

Topographic Survey





May 20, 2016

Reference No. VAN-00226703-A0

Lamoureux Architect Inc.
3392 Marine Drive
West Vancouver, BC V7V 1M9

Attention: Mr. Brad Lamoureux

Email: Brad@lamoureuxarchitect.ca

**Re: Geotechnical Exploration Report
White Glacier, Site 3
Edgewater Resort, Whistler, BC**

Dear Sir:

1.0 INTRODUCTION

Exp Services Inc. (**exp**) has completed a geotechnical exploration program in accordance with our fee proposal for Site 3 (YOGA STUDIO). The purpose of the study was to review the subsoil and groundwater conditions underlying the site and to provide geotechnical recommendations for site preparation and foundation design for the proposed development of Site 3. Based on **exp's** understanding of the conceptual design the proposed structure will be as at grade, two storey building.

The scope of services was limited to the provision of geotechnical engineering services only and does not include any provision for the investigation, analytical testing or assessment of the potential for soil and/or groundwater contamination at the site or possible bio-engineering considerations.

2.0 SITE AND PROJECT DESCRIPTION

The proposed development site is located about 355m West of Sea-to-Sky Hwy. The proposed building is to be located about 140m North of main site (Site 1). Dimension and size of the proposed building were not available at the time of writing the report.

Green Lake is generally located on the east side of the proposed development. It was understood that the proposed building will be a two storey residential building. Proposed finished grade in the area of site 3; is understood to be increased to an elevation greater than the flood construction level, to be determined by others. We understand this will result in a grade increase of 1 to 2m, based on preliminary discussions.

3.0 SCOPE OF SERVICES

Key geotechnical evaluation and design issues considered for this geotechnical assessment including but not limited to:

- a. Characterization of the subsurface soil and groundwater conditions;
- b. Provision of preliminary recommendations for foundation support of the proposed structure;
- c. Assess liquefaction potential and associated lateral and vertical displacement and differential movements, provide recommendations for possible ground improvement techniques;

- d. Provide recommendation for preloading;
- e. Provide lateral pressures for design of below grade walls.

4.0 SUBSURFACE CONDITIONS

4.1 Surficial Geology

Based on geological and Landslide Inventory of The Upper Sea to Sky Corridor (File No. 5324) the proposed site consisted of floodplain sediments; sand and silt, commonly including organic materials and underlain, in many places, by gravel; 1 to 3m thick.

4.2 Geotechnical Drilling and Subsurface Exploration

Exp's field work was carried out on April 13, 2016 and included the following:

- Three (3) Auger holes to depths ranging from 10.7m to 22.6m, by sub-contractor Uniwide Drilling Co. Ltd., of Burnaby, BC.
- Three (3) Dynamic Cone Penetration Test sounding (DCPT) to depths ranging from 13.4 to 22.6m, by sub-contractor Uniwide Drilling Co. Ltd., of Burnaby, BC.

Locations of the test holes are shown on the attached Test Hole Location Plan, Figure 1.

4.2.1 Dynamic Cone Penetration Test (DCPT)

Dynamic Cone Penetration Tests (DCPT) provides a continuous record of soil resistance, and is carried out by dropping a weight to drive a steel cone into the ground. A 63.5 kg (140 lb) hammer, free falling a distance of 762mm (30"), was used in this test. The cone used in this test was 64mm in diameter with a 19mm diameter flat surface at the end and a 60 degrees apex (cone) angle.

DCPT "blow counts", the number of blows for each 300mm of penetration, is considered equivalent to SPT N values for tests within 10m to 15m depth (Canadian Foundation Engineering Manual, 4th Edition, 2006). The results of the DCPT are presented on the test hole logs in Appendix A. The DCPT data was utilized for interpretation of soil density/consistency at the test hole locations and for geotechnical analyses.

4.2.2 Auger Hole

Continuous flight solid stem augers with an outside diameter of 152mm were used to advance the auger holes. The augers were drilled to depth in stages and withdrawn, allowing for visual soil classifications and sampling.

The Auger hole was backfilled and sealed according to the regulations of the B.C. Ground Water Protection Act.

The log for the auger hole is provided in Appendix A.

4.3 Laboratory Tests

Laboratory tests were conducted on representative soil samples obtained from the auger holes. The tests included natural moisture content tests, sieve analysis on granular soils and consolidation tests on undisturbed cohesive soil samples. The following is a summary of the laboratory tests carried out.

4.3.1 Natural Moisture Content Test

Moisture content determinations were performed on select soil samples obtained from the exploration to assist in identification of soil types and to correlate with engineering design parameters. The tests were done in general accordance with the test procedures in ASTM D-2216. Results of the tests are shown on the auger hole log, provided in Appendix A.

4.3.2 Sieve Analysis

Sieve analysis was performed on select soil samples obtained from the exploration to determine the grain size distribution of the granular soil. Sieve analysis was conducted on four (2) select samples in general accordance with ASTM C-136 and ASTM C-117, respectively. The results of the tests are provided in Appendix B.

4.4 Sub soil Conditions

In general, based on the test hole completed within the subject site and deep boreholes completed on site 1 the following subsurface soil conditions, in order of increasing depth were present. It should be noted that the soil conditions may vary beyond drill hole locations and below the depth of exploration.

UNIT A	Soft to firm, wet/moist, dark brownish black PEAT/organic SILT. Thickness varied from 0.3m to 0.7m. Moisture content varied from 102% to 253%.
UNIT B	loose, grey, silty SAND to Sand traces to some silt. Thickness varied from .8m (at AH16-01) to 2.5m (at AH16-02).
UNIT A1	Soft to firm, wet/moist, dark brownish black PEAT/organic SILT. Thickness varied from 0.4 m (AH16-01) to 3.4m (AH16-03). Moisture content varied from 107% to 407%.
UNIT C	Loose to compact, wet, sandy GRAVEL/SAND and GRAVEL, trace to some silt. Thickness varied from 7 to 8.7m.
UNIT D	soft to firm, organic SILT, trace sand. Moisture content varied from 60% to 94%. Encountered in test hole BH16-02 between 10.4 and 13.7m depth.
UNIT E	compact silty SAND, trace organic, grey wet. About 1.5m thick at BH16-02
UNIT F	soft to stiff, SILT, some clay to clayey, occasional wood fragments/organics, moisture content varied from 50% to 80%. Thickness of the layer greater than 4.6m.

4.5 Groundwater Condition

Inferred groundwater depth at the time of drilling was measured at about 0.2 to 0.5m below the existing grade. Based on previous test holes depth of ground water was about 10m below the existing grade at the intersection of Sea-to-Sky Highway and Alpine Way. An artesian groundwater conditions were encountered at a depth at about 13 to 14m below the existing grade.

It should be noted that groundwater conditions may vary and fluctuate seasonally in response to climate conditions, and possibly also due to precipitation, runoff, changes in land use, and other factors. Water level in the Green Lake could make a big influence on the water level in the surrounding area.

5.0 SEISMIC CONSIDERATIONS

5.1 Introduction

It is understood that the Resort Municipality of Whistler Building By-Law implements the criteria of the BCBC2012/NBCC2010 (“Building Code”) for the seismic assessment of their facilities. In the BCBC2012 and NBCC2010, an earthquake motion with a return period of 2475 years is specified. The philosophy for earthquake design in the Building Code is prevention of collapse, but to accept damage to structures. The expectation is that “typical” or “normal” structures will be near collapse and the building may not be repairable following the design earthquake. Implicit within the Building Code is the intent to limit damage during low to moderate level earthquake shaking.

5.2 Seismic Design Parameters

Site specific interpolated seismic design parameters for this site were obtained from the interactive website maintained by the Geological Survey of Canada (GSC). Table 1 presents the parameters in the form of response spectrum for motions at a hypothetical, “outcropping firm ground”, for the design 2475 year event.

**Table 1 - Response Spectrum for 5% Damping at
“Outcropping Firm Ground” (BCBC 2012)**

Periods, (s)	Acceleration Response Spectra (g)
0.2	0.63
0.5	0.47
1.0	0.281
2.0	0.156
PGA	0.285

The “outcropping firm ground” is specified as soils with average shear wave velocity in the range of 360 m/s to 750 m/s. Very dense soils or soft bedrock could be classified as “firm ground”.

The ground motions would be altered (amplified or attenuated) as earthquake induced shear waves propagate through the soils which overly the “firm ground”. To develop site-specific-near- surface design ground motions and to carry out liquefaction assessment, a site-specific ground response analysis was carried out. The following sections describe the ground response analysis and the results

5.3 Seismic Ground Response Analysis

Site specific seismic ground response analysis was carried out for Site 1. In order to make standalone separate following sections are restated from the site 1 report.

5.3.1 Introduction

Seismic ground response analysis was carried out using the computer program PROSHAKE (Version 1.12) in order to develop site-specific seismic design parameters. The program PROSHAKE models the soil deposit as a 1-D column, allowing vertical propagation of the earthquake induced shear waves.

5.3.2 Input Earthquake Records

The analysis was carried out using eight earthquake records, input at the outcropping “firm ground”. The records were modified using the computer program SYNTH such that the response spectrum of each record matches that presented in Table 1.

5.3.3 Soil Parameters

The soil properties for the ground response analysis include shear wave velocity (V_s), unit weight, and relationships between shear modulus and damping with shear strain. Shear wave velocity profile obtained at test hole SCPT15-1 was used in the analysis and presented in Figure 2.

The “Elastic halfspace” for the SHAKE analysis was assumed at 60m depth, with a shear wave velocity of 555 m/s (mean V_s of the range recommended in NBCC 2010).

Shear modulus reduction and damping curves used in the analysis are from published data for similar soils (Seed and Idriss, 1970, for sand or sand and gravel; Vucetic and Dobry, 1991 for silts and clays). For sand layers, the upper bound modulus reduction and lower bound damping curves from Seed et al (1986) were used.

5.3.4 Near Surface Response Spectrum

Response spectra for 5% damping, for motions at ground surface and 2m below the ground surface were obtained from the ground response analysis are shown graphically in Figure 3 and 4, respectively. Figure 5 shows the response spectra for Site Class C, D, E, average from the shake analysis and the recommended response spectra if the ground improvement is not implemented. If the ground densification techniques are applied then the site could be used as Site Class E, with F_a and F_v of 1.24 and 1.92, respectively.

5.3.5 Peak Ground Acceleration (PGA)

PGA profiles obtained from the analysis for the six input records and the mean profile are shown in Figure No. 6. Based on the analysis the mean surface PGA for the 2475 year event is 0.11g for this site if the

ground improvement is not implemented. If ground improvement such as densification technique is applied then surface PGA could be 0.35g.

5.3.6 Cyclic Stress Ratio (CSR)

CSR was calculated as $0.65 \cdot \tau_{\text{peak}} / \sigma'_v$, where τ_{peak} and σ'_v are peak of the cyclic shear stress and vertical effective stress respectively at a given depth. CSR profiles for the six input records and the mean profile are shown in Figure No. 7. The mean CSR profile was then used in liquefaction assessment as described in the next sub-section.

5.4 Liquefaction Assessment

Liquefaction susceptibility of the sub-soils was assessed using the procedures given in Youd et al (2001) with the CSR profiles described above. The cyclic resistance of the ground, expressed in the form Cyclic Resistance Ratio (CRR) was obtained using DCPT data according to the Youd et al (2001) procedure for SPT method.

Earthquake magnitude for this assessment was taken as 7.0 for the 1:2475 year event (Ref. Task Force Report, Geotechnical Design Guidelines for Buildings on Liquefiable Sites in Accordance with NBC 2005 for Greater Vancouver Region, May 8, 2007).

Factor of Safety against liquefaction (F.S.) was calculated as the ratio of CRR/CSR. Soil layers with a F.S. less than 1 are considered liquefiable for the 2475 year return period earthquake event. The extent liquefiable layers were estimated to be about 10m and thickness of liquefiable layer could be in the order of 2.5 to 4m. The SILT/CLAY and organic silt/PEAT soils are likely to be liquefiable based on the guidelines of the Task Force Report (2007). Strain softening could occur during a high magnitude earthquake event. Liquefaction induced settlement was estimated based on procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5 Consequences of Liquefaction

Following liquefaction, the soils lose a significant portion of their shear strength and behave like a heavy liquid. Some of the consequences are: liquefaction induced settlement of the ground, lateral spreading of the ground and the overlying structures, flotation, tilting and/or shear failure of the foundations.

5.5.1 Post-liquefaction Settlement

Dissipation of the excess pore water pressure developed during shaking and liquefaction would cause settlement of the ground. As mentioned above, the sandy soil below water table is likely liquefiable. Cumulative thickness of liquefiable layers was estimated to be 2 to 3m. Post-liquefaction settlement due pore pressure buildup within the soil mass was estimated to be in the order of 150 to 200mm based on SPT and DCPT holes data and using the procedure of I.M. Idriss and R.W. Boulanger (2008).

5.5.2 Lateral Spreading

As discussed before the sub-surface under the water table is liquefiable. Magnitude of lateral spreading of the ground was calculated using Youd et al (2002) procedure. The existing topography around this station is generally flat. However, the presence of Green Lake on the east side (a “ground slope” condition) would likely result in movement towards the lake. A survey of the Lake bottom by Doug Bush Survey Services Ltd. indicated a gently inclined slope. The analysis indicates that lateral ground movements in the order of 300mm to 500mm may occur following the design earthquake if ground improvements are not implemented. Note that Youd et al. (2002) procedure is highly empirical and great uncertainty exists in the calculated numbers. A range of half to twice the values given is recommended for design considerations.

5.5.3 Flotation

Note that the static groundwater level was potentially at the existing ground surface. Flood Construction Level (FCL) is assumed to be below first floor slab elevation, however if the slab is below FCL the following commentary applies.

Following liquefaction, the liquefied soil would behave like a heavy liquid, inducing added buoyancy forces on buried structures and possibly leading to floatation. The buoyancy force can be calculated using an equivalent fluid pressure of 18kN/m^3 for liquefied soils. The magnitude of the buoyancy force depends on the depth and thickness of the liquefiable soil layer. The uplift force due to buoyancy during liquefaction could be calculated using the equivalent fluid pressure for liquefied soils for the portion of the structure submerged below groundwater.

5.6 Consolidation Settlement

Based on BH16-2 there is soft compressible Peat/organic silt in the upper 0.6m and about 2.4m thick Peat/organic silt layer between 10.4 to 12.1m followed by silty Clay between 15.2 and 31m depth. The soft compressible layers have potential for consolidation settlement if any surcharge load is applied. Preliminary settlement analysis was carried out using soil parameters derived from consolidation test results conducted on Site 1. The computer program Settle 3D was used develop preliminary settlement values. As final loads were not available at the time of writing this report, 2m (40kPa) to 3m (60kPa) surcharge loads were applied at the ground surface to estimate the total settlement. Table 2 below shows some preliminary settlement estimates for various surcharge loads. Total and differential settlement for site specific structure will be provided in the final design.

Table 2: Predicted settlements without Pile

Fill Height (m)	Predicted Settlement (mm)
2.0	About 300 to 400
3.0	About 400 to 600

Based on the Table 2 a 2m surcharge above finished grade for 6 to 12 months is expected to be required to achieve the primary consolidation settlement. Preload duration could be reduced by using additional surcharge. Actual settlement monitoring data will be required to confirm the duration of preload. Additional settlement analysis is required to refine the settlement prediction as design progresses.

6.0 DISCUSSION AND RECOMMENDATIONS

Test holes encountered a peat/organic silt layer followed by a soil profile comprised of loose to compact sandy gravel/gravelly sand interlayered with clayey silt/organic silt to about 15m depth. Silt with occasional thin layer of sand was encountered between 15m to 31m depth. It is expected that a substantial silt layer would be present at greater depths. Further, bedrock is expected to be well in excess of 60m deep close to the lake, the depth of bedrock could be shallower to the west. Based on previous test holes completed by **exp** for a project near the intersection at Sea-to-Sky and Alpine Way the depth of bedrock was about 25m. The groundwater table at the proposed location of the building was approximately 0.2m to 0.3m below existing ground surface at the time of exploration, and is expected to fluctuate seasonally with higher levels in the winter/spring. Depth of groundwater was deeper towards the west, about 10m at the intersection of Sea-to-Sky Highway and Alpine Way area.

As discussed above, the site area was determined to have subsurface soil layers that are settlement sensitive. As the magnitude of settlement is high, preload with a surcharge should be considered to mitigate the post-construction settlement.

As discussed above, the site area was determined to have subsurface soil layers that are susceptible to liquefaction under the design earthquake event. Significant lateral and vertical ground displacements (as described above) are expected to occur if soil layers beneath the site were to liquefy, with corresponding horizontal movements and differential settlements within the proposed project elements.

If the proposed structure can't tolerate the predicted post liquefaction settlement and movement then it should be noted that ground improvement would need to be employed to mitigate the seismic hazard by potential liquefaction. Ground improvement is commonly achieved by means of vibro-replacement (stone columns). However, with the limitation of ground improvement technique that the ground densification can only mitigate and not completely eliminate the hazard of the earthquake induced ground movement.

It is recommended that the building could be designed on a raft type foundation, with thickenings as required for concentrated loads, to limit the damage caused by earthquake induced ground movements. Static and post liquefaction seismic buoyancy has a significant impact on buried tanked structures. Static buoyancy could be mitigated by using soil anchors. Seismic buoyancy could be mitigated with ground improvements.

6.1 Site Preparation

Site preparation for the proposed residential building should include the removal of all vegetation, removing organic/peat soft soil to expose underlying sand and gravel. Grade reinstatement or increases to achieve flood construction elevations below the proposed raft slabs should be achieved by placement of structural fill consisting of well-graded shot rock placed in lifts with a maximum thickness of 300mm compacted with several passes of a heavy ride-on type vibratory roller. We recommend that a layer at least 300mm thick of clear crushed gravel be placed immediately below the proposed raft slab for drainage, to provide a solid working platform, and for improved and more uniform bearing resistance. The clear crushed rock layer should be compacted to a dense state using vibratory methods.

As discussed earlier, preload surcharge is recommended to mitigate the consolidation settlement. A preload surcharge of 2m above finish grade is recommended.

Due to the presence of the organic silt/PEAT, there is potential for methane gas generation underneath the proposed building. Some provision for methane gas mitigation should be considered during final design. If the upper organic soil layer above water table is removed during preloading then provision for methane gas underside the building may not be required.

6.2 Excavation and Dewatering

Depending on the actual excavation depths, the excavation could possibly be carried out by slope cutting method, which would be the most economical. For preliminary planning purposes, we recommend assuming excavation side slopes no steeper than 1.5H:1V. If the extent of the excavation needs to be minimized, then a commonly used and generally effective method for the ground conditions at the site would involve sheetpile shoring.

The design, operation, and maintenance of the dewatering and shoring system should be made the responsibility of the contractor. The contractor would need to determine the means and methods of dewatering and shoring necessary to meet the project requirements.

6.3 Foundation Design

Table 3 below provides bearing values which may be used for the design of the raft, strip and pad foundation.

TABLE 3: Bearing Pressures

Foundation Material	Factored Ultimate Bearing Resistance	Maximum Allowable Bearing Pressure
Non-densified soil or structural fill placed thereon	112.5 kPa	75 kPa

The bearing capacities provided above are subject to the following conditions:

- Raft foundation is setback a suitable distance from finished fill or cut slopes with locations approved by the Geotechnical Engineer;
- Site preparation is completed as described in Section 6.1 “Site Preparation” and load bearing surfaces are reviewed and approved by the Geotechnical Engineer;
- The perimeter of the raft foundation is placed a minimum of 600 mm below finished adjacent grade for frost protection and confinement purposes;
- Minimum width of strip and pad footing should be 0.45m and 0.6m respectively. A minimum embedment of 600 mm below finished adjacent grade for frost protection and confinement is recommended.

A modulus of subgrade reaction for raft slab design of 15,000 to 20,000 kN/m³ is considered appropriate for the subject property.

6.4 Slab-on-Grade

Construction of raft slabs should comply with recommendations provided in Section 6.1 “Site Preparation”. Floor slabs constructed on backfill placed on top of the raft slab should be prepared by placement of well-graded free draining structural fill with less than 5% fines content (passing the No. 200 sieve). The material should be placed in maximum 300mm thick lifts compacted to at least 95% Modified Dry Proctor Density (ASTM D 1557). A 100mm thick layer of 19mm clear crushed gravel should be placed beneath concrete slabs in order to provide a drainage and bedding layer. A layer of 6 mil poly vapor barrier should be placed over the clear crushed gravel to protect it from concrete contamination and to limit dampness of the concrete slab from capillary moisture effects.

6.5 Backfill

Backfill used for perimeter fill or for support of exterior sidewalks, driveways, patios etc. should consist of well-graded granular material with less than 5% fines passing the #200 sieve. The backfill should be placed in thin lifts with a maximum thickness of 300mm compacted to at least 90% Modified Dry Proctor Density. The placement of the backfill should be monitored and density tested to confirm adequate compaction has been achieved for hardscaped areas.

6.6 Sub-Drainage

A perimeter drain should be installed in areas where floor slab is less than 150mm above adjacent finished grade consisting of a 150mm diameter perforated PVC pipe surrounded by 150 mm of 19 mm clear crushed gravel wrapped in non-woven filter fabric. The perimeter drain should be installed approximately 450 to 600mm below the top of the main floor slab. The perimeter drain should be connected to a pumped sump or suitable gravity outlet.

6.7 Below Grade Lateral Earth Pressures

Below grade walls should be backfilled with free draining, well graded granular soil hydraulically connected to the perimeter drain system. The backfill should be compacted to at least 95% Modified Proctor maximum dry density where surrounding area will be paved or have other settlement sensitive features. Otherwise, the backfill compaction can be limited to 90% of the same standard.

Recommended design lateral pressures for design of below grade walls considering active and at-rest pressure conditions are shown in the attached Figure 9 and 10, respectively.

6.8 Geotechnical Reviews

Geotechnical reviews are required to satisfy Letters of Assurance issued for building permits and to confirm general compliance with our designs and recommendations provided in this report. It is considered that geotechnical reviews will be required to address the following issues:

- confirmation of adequacy of stripping within the building envelope;
- review and confirmation of adequacy of ground densification;
- confirm adequate compaction effort of backfill and allowable bearing pressure of building foundation;
- review of backfill for sub-drainage system;

- review of perimeter backfill;
- Pile driving.

7.0 CLOSURE

Please be advised that the contents of this report are based on information (structural and survey drawings, etc.) provided to **exp** by others and **exp's** understanding of the proposed development as described in this report. If the development plans change, or if during construction the soil conditions are noted to be different than those described in this report, **exp Services Inc.** must be notified promptly and the recommendations on the geotechnical aspects of the proposed development reviewed and adjusted accordingly. This report assumes that **exp** will complete field reviews during construction.

This report was prepared for the exclusive use of our client and designated consultants or agents, and may not be used by other parties without the written permission of **exp Services Inc.** **Exp** should be permitted to review the final architectural and structural plans.

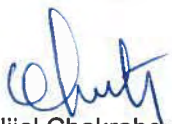
Contractors should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions. This geotechnical report should not be included in contract specifications without suitable qualifications and prior review by **exp Services Inc.** However, the geotechnical report may be used as an attachment to contract specifications, for information purposes only.

Exp's "Interpretation & Use of Study and Report Instructions" is attached. These instructions form an integral part of this report and should be included with any copies of this report.

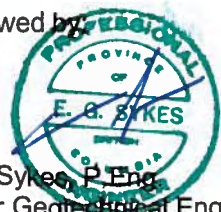
If you have any questions regarding the contents of this report, please call the undersigned.

Sincerely,

exp Services Inc.


Ujjal Chakraborty, P.Eng.
Geotechnical Engineer

Reviewed by


Evan Sykes, P.Eng.
Senior Geotechnical Engineer

May 24, 2016

Enclosures: Interpretation & Use of Study and Report
Site Plan A1.0
Figure 1 – Testhole Location Plan
Figure 2 – Shear Wave Velocity Profile
Figure 3– Acceleration Response Spectra for Near Surface
Figure 4 – Acceleration Response Spectra at 2m below Grade
Figure 5 – Acceleration Response Spectra Recommended
Figure 6 – Peak Ground Acceleration Vs Depth Plot
Figure 7 – Cyclic Stress Ratio Vs Depth Plot

Figure 8 – Liquefaction Assessment Plot
Figure 9 – Lateral Earth Pressure for Yielding Wall
Figure 10 – Lateral Earth Pressure for Non-Yielding Wall
Appendix A – Bore Hole Logs (BH15-01 and AH16-01 to AH16-03)
Appendix B – CPT Data and Interpretation Plots
Appendix C – Photographs From Bore Hole BH15-01
Appendix D – Atterberg Limits
Appendix E – Sieve Analysis Report
Appendix F – Consolidation Test Results
Appendix G – Topographic Survey

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INTERPRETATION & USE OF STUDY AND REPORT

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental consulting unless specifically stated in the engineering report.

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 THE REPORT

The Report has been prepared for the specific site, development, building, design or building assessment 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 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 unauthorised use of the Report.

5. INTERPRETATION OF THE REPORT

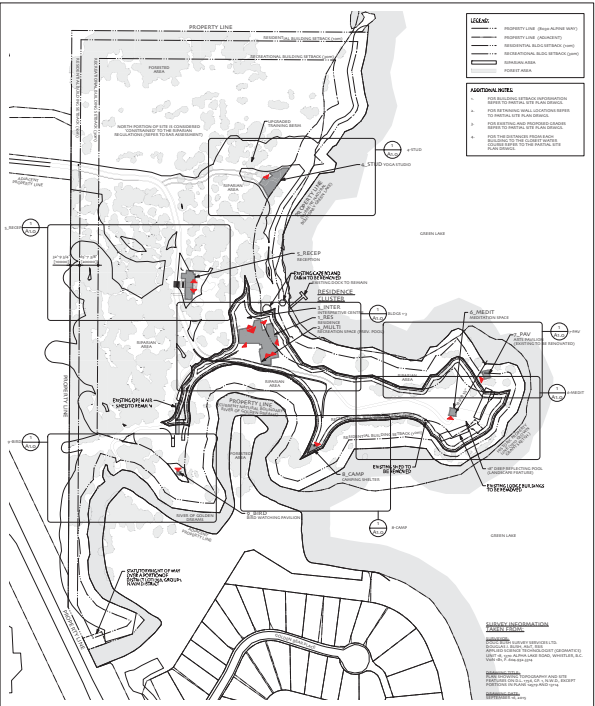
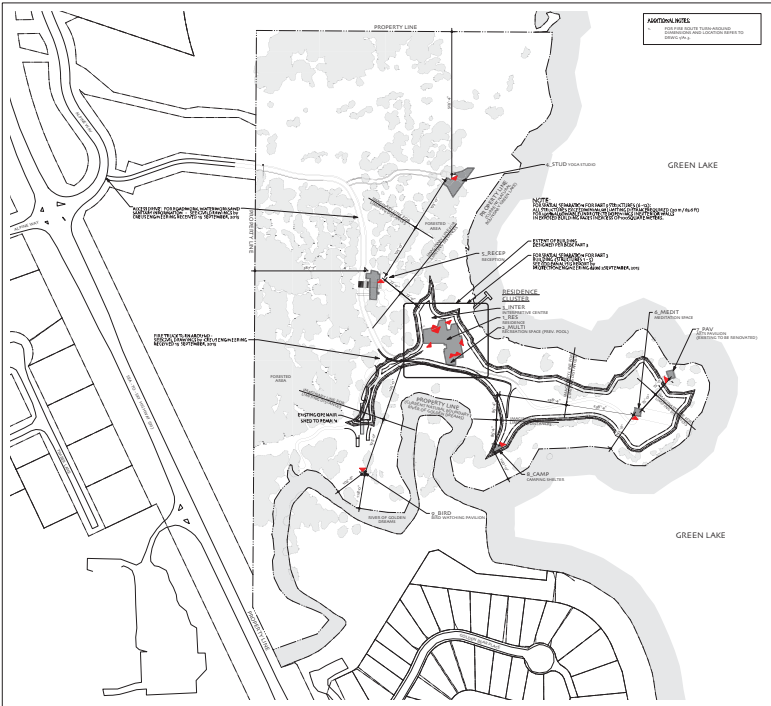
- a. Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising 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.
- 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 us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- c. To avoid misunderstandings, **exp** Services Inc. (**exp**) should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by **exp**. Further, **exp** should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with **exp's** recommendations. Any reduction from the level of services normally recommended will result in **exp** providing qualified opinions regarding adequacy of the work.

6.0 ALTERNATE REPORT FORMAT

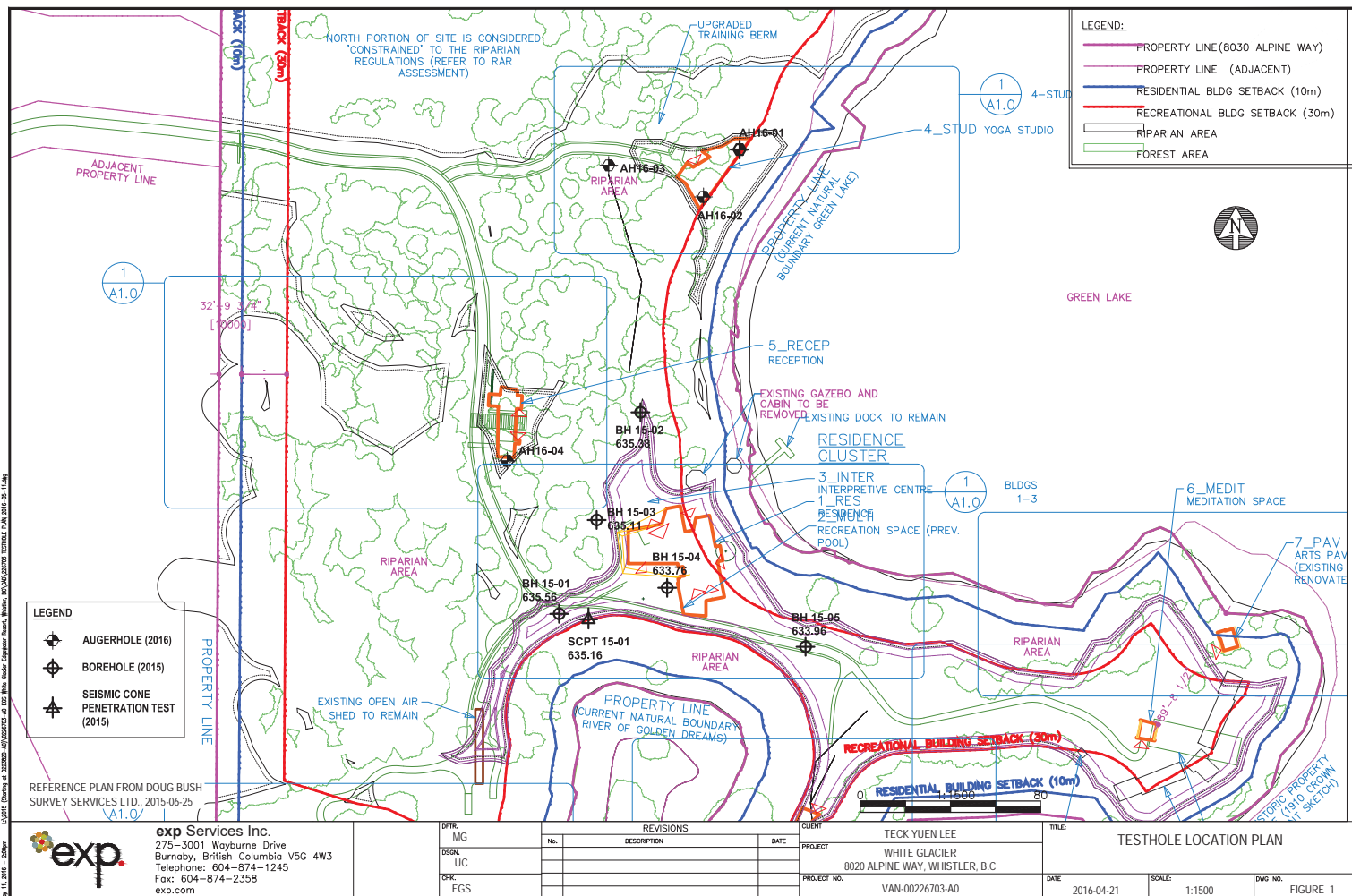
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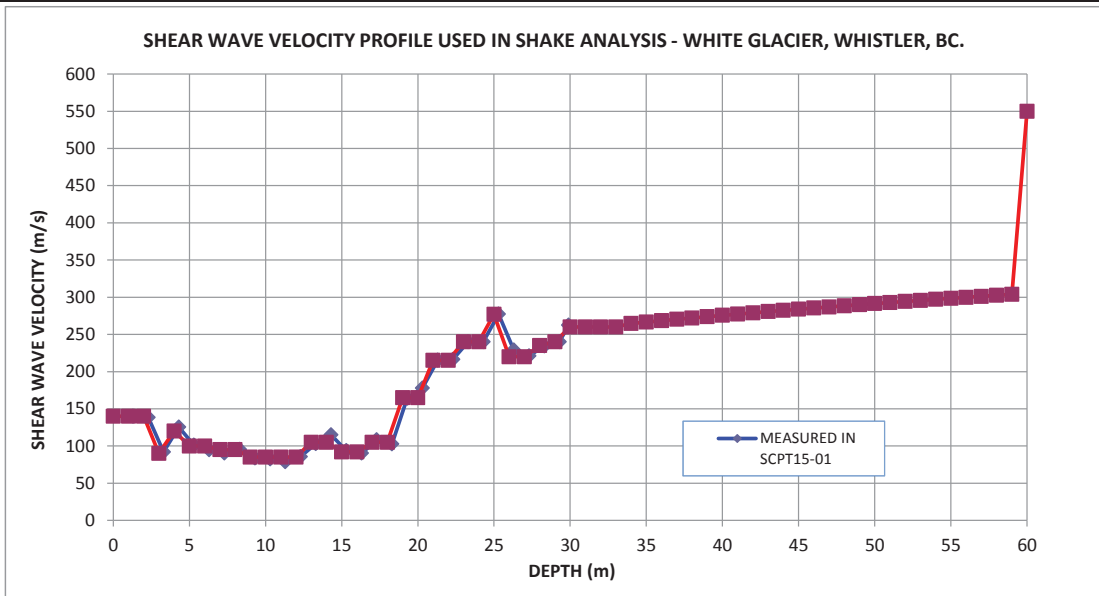
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NO. 1		DATE: 01-01-2020		BY: J. LAMOREUX		APP. PLAN		PROJECT: WHITE GLACIER 8030 ALPINEWAY, WHITING, ID		SCALE: 1" = 100'	
PRELIMINARY DRAWING ONLY - NFC											





exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:
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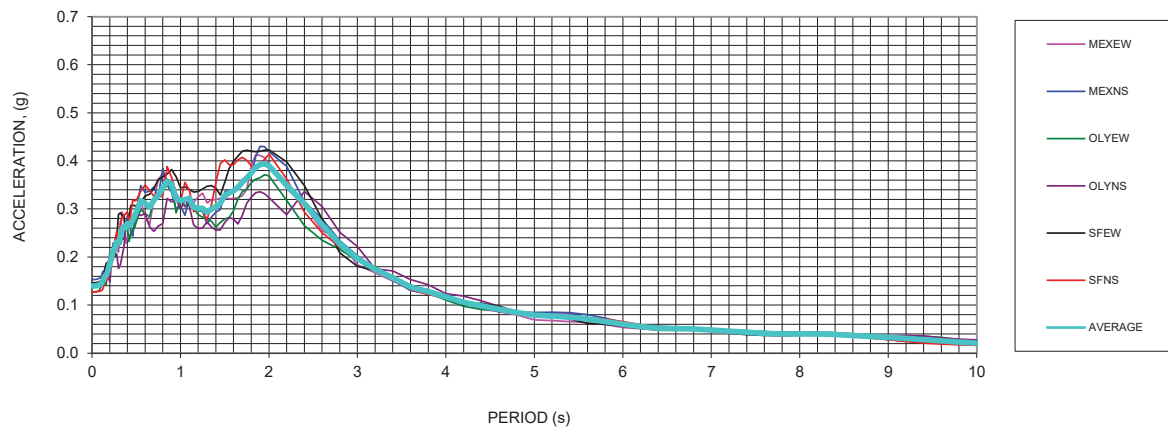
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 SHEAR WAVE VELOCITY PROFILE USED IN SHAKE ANALYSIS

DATE:
 7/13/2015

SCALE:
 NTS

FIGURE: 2

ACCELERATION RESPONSE SPECTRA AT GROUND SURFACE 1:2475 YEAR EVENT, 5% DAMPING



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 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
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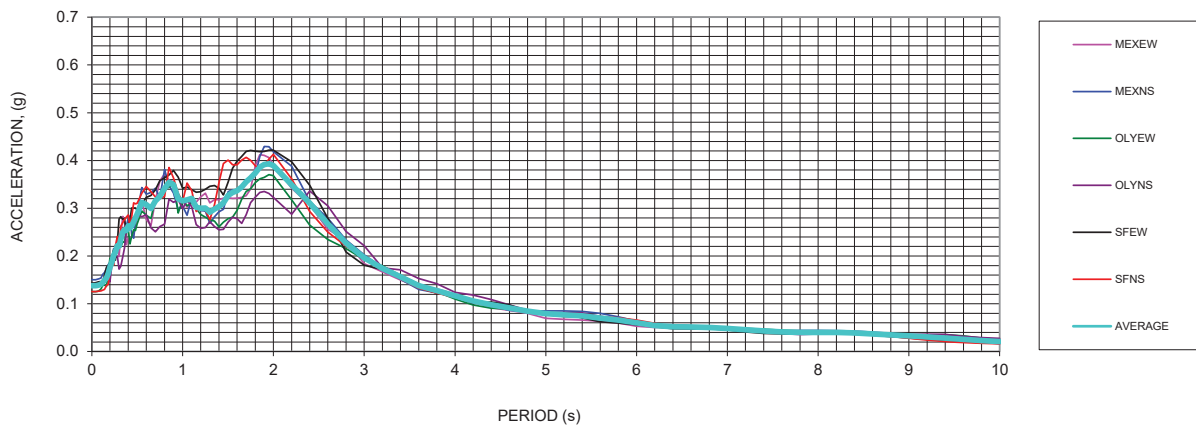
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TITLE:

ACCELERATION RESPONSE SPECTRA OF NEAR-SURFACE

DATE: 7/13/2015	SCALE: NTS	FIGURE: 3
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ACCELERATION RESPONSE SPECTRA 2m BELOW GROUND SURFACE SURFACE 1:2475 YEAR EVENT, 5% DAMPING



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Burnaby, BC V5A 1X7
Tel: 604-874-1245
Fax: 604-874-2358
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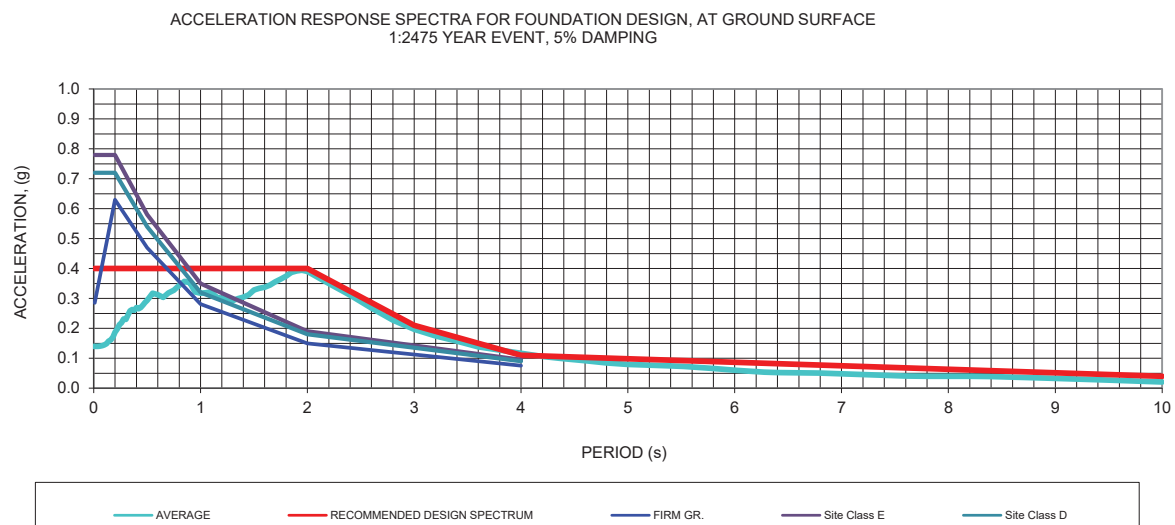
TITLE:

ACCELERATION RESPONSE SPECTRA AT 2M BELOW
GROUND SURFACE

DATE:
7/13/2015

SCALE:
NTS

FIGURE: 4



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Burnaby, BC V5A 1X7
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Fax: 604-874-2358
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EGS

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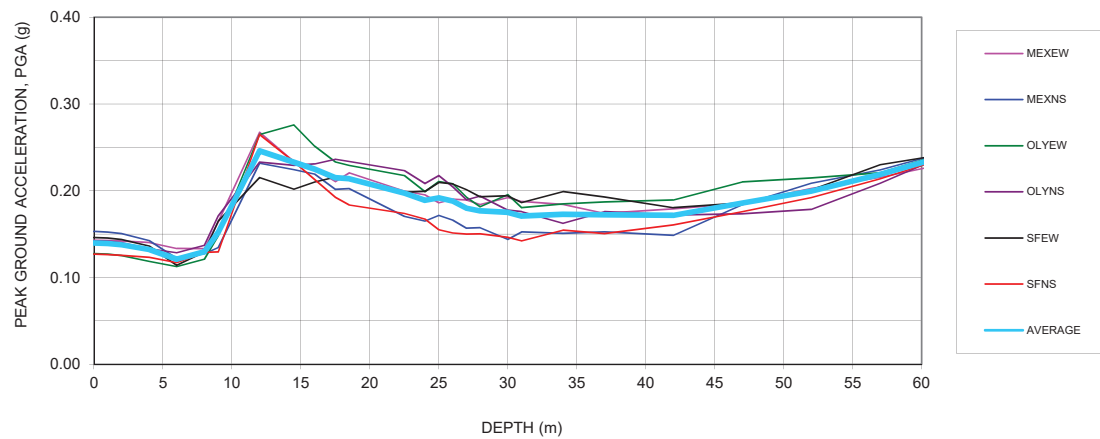
ACCELERATION RESPONSE SPECTRA FOR FOUNDATION
DESIGN

DATE:
7/13/2015

SCALE:
NTS

FIGURE: 5

RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475 EVENT



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 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

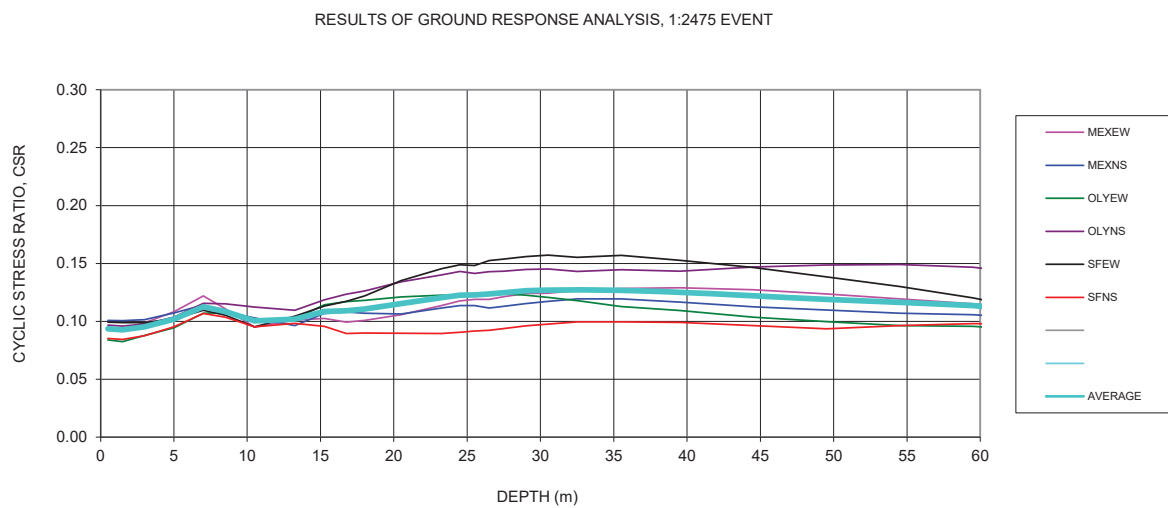
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 Teck Yuen Lee c/o Lameoureaux Architec Inc.

PROJECT
 White Glacier - Edgewater Resort

PROJECT NO.	DFTR.	DSGN.	CHK.
226703	UC	UC	EGS

TITLE:
 RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, PGA

DATE:	SCALE:	FIGURE:
5/9/2016	NTS	6



exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:
 Teck Yuen Lee c/o Lameoureaux Architec Inc.

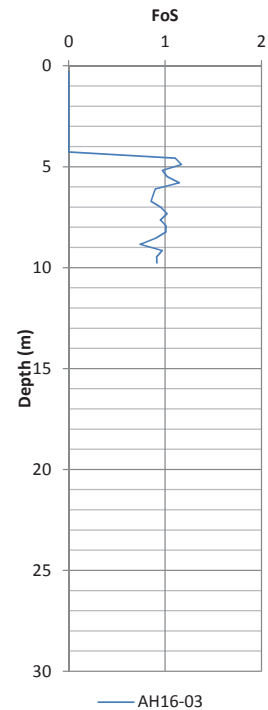
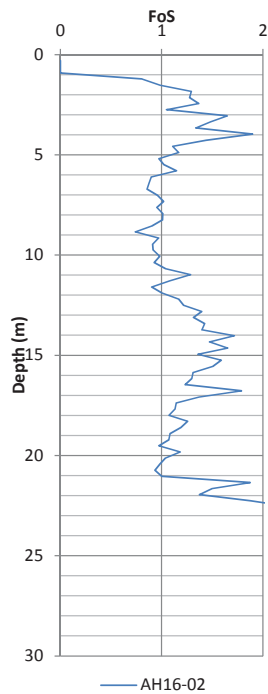
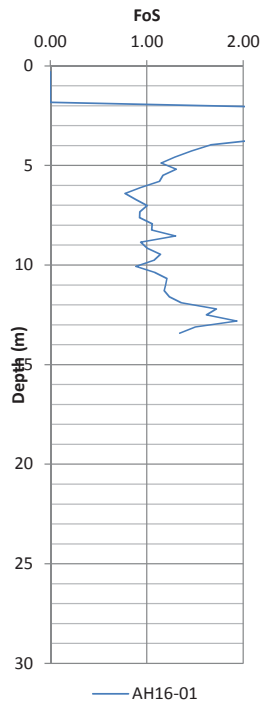
PROJECT
 White Glacier - Edgewater Resort

PROJECT NO.	DFTR.	DSGN.	CHK.
226703	UC	UC	EGS

TITLE:

RESULTS OF GROUND RESPONSE ANALYSIS, 1:2475
 EVENT, CSR

DATE:	SCALE:	FIGURE:
7/13/2015	NTS	7



exp Services Inc.
 275-3001 Wayburne Drive
 Burnaby, BC V5A 1X7
 Tel: 604-874-1245
 Fax: 604-874-2358
 exp.com

CLIENT:

Teck Yuen Lee c/o Lameoureaux Architect Inc.

PROJECT

White Glacier - Edgewater Resort

PROJECT NO.

226703

DFTR.

UC

DSGN.

UC

CHK.

EGS

TITLE:

Liquefaction Assessment

DATE:

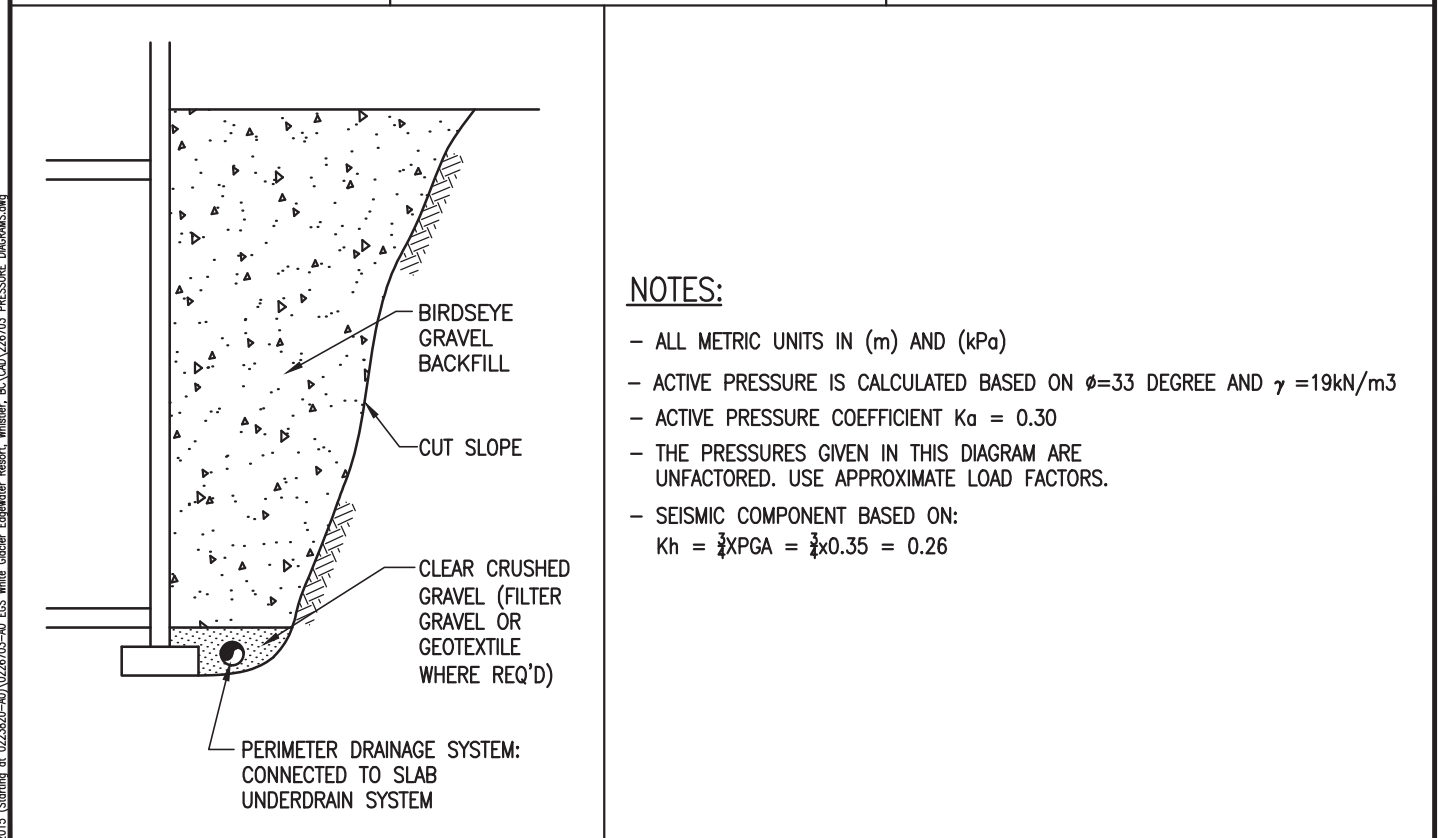
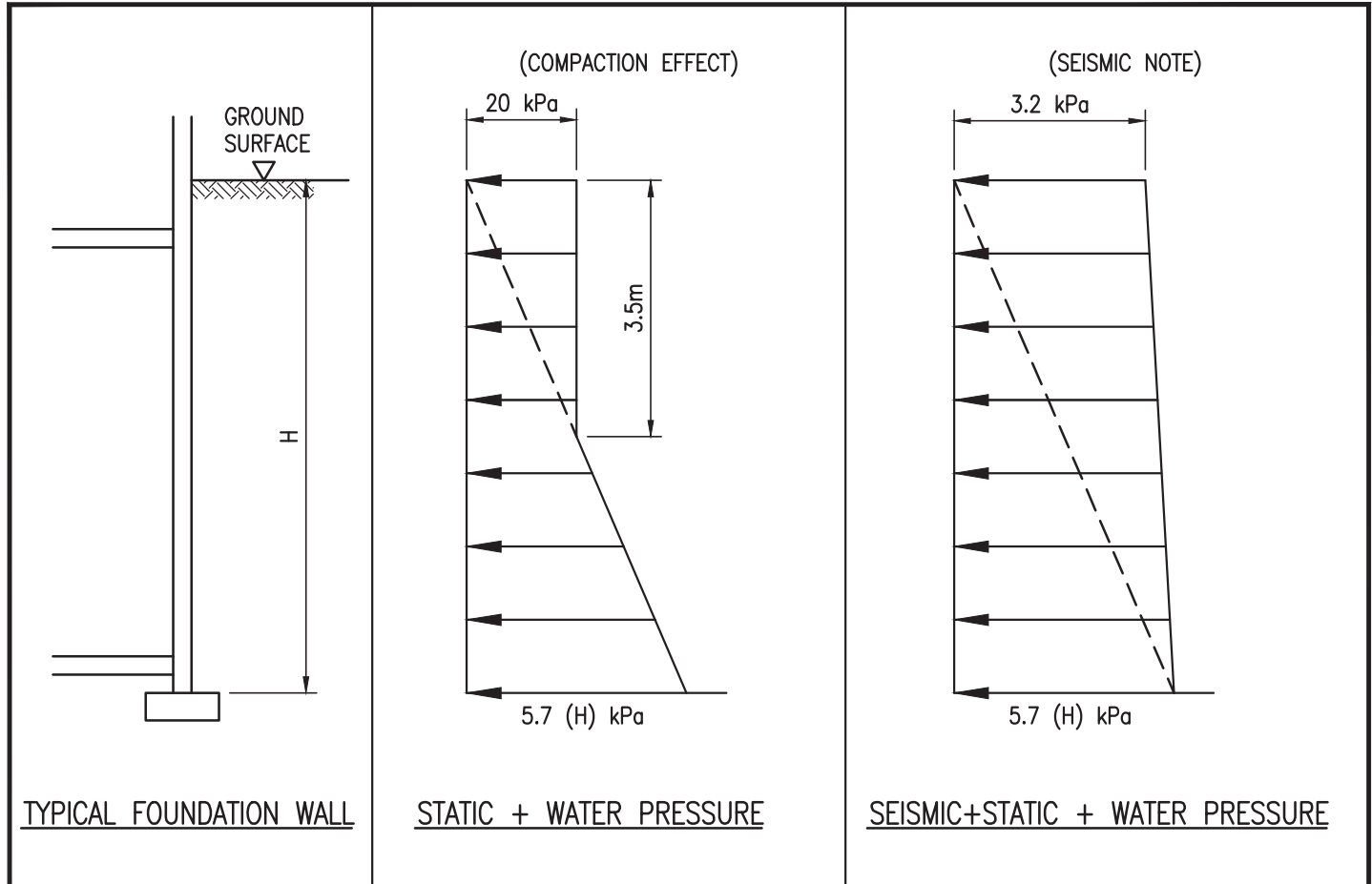
5/17/2016

SCALE:

NTS

FIGURE:

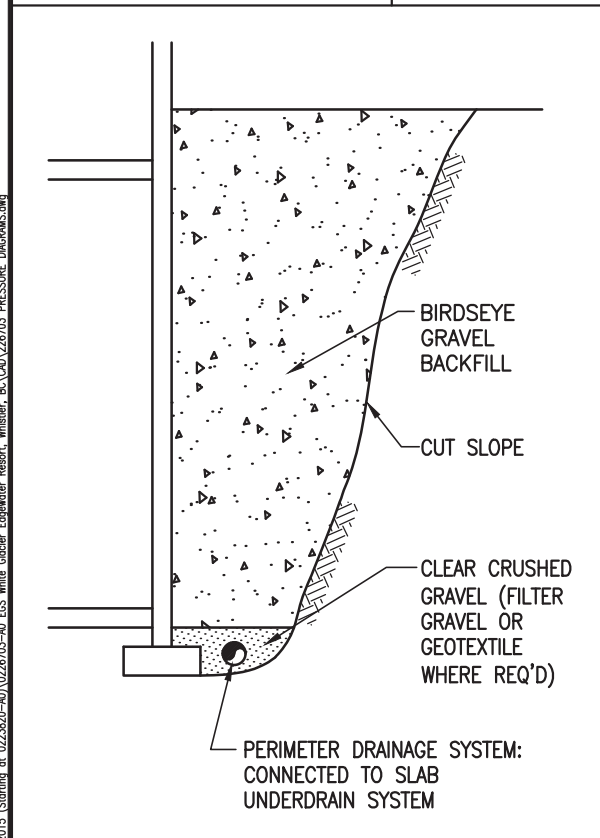
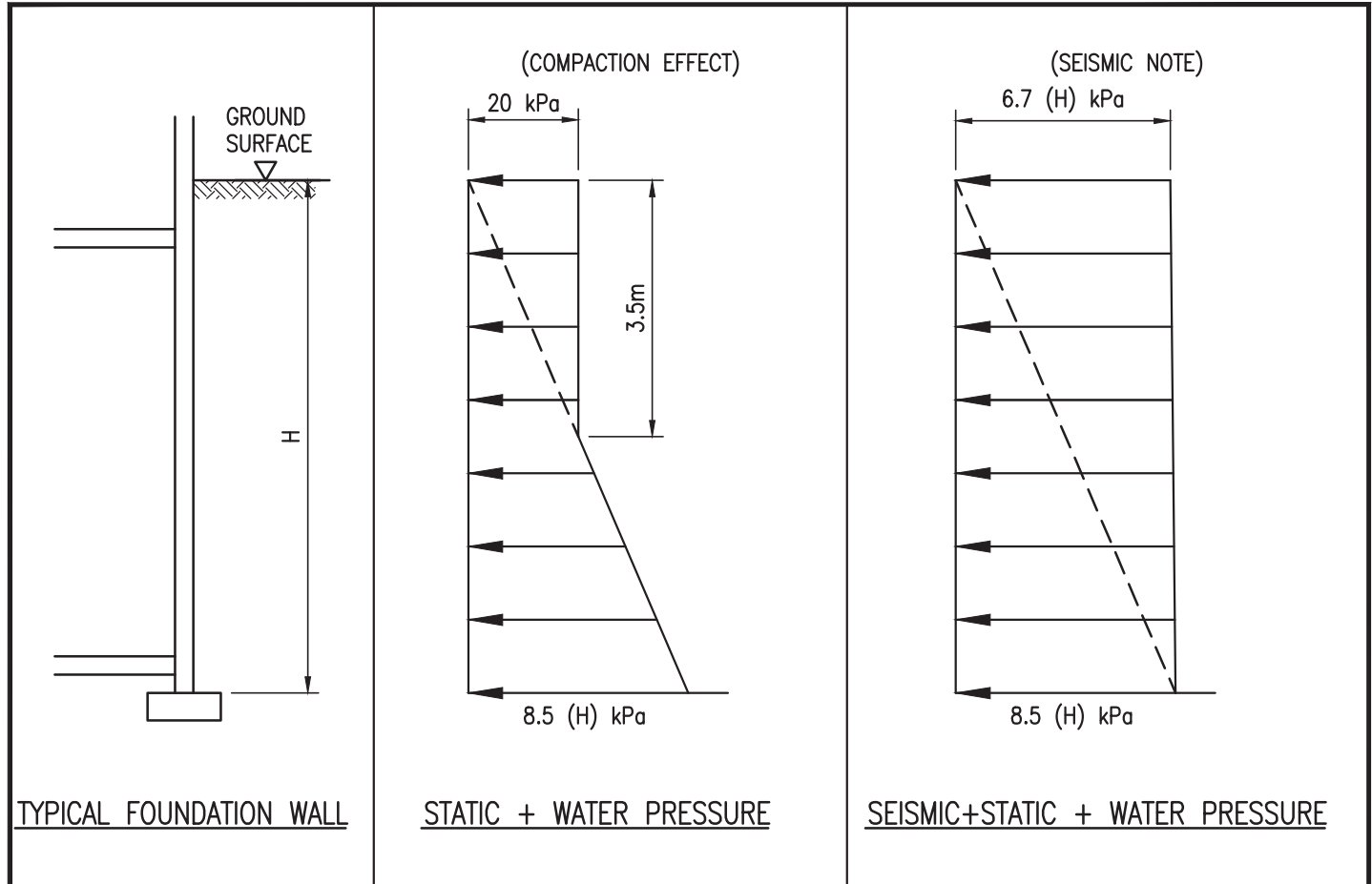
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L:\2015 (Starting at 0226703-A0) 0226703-A0 EGS White Glacier Edgewater Resort, Whistler, BC CAD\226703 PRESSURE DIAGRAMS.dwg
Jul 10, 2015 - 10:44am



CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE ON YIELDING WALLS, 2475 EQ		
PROJECT WHITE GLACIER - EDGEWATER RESORT WHISTLER, B.C.						
PROJECT NO. VAN-00226703-A0	DFTR. MG	DSGN. UC	CHK. EGS	DATE 2015-07-08	SCALE: NTS	DWG NO. FIGURE 9



NOTES:

- ALL METRIC UNITS IN (m) AND (kPa)
- ACTIVE PRESSURE IS CALCULATED BASED ON $\phi=33$ DEGREE AND $\gamma = 19 \text{ kN/m}^3$
- EARTH PRESSURE AT REST COEFFICIENT $K_0 = 0.45$
- THE PRESSURES GIVEN IN THIS DIAGRAM ARE UNFACTORED. USE APPROXIMATE LOAD FACTORS.
- SEISMIC COMPONENT BASED ON:
 $K_h = \text{PGA} = 0.35g$



CLIENT TECK YUEN LEE				TITLE: LATERAL EARTH PRESSURE ON NON-YIELDING WALLS, 2475 EQ		
PROJECT WHITE GLACIER - EDGEWATER RESORT WHISTLER, B.C.						
PROJECT NO. VAN-00226703-A0	DFTR. MG	DSGN. UC	CHK. EGS	DATE 2015-07-08	SCALE: NTS	DWG NO. FIGURE 10

Appendix A

Bore Hole Logs

BH15-01

AH16-1 to AH16-3

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Appendix B

CPT

CPT Data and Interpretation Plots

PRESENTATION OF SITE INVESTIGATION RESULTS

Green Lake, Whistler

Prepared for:

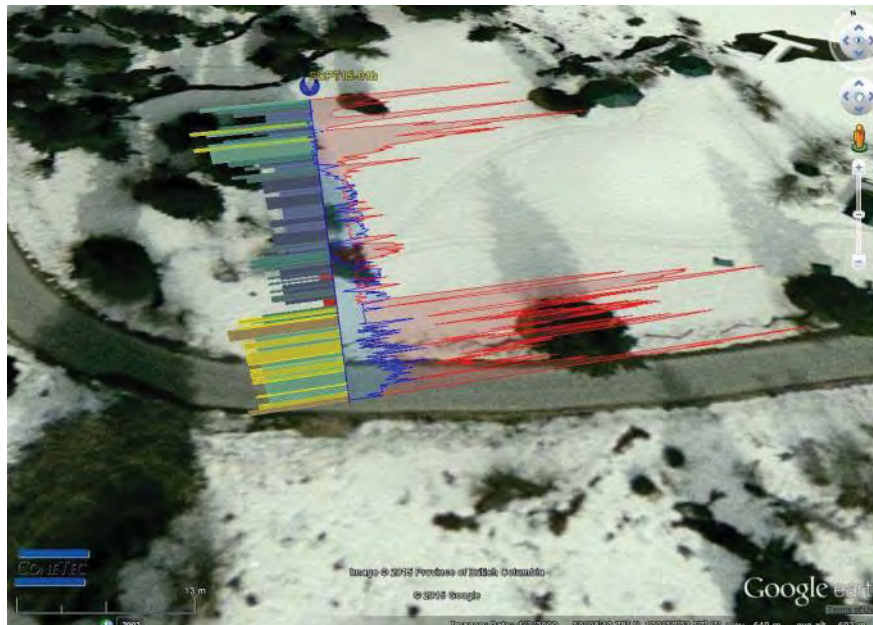
exp Services Inc – Burnaby, BC

ConeTec Job No: 15-02049

Project Start Date: 02-Jun-2015

Project End Date: 02-Jun-2015

Report Date: 03-Jun-2015



Prepared by:

ConeTec Investigations Ltd.
12140 Vulcan Way
Richmond, BC V6V1J8

Tel: (604) 273-4311
Fax: (604) 273-4066
Toll Free: (800) 567-7969

Email: insitu@conetec.com
www.conetec.com
www.conetecdataservices.com



Introduction

This report presents the data gathered by ConeTec Investigations Ltd. on June 2nd 2015. The work, which consisted of 1 SCPT sounding, was conducted next to Green Lake along Alpine Way in Whistler, BC.

Project Information

Project	
Client	exp Services Inc - Burnaby, BC
Project	Green Lake, Whistler
ConeTec project number	15-02049

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Track Rig (M5T)	14 ton rig cylinder	SCPT

Coordinates			
Test Type	Collection Method	EPSG Number	Comments
SCPT	Consumer Grade GPS	32610	Coordinates were collected using a consumer grade GPS device; elevations are not reported

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	Seismic and Advanced, Su (Nkt)
Additional comments	

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm ²)	Sleeve Area (cm ²)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
328:T1500F15U500	AD328	15	225	1500	15	500
Cone AD328 was used for all CPT soundings.						

Interpretation Tables	
Additional information	The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997) was used to classify the soil for this project.

Limitations

This report has been prepared for the exclusive use of exp Services Inc - Burnaby, BC (Client) for the project titled "Green Lake, Whistler". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Investigations Ltd. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm² and 15 cm² tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm² penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm² piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u₂" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

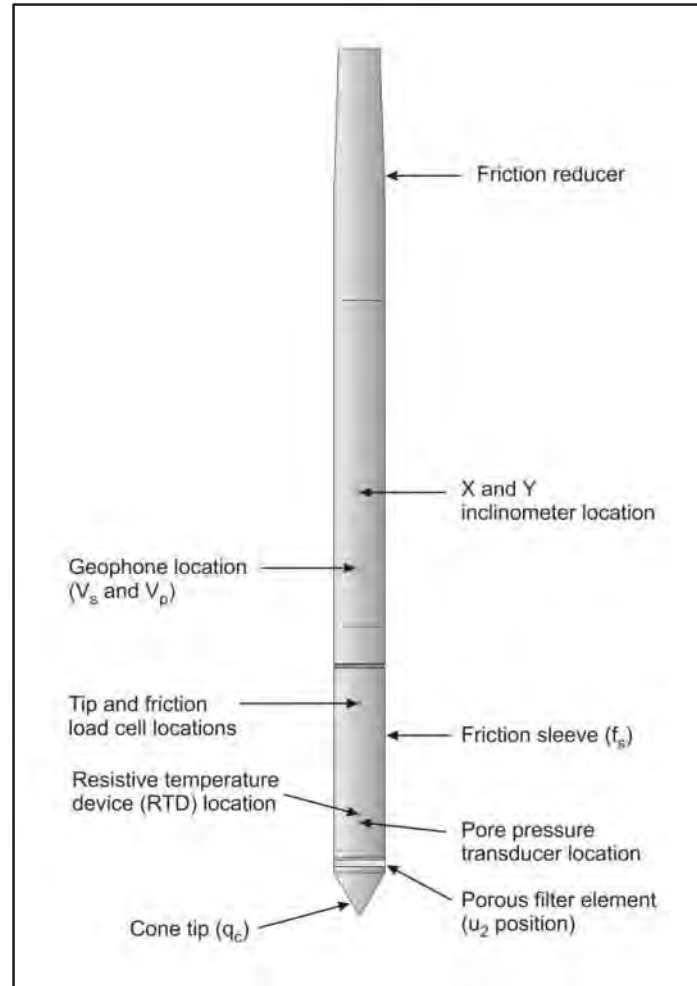


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerine or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerine under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behaviour type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where: q_t is the corrected tip resistance

q_c is the recorded tip resistance

u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)

a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

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Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

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Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (V_p) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

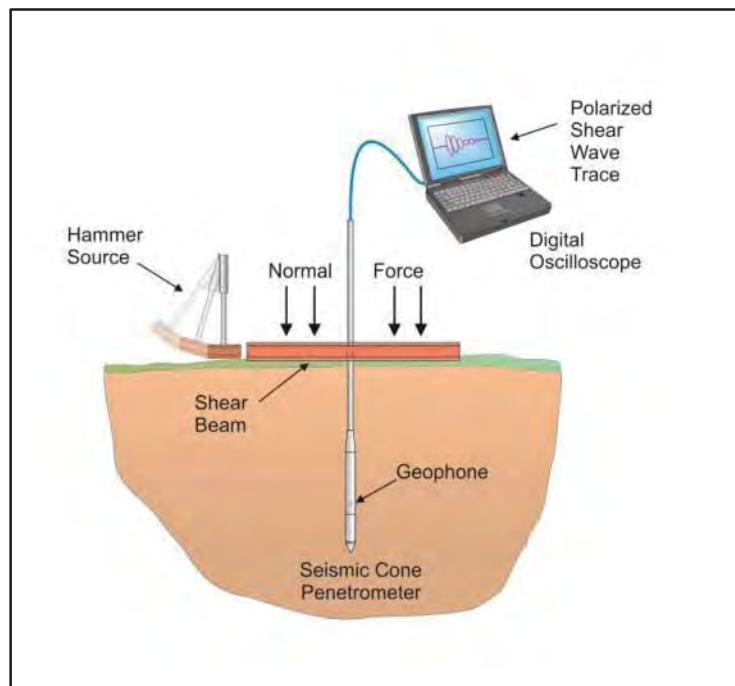


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

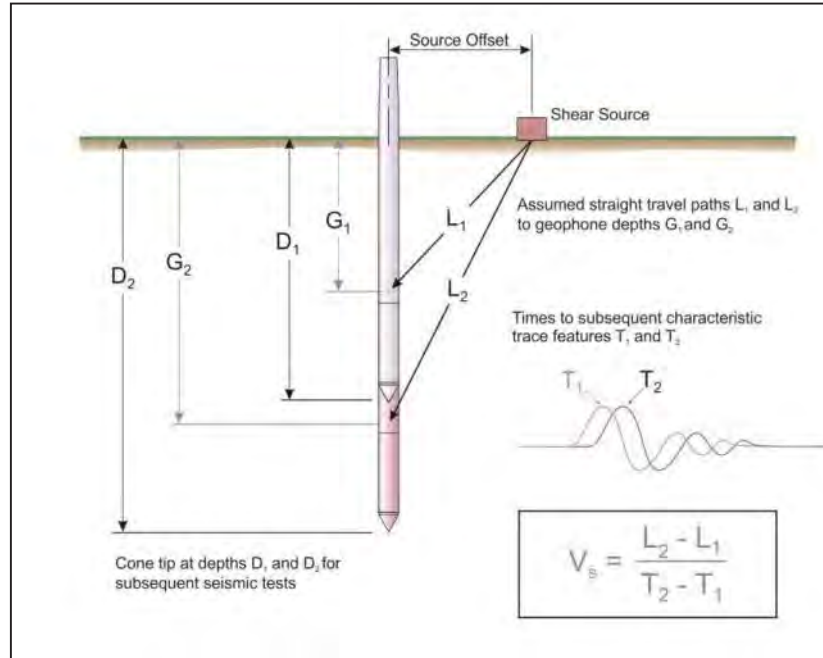


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 30 meters (V_{s30}) has been calculated and provided for all applicable soundings using an equation presented in Crow et al., 2012.

$$V_{s30} = \frac{\text{total thickness of all layers (30m)}}{\sum(\text{layer traveltimes})}$$

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

Crow, H.L., Hunter, J.A., Bobrowsky, P.T., 2012, "National shear wave measurement guidelines for Canadian seismic site assessment", GeoManitoba 2012, Sept 30 to Oct 2, Winnipeg, Manitoba.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

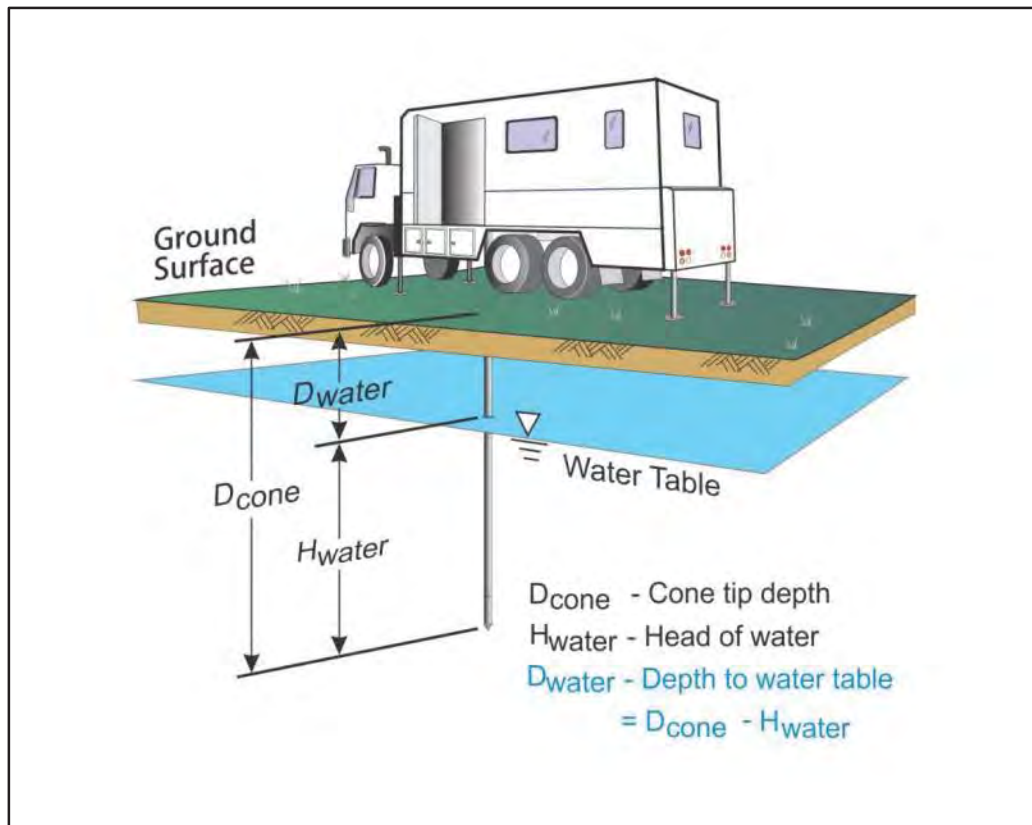


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behaviour.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

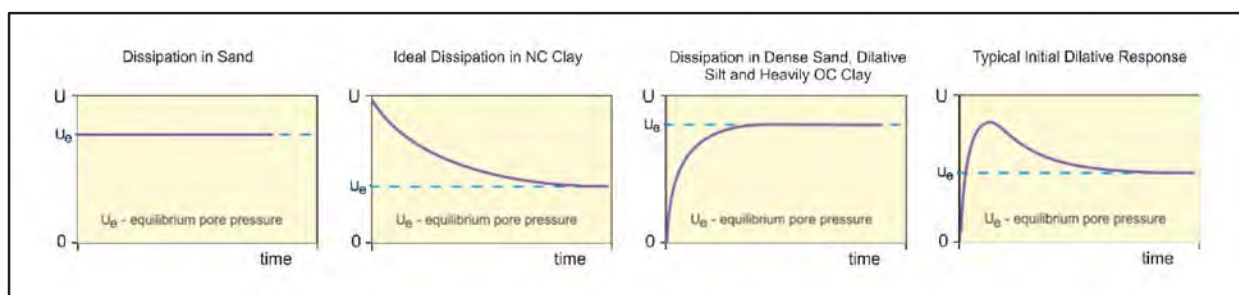


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100} . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100} . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T^*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T^* is the dimensionless time factor (Table Time Factor)
 a is the radius of the cone
 I_r is the rigidity index
 t is the time at the degree of consolidation

Table Time Factor. T^* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50} , dissipation tests must be taken to a pressure less than u_{50} . The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100} . To estimate u_{50} , both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50} . In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r , the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50} , other methods should be applied to confirm the results for c_h .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots, S_u (Nkt)
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface ¹ (m)	Final Depth (m)	Northing ² (m)	Easting (m)	Refer to Notation Number
SCPT15-01b	15-02049_SCP01b	02-Jun-2015	AD328:T1500F15U500	1.4	30.00	5554986	503134	

1. Assumed phreatic surface based on pore pressure dissipation tests. The equilibrium pore pressure profile was used for the interpretation tables.

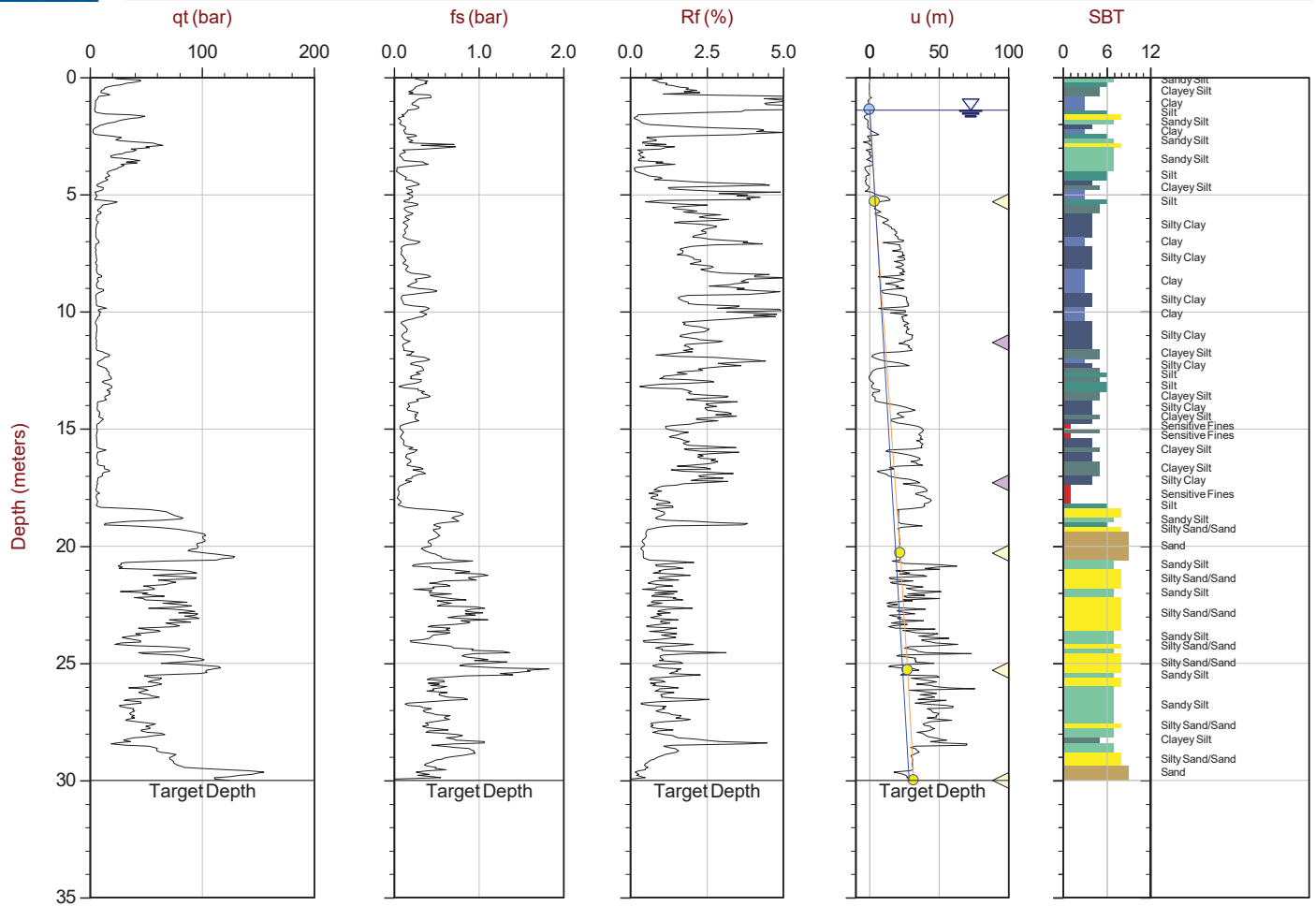
2. Coordinate were collected using a consumer grade GPS device with datum WGS84/UTM Zone 10 North.



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft

File: 15-02049 SCP01B.COR
UnitWt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Avg Int: 0.200 m

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots Undrained Shear Strength (Nkt)



exp Services Inc

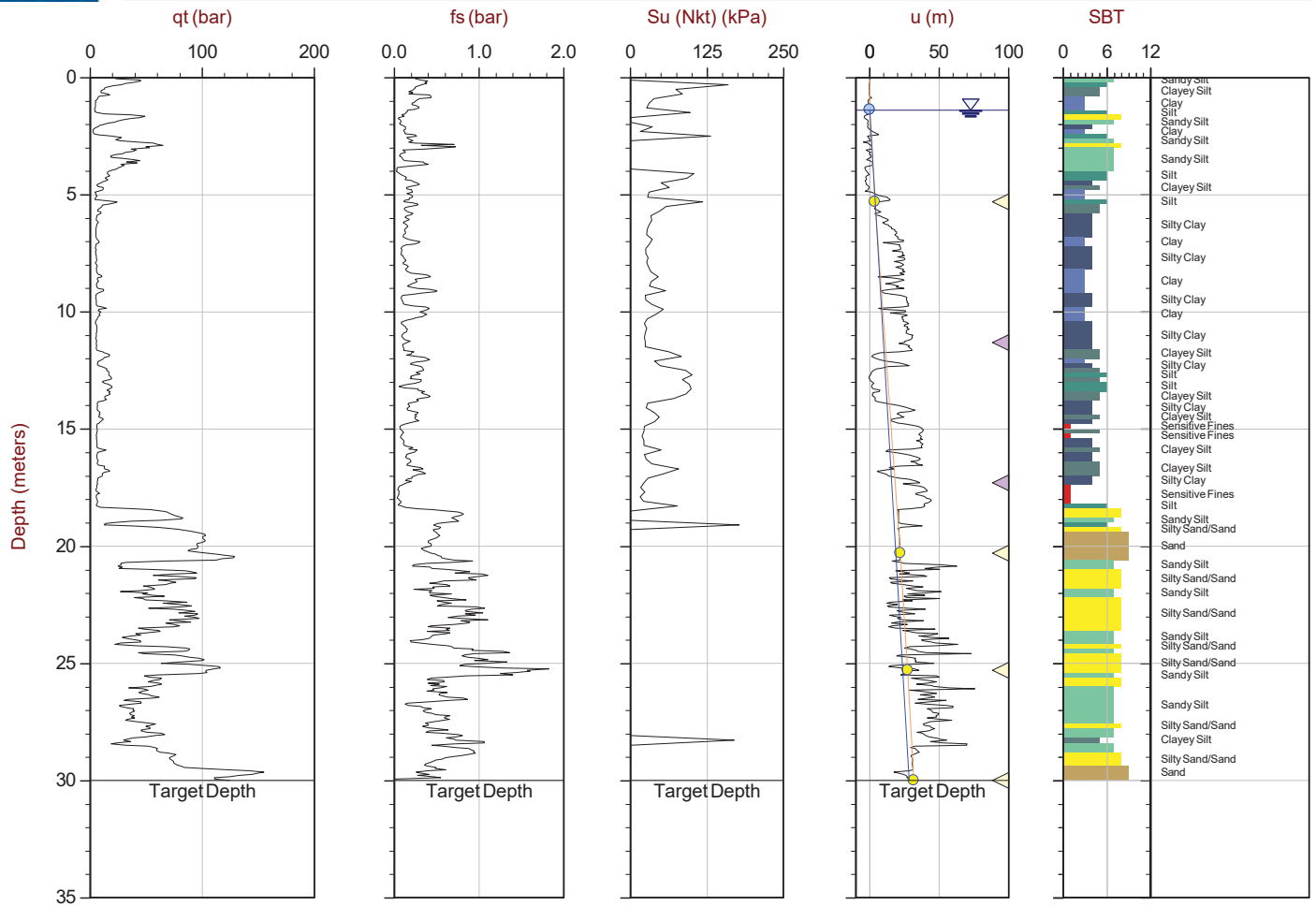
Job No: 15-02049

Date: 06:02:15 12:34

Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b

Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft

Depth Inc: 0.050 m / 0.164 ft

Avg Int: 0.200m Su Nkt: 15.0

File: 15-02049 SCP01B.COR

Unit Wt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997

Coords: UTM Zone 10N: 5554986 E: 503134

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

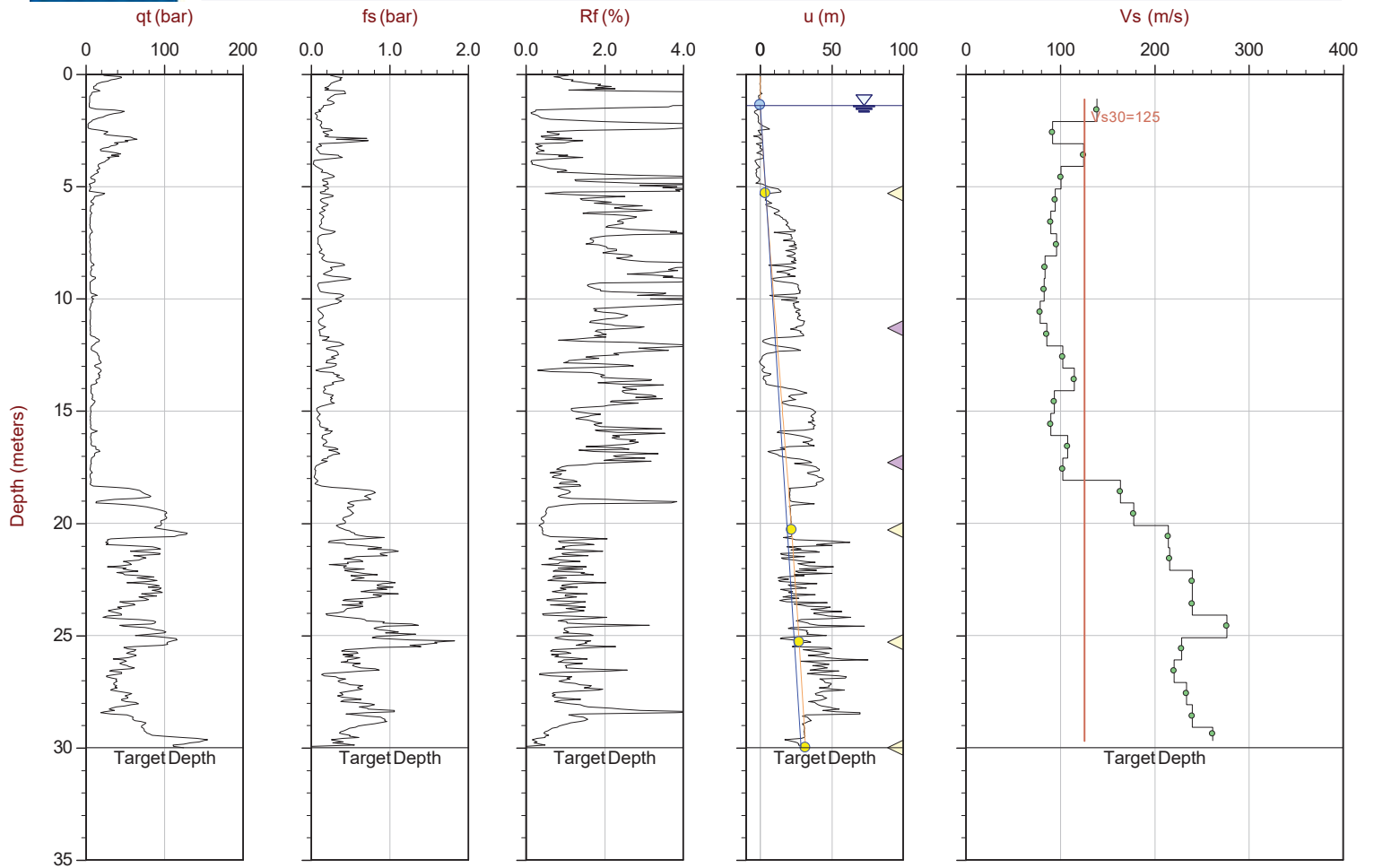
Seismic Cone Penetration Test Plots



exp Services Inc

Job No: 15-02049
Date: 06:02:15 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500



MaxDepth: 30.000 m / 98.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 15-02049 SCP01B.COR
UnitWt: SBT Chart Soil Zones

SBT: Lunne, Robertson and Powell, 1997
Coords: UTM Zone 10N: 5554986 E: 503134

Assumed Ueq Ueq Hydrostatic Line Ueq Profile PPD, Ueq achieved PPD, Ueq not achieved
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
1.30	1.10	1.17			
2.30	2.10	2.14	0.97	6.98	139
3.30	3.10	3.13	0.99	10.74	92
4.30	4.10	4.12	0.99	7.92	125
5.30	5.10	5.12	1.00	9.85	101
6.30	6.10	6.11	1.00	10.52	95
7.30	7.10	7.11	1.00	11.05	90
8.30	8.10	8.11	1.00	10.46	96
9.30	9.10	9.11	1.00	11.95	84
10.30	10.10	10.11	1.00	12.09	83
11.30	11.10	11.11	1.00	12.71	79
12.30	12.10	12.11	1.00	11.65	86
13.30	13.10	13.11	1.00	9.70	103
14.30	14.10	14.11	1.00	8.68	115
15.30	15.10	15.11	1.00	10.65	94
16.30	16.10	16.10	1.00	11.07	90
17.30	17.10	17.10	1.00	9.23	108
18.30	18.10	18.10	1.00	9.73	103
19.30	19.10	19.10	1.00	6.10	164
20.30	20.10	20.10	1.00	5.62	178
21.30	21.10	21.10	1.00	4.64	215
22.30	22.10	22.10	1.00	4.62	216
23.30	23.10	23.10	1.00	4.17	240
24.30	24.10	24.10	1.00	4.16	240
25.30	25.10	25.10	1.00	3.61	277
26.30	26.10	26.10	1.00	4.37	229
27.30	27.10	27.10	1.00	4.52	221
28.30	28.10	28.10	1.00	4.27	234
29.30	29.10	29.10	1.00	4.17	240



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

Seismic Source: Beam
Source Offset (m): 0.40
Source Depth (m): 0.00
Geophone Offset (m): 0.20

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - V_s

Tip Depth (m)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Travel Time Interval (ms)	Interval Velocity (m/s)
29.90	29.70	29.70	0.60	2.29	262

Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots



Job No: 15-02049
Client: exp Services Inc - Burnaby, BC
Project: Green Lake, Whistler
Start Date: 02-Jun-2015
End Date: 02-Jun-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm ²)	Duration (s)	Test Depth (m)	Estimated Equilibrium Pore Pressure U _{eq} (m)	Calculated Phreatic Surface (m)	Estimated Phreatic Surface (m)	t ₅₀ ^a (s)	Assumed Rigidity Index (I _r)	c _h ^b (cm ² /min)
SCPT15-01b	15-02049_SCP01b	15	300	5.30	3.9	1.4		19	100	36.2
SCPT15-01b	15-02049_SCP01b	15	700	11.30	9.9		1.4	599	100	1.2
SCPT15-01b	15-02049_SCP01b	15	300	17.30	15.9		1.4	165	100	4.3
SCPT15-01b	15-02049_SCP01b	15	300	20.30	22.0	-1.7			100	
SCPT15-01b	15-02049_SCP01b	15	500	25.30	27.4	-2.1		14	100	49.91
SCPT15-01b	15-02049_SCP01b	15	400	30.00	31.8	-1.8			100	

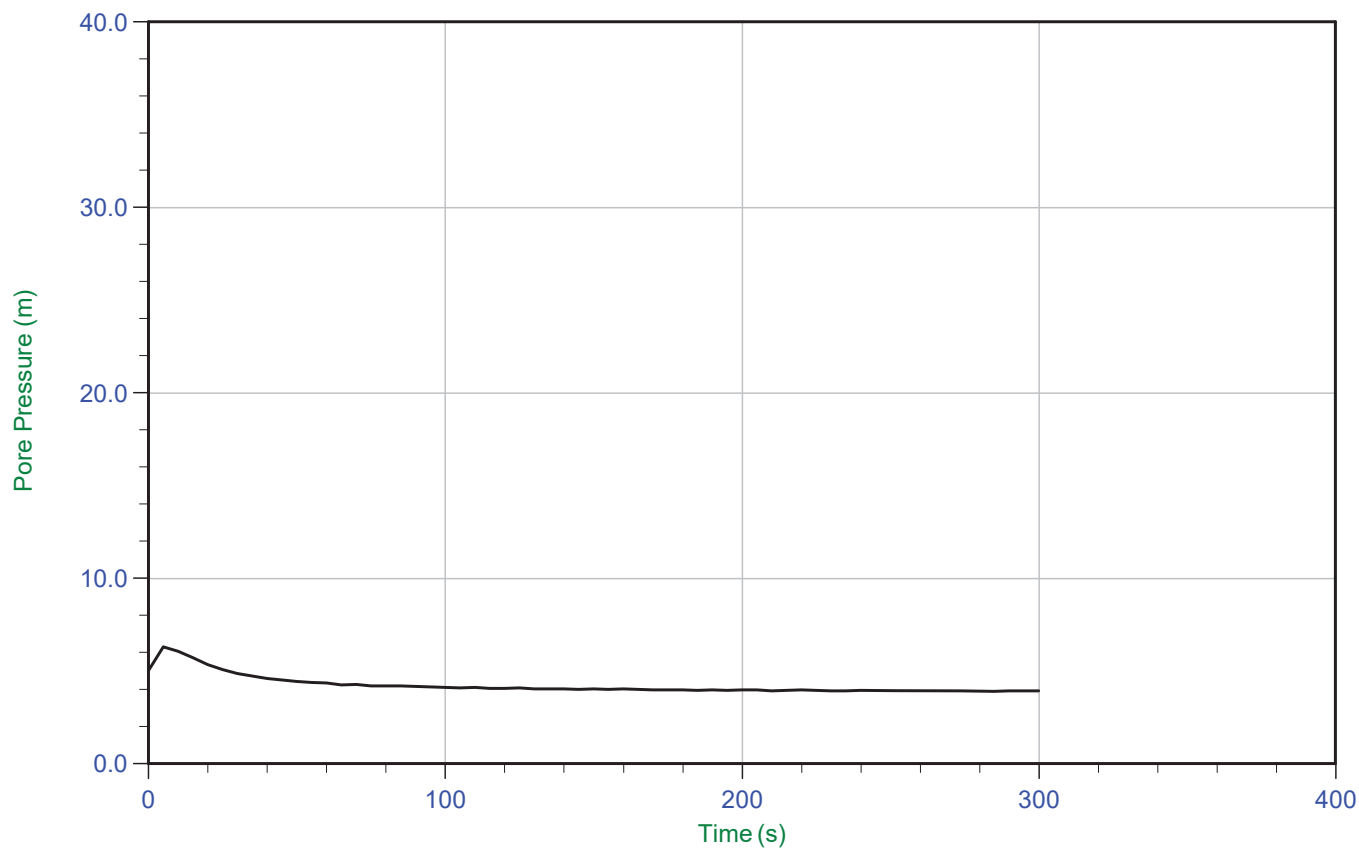
a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



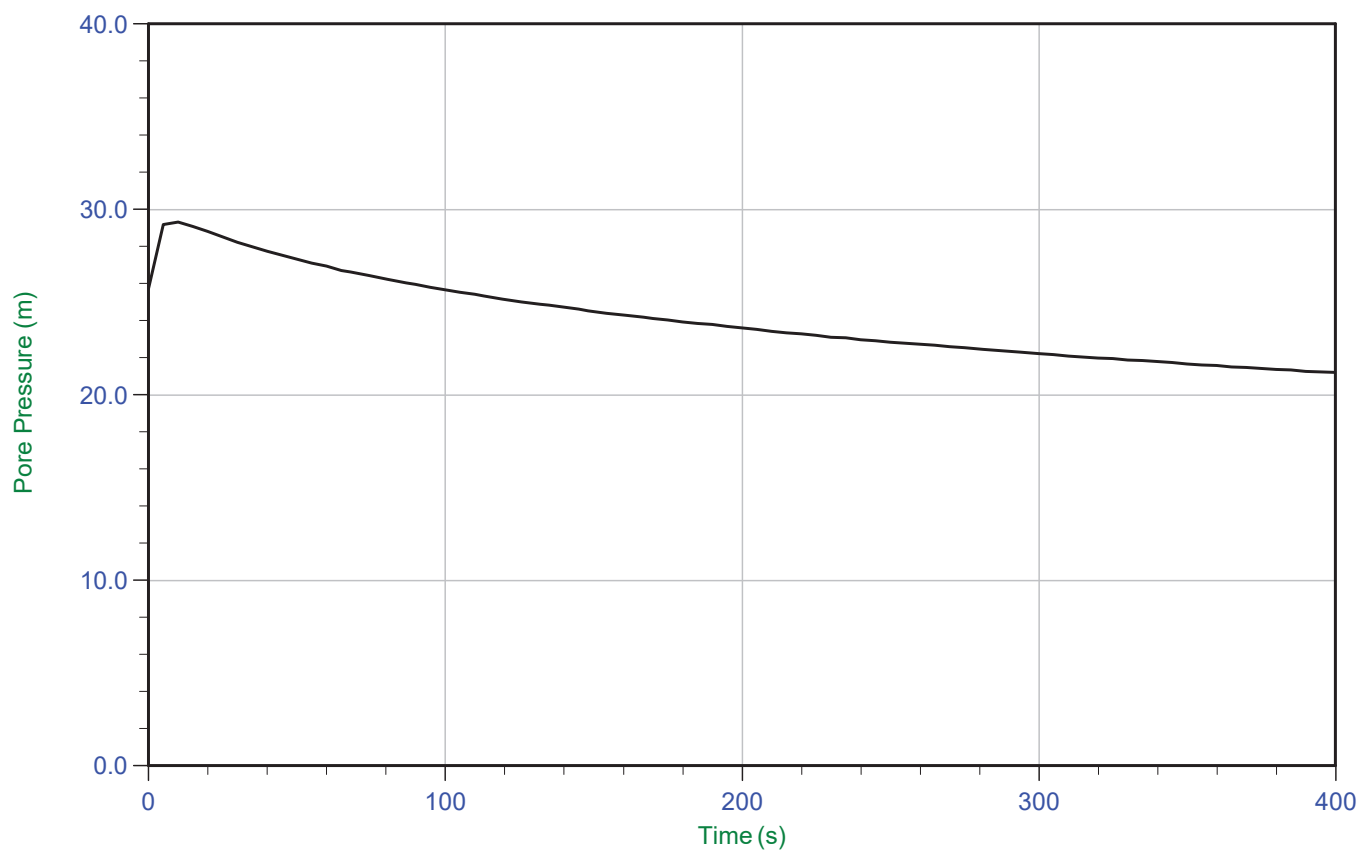
Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 3.9 m	WT: 1.382 m / 4.534 ft	T(50): 19.4 s
	Depth: 5.300 m / 17.388 ft	U Max: 6.3 m	Ueq: 3.9 m	Ir: 100
	Duration: 300.0 s		U(50): 5.11 m	Ch: 36.1 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



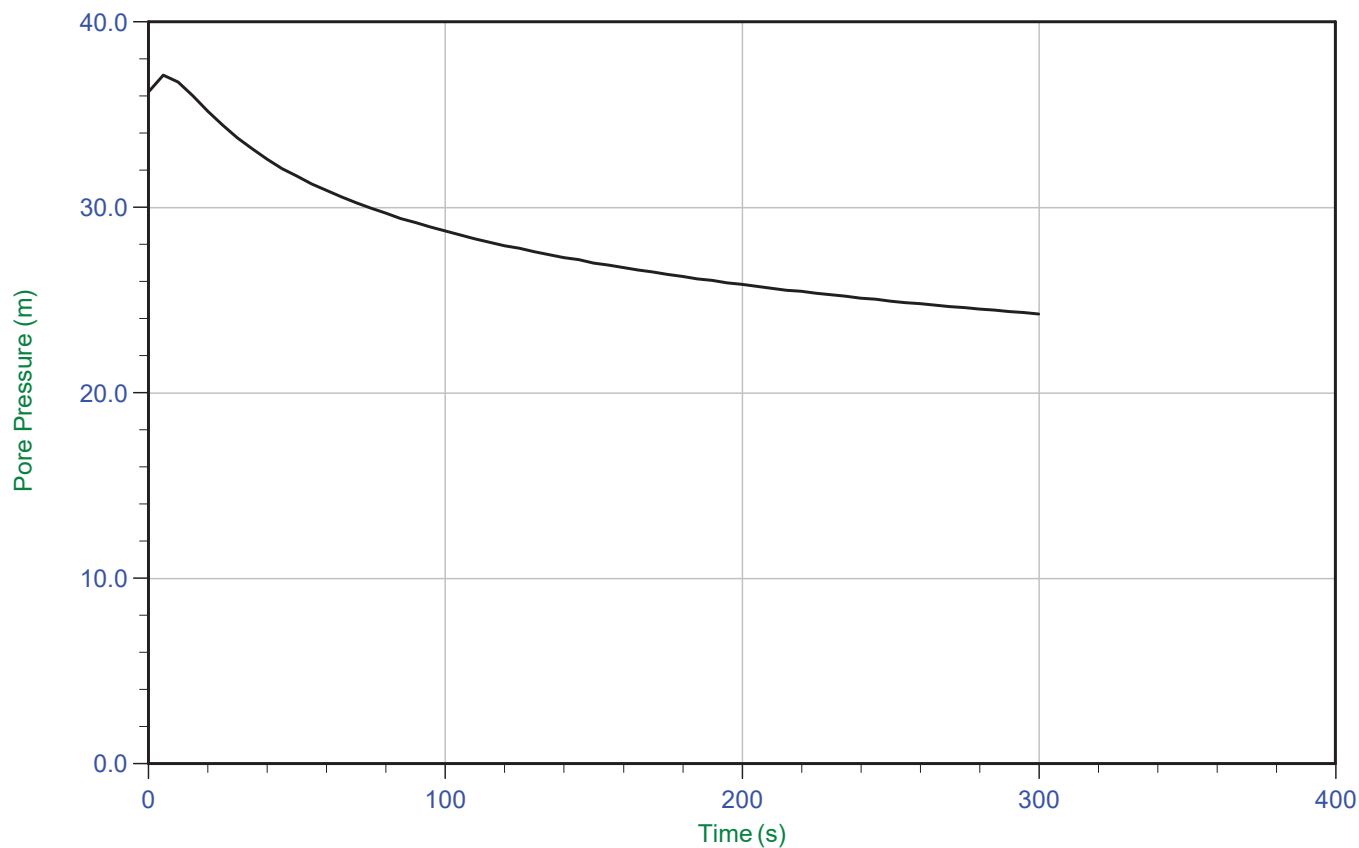
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 19.1 m WT: 1.382 m / 4.534 ft T(50): 598.6 s
 Depth: 11.300 m / 37.073 ft U Max: 29.3 m Ueq: 9.9 m Ir: 100
 Duration: 700.0 s U(50): 19.62 m Ch: 1.2 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



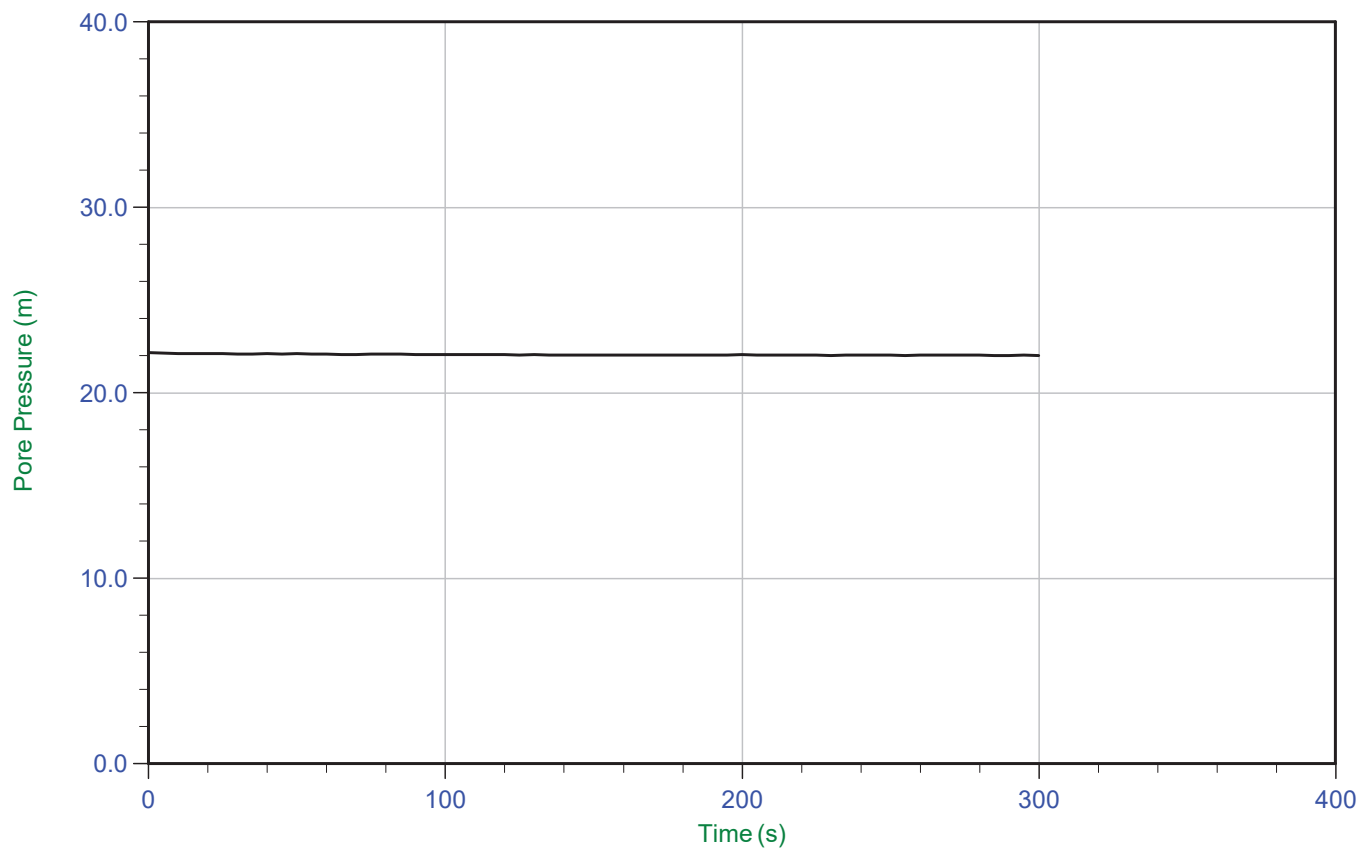
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 24.3 m WT: 1.382 m / 4.534 ft T(50): 164.6 s
Depth: 17.300 m / 56.758 ft U Max: 37.1 m Ueq: 15.9 m Ir: 100
Duration: 300.0 s U(50): 26.52 m Ch: 4.3 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



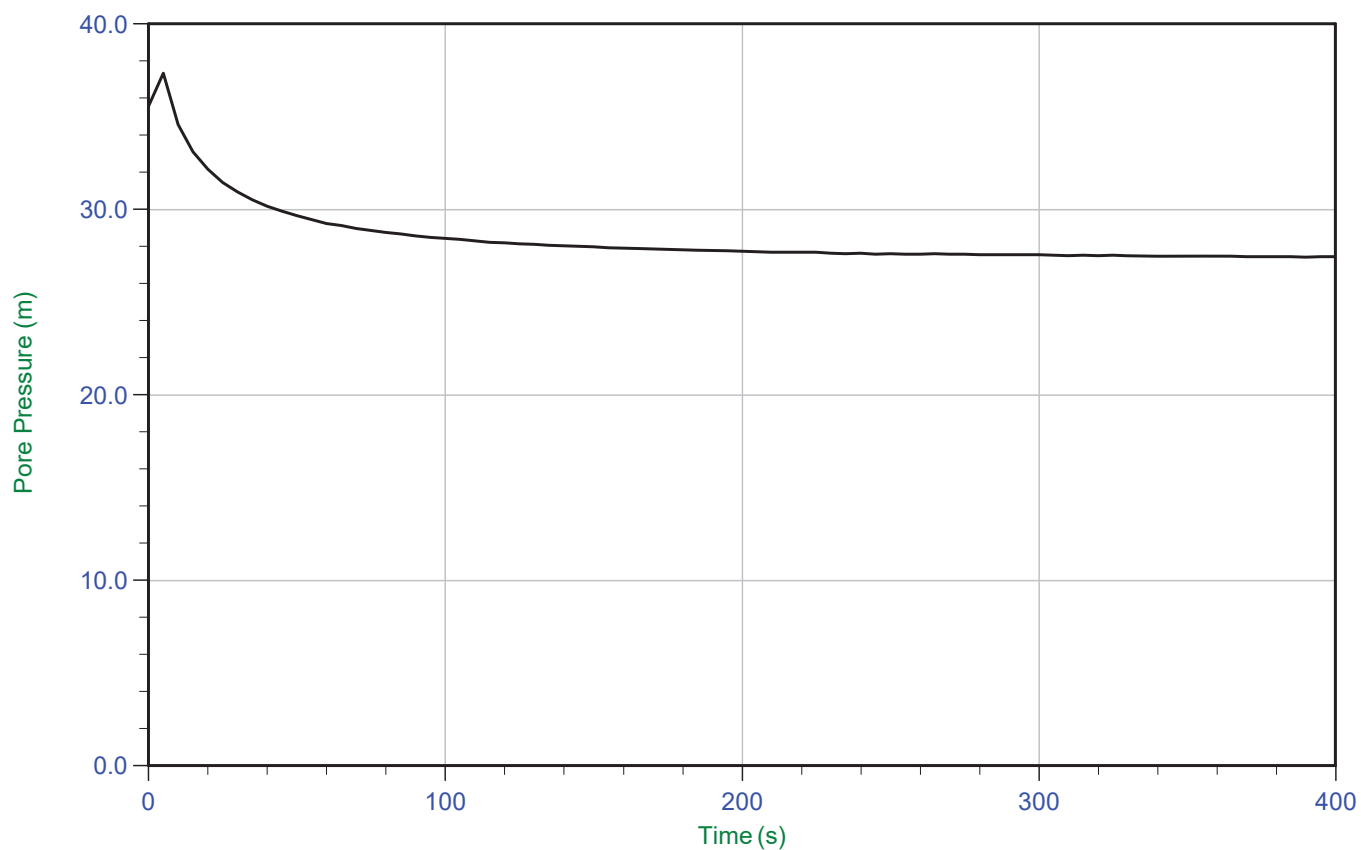
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 22.0 m WT: -1.713 m / -5.620 ft
Depth: 20.300 m / 66.600 ft U Max: 22.2 m Ueq: 22.0 m
Duration: 300.0 s



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



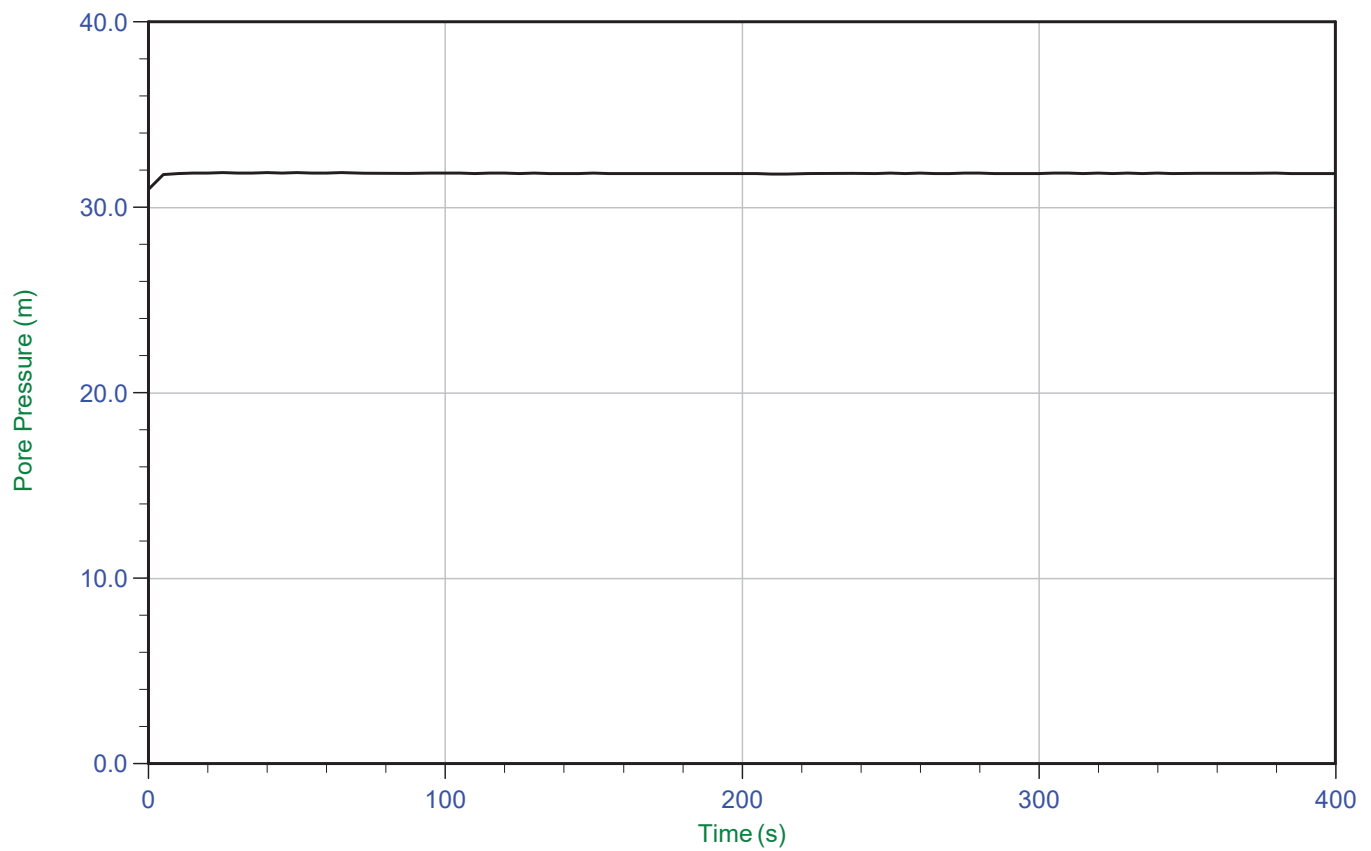
Trace Summary: Filename: 15-02049_SCP01b.PPF U Min: 27.4 m WT: -2.059 m / -6.755 ft T(50): 14.1 s
 Depth: 25.300 m / 83.004 ft U Max: 37.3 m Ueq: 27.4 m Ir: 100
 Duration: 500.0 s U(50): 32.35 m Ch: 49.9 sq cm/min



exp Services Inc

Job No: 15-02049
Date: 06/02/2015 12:34
Site: 8020 Alpine Way, Whistler, BC

Sounding: SCPT15-01b
Cone: 328:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:	Filename: 15-02049_SCP01b.PPF	U Min: 31.0 m	WT: -1.775 m / -5.823 ft
	Depth: 30.000 m / 98.424 ft	U Max: 31.9 m	Ueq: 31.8 m
	Duration: 400.0 s		

Appendix C

Photographs

BH15-01

BH15-01







Appendix D

Atterberg Limits



Liquid Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	158.13	159.02	26.71			
Weight of Dry Soils + Pan:	153.93	155.67	23.12			
Weight of Pan:	146.43	149.43	15.99			
Weight of Dry Soils:	7.50	6.24	7.13			
Weight of Moisture:	4.20	3.35	3.59			
% Moisture:	56.00%	53.69%	50.35%			
N:	18	25	32			

Liquid Limit @ 25 Blows: 53.35%

Plastic Limit: 46.96%

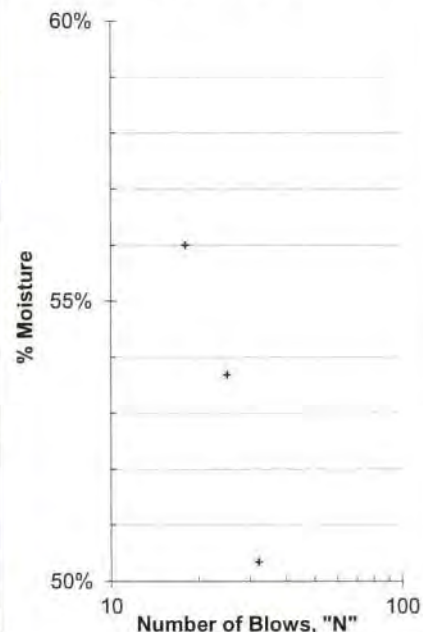
Plasticity Index, I_p : 6.39%

Moisture Content, M_C : 64.20%

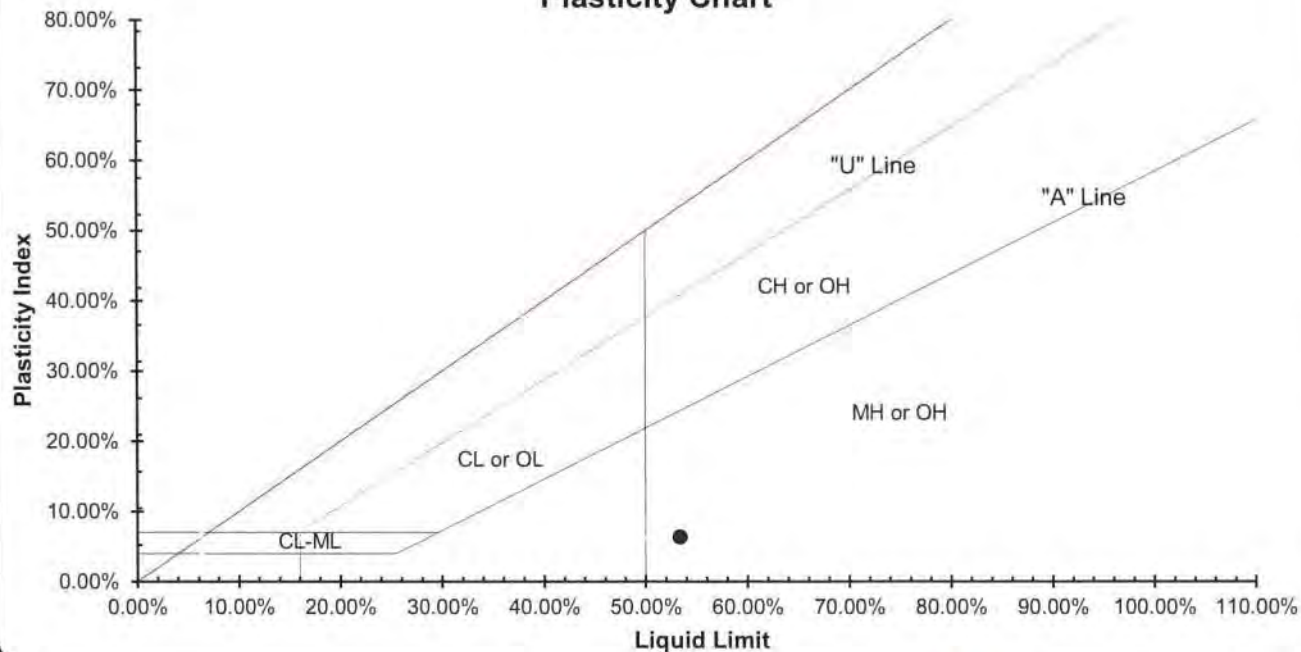
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	11.02	10.67				
Weight of Dry Soils + Pan:	8.77	8.52				
Weight of Pan:	4.01	3.91				
Weight of Dry Soils:	4.76	4.61				
Weight of Moisture:	2.25	2.15				
% Moisture:	47.27%	46.64%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech



Liquid Limit Determination

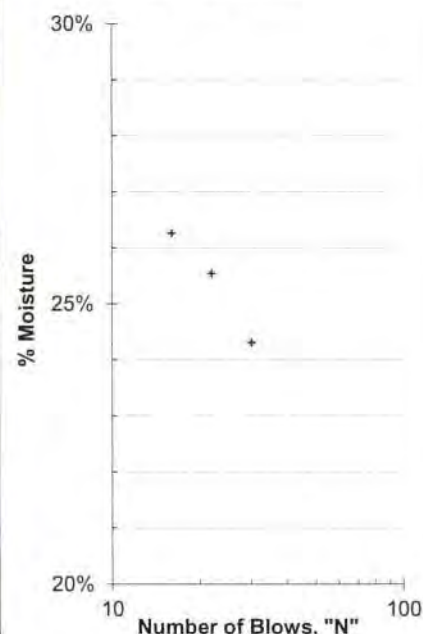
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	14.88	13.20	12.52			
Weight of Dry Soils + Pan:	12.59	11.31	10.85			
Weight of Pan:	3.87	3.91	3.98			
Weight of Dry Soils:	8.72	7.40	6.87			
Weight of Moisture:	2.29	1.89	1.67			
% Moisture:	26.26%	25.54%	24.31%			
N:	16	22	30			

Liquid Limit @ 25 Blows: 25.04%
Plastic Limit: 24.08%
Plasticity Index, I_p : 0.97%
Moisture Content, M_C : 26.50%

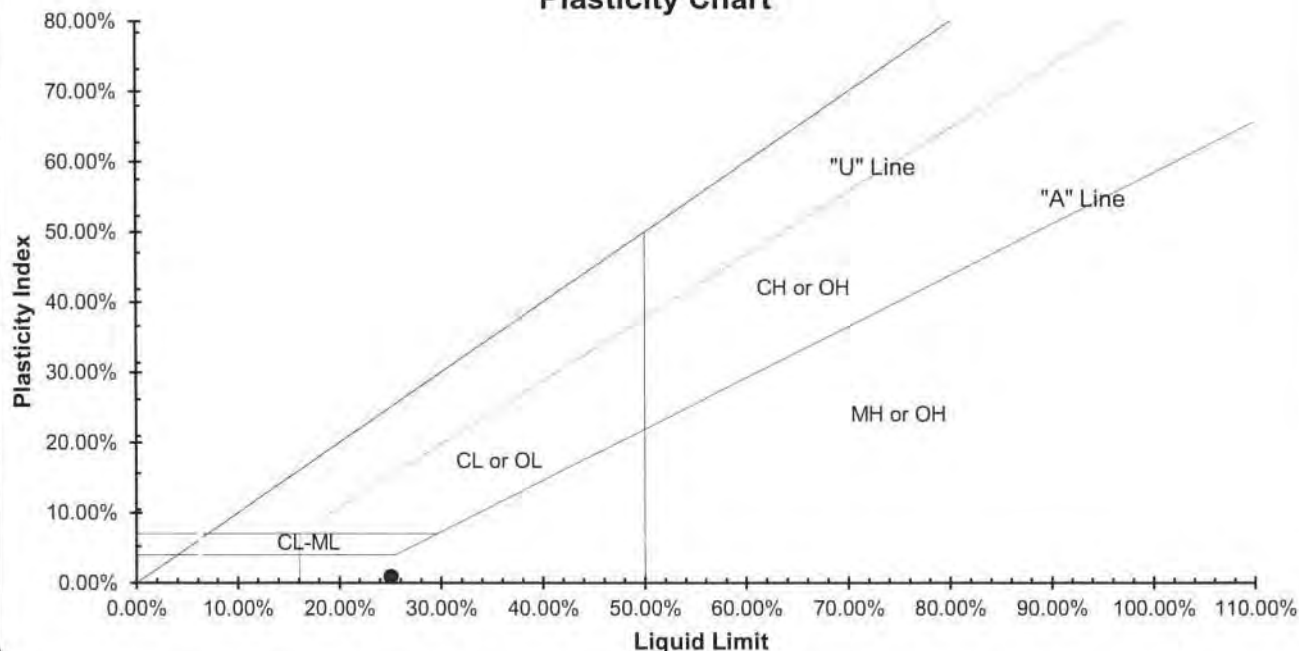
Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	16.94	14.78				
Weight of Dry Soils + Pan:	14.50	12.64				
Weight of Pan:	4.32	3.79				
Weight of Dry Soils:	10.18	8.85				
Weight of Moisture:	2.44	2.14				
% Moisture:	23.97%	24.18%				

Liquid Limit



Plasticity Chart



Reported by: Tyson Gash, CCIL Certified Technician

Reviewed by: Kevin Bowyer, CTech

Appendix E

Sieve Analysis Report



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
exp - EVAN SYKES

ATTN: EVAN SYKES

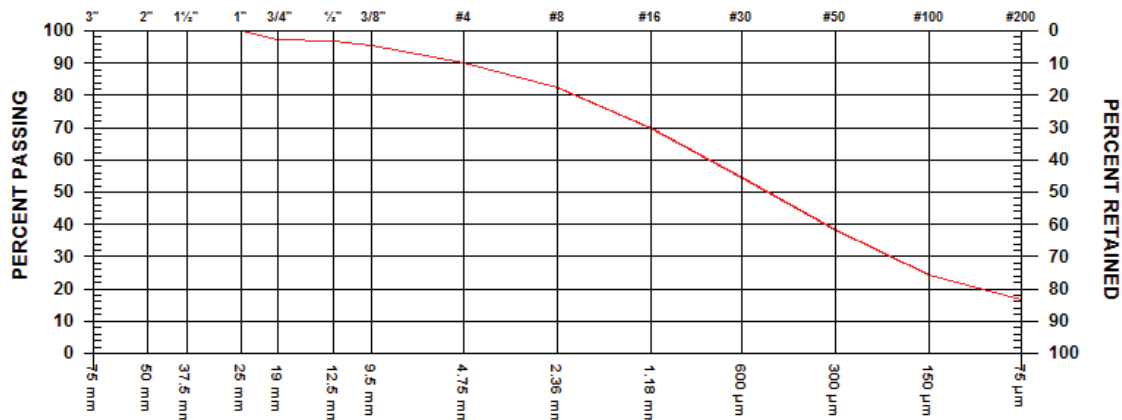
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 5 DATE RECEIVED Apr 25, 2016 DATE TESTED Apr 26, 2016 DATE SAMPLED Apr 13, 2016

SUPPLIER SITE
SOURCE AH16-01 S6 @ 5.8M
SPECIFICATION
MATERIAL TYPE SAND, SOME GRAVEL, SOME SILT

SAMPLED BY D. SILVEIRA
TESTED BY L. JEAN, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm	100.0	
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm		
3/4"	19 mm		
1/2"	12.5 mm		
3/8"	9.5 mm	95.4	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	90.3	
No. 8	2.36 mm	82.3	
No. 16	1.18 mm	69.7	
No. 30	600 µm	54.6	
No. 50	300 µm	38.2	
No. 100	150 µm	24.1	
No. 200	75 µm	16.8	

COMMENTS

TEST METHOD: ASTM C136, C117.



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
exp - EVAN SYKES

ATTN: EVAN SYKES

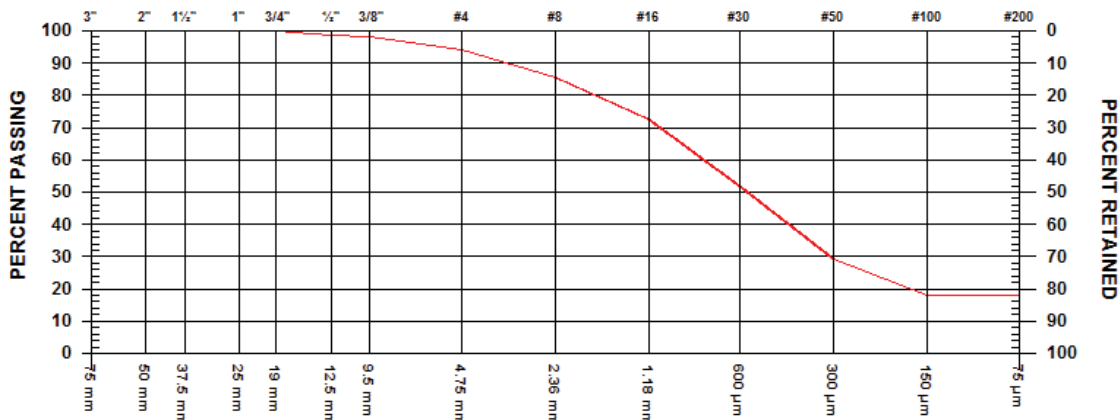
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 6 DATE RECEIVED Apr 25, 2016 DATE TESTED Apr 26, 2016 DATE SAMPLED Apr 13, 2016

SUPPLIER SITE
SOURCE AH16-01 S8 @ 8.9M
SPECIFICATION
MATERIAL TYPE SAND, SOME SILT, SOME GRAVEL

SAMPLED BY D. SILVEIRA
TESTED BY L. JEAN, ASCT
TEST METHOD WASHED



GRAVEL SIZES		PERCENT PASSING	GRADATION LIMITS
3"	75 mm		
2"	50 mm		
1 1/2"	37.5 mm		
1"	25 mm		
3/4"	19 mm	100.0	
1/2"	12.5 mm	98.7	
3/8"	9.5 mm	98.2	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	94.2	
No. 8	2.36 mm	85.5	
No. 16	1.18 mm	72.6	
No. 30	600 µm	51.6	
No. 50	300 µm	29.4	
No. 100	150 µm	18.2	
No. 200	75 µm	18.1	

COMMENTS

TEST METHOD: ASTM C136, C117.



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

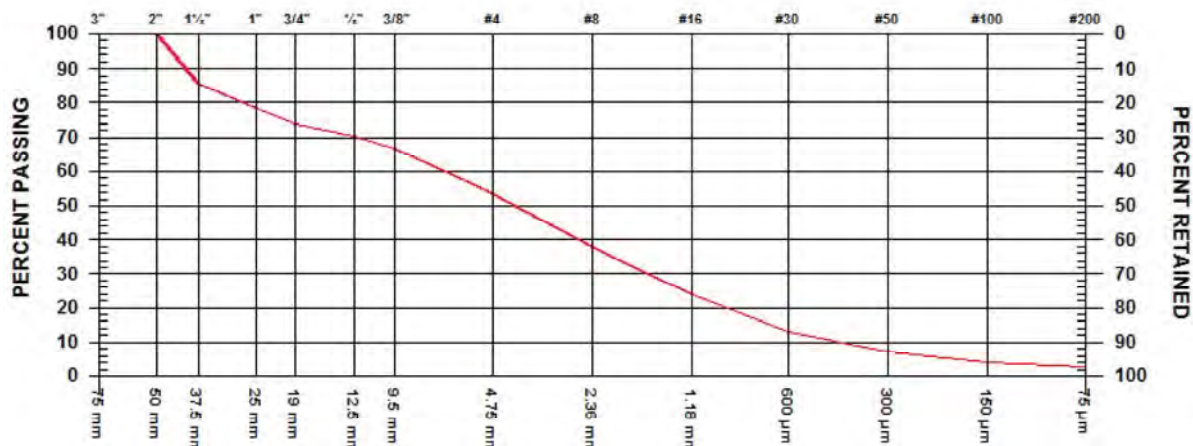
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 1 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE GRAVEL AND SAND, TRACE SILT

SAMPLED BY D.SILVERA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm	100.0	
2"	50	mm		
1 1/2"	37.5	mm		
1"	25	mm		
3/4"	19	mm		
1/2"	12.5	mm		
3/8"	9.5	mm		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	53.5	
No. 8	2.36 mm	37.9	
No. 16	1.18 mm	24.0	
No. 30	600 µm	13.1	
No. 50	300 µm	7.1	
No. 100	150 µm	4.0	
No. 200	75 µm	2.7	

COMMENTS

SAMPLE LOCATION: S12 BOREHOLE 15-01, 10.05M DEPTH. (34') (GB)



exp Services Inc.
275-3001 Wayburne Drive
Burnaby, BC V5G 4W3
604-874-1245

Kamloops Branch
250-372-5321



CERTIFIED TESTING
LABORATORY

SIEVE ANALYSIS REPORT 8 16 30 50 SERIES

PROJECT NO. 002-26703

CLIENT TECK YUEN LEE C/O LAMEOUREAUX
c.c. exp - EVAN SYKES

TO
TECK YUEN LEE C/O LAMEOUREAUX
ARCHITEC INC
3392 MARINE DRIVE
WEST VANCOUVER, BC
V7V 1M9

ATTN: MR. BRAD LAMOUREUX

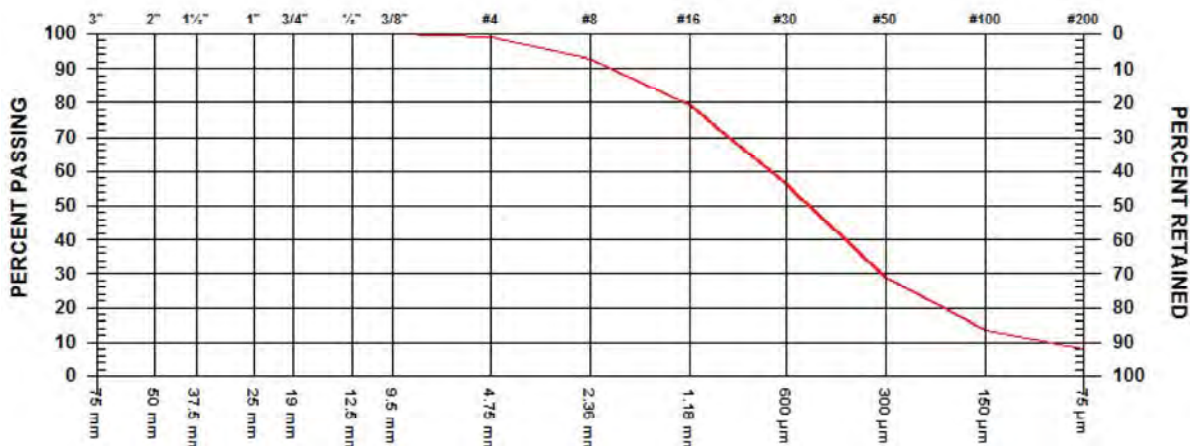
PROJECT WHITE GLACIER - EDGEWATER RESORT
GEOTECHNICAL
CONTRACTOR

WHISTLER

SIEVE TEST NO. 2 DATE RECEIVED Jun 02, 2015 DATE TESTED Jun 10, 2015 DATE SAMPLED Jun 02, 2015

SUPPLIER SITE
SOURCE EXISTING
SPECIFICATION
MATERIAL TYPE SAND, TRACE SILT AND GRAVEL

SAMPLED BY D.SILVEIRA
TESTED BY R.MILLARES, ASCT
TEST METHOD WASHED



GRAVEL SIZES	PERCENT PASSING	GRADATION LIMITS
3" 75 mm	100.0	
2" 50 mm		
1 1/2" 37.5 mm		
1" 25 mm		
3/4" 19 mm		
1/2" 12.5 mm		
3/8" 9.5 mm		

SAND SIZES AND FINES	PERCENT PASSING	GRADATION LIMITS
No. 4 4.75 mm	99.1	
No. 8 2.36 mm	92.9	
No. 16 1.18 mm	79.1	
No. 30 600 µm	56.5	
No. 50 300 µm	28.7	
No. 100 150 µm	13.7	
No. 200 75 µm	7.9	

COMMENTS

SAMPLE LOCATION: S10 - BOREHOLE 15-01, 5.79M DEPTH. (19') (SPT)

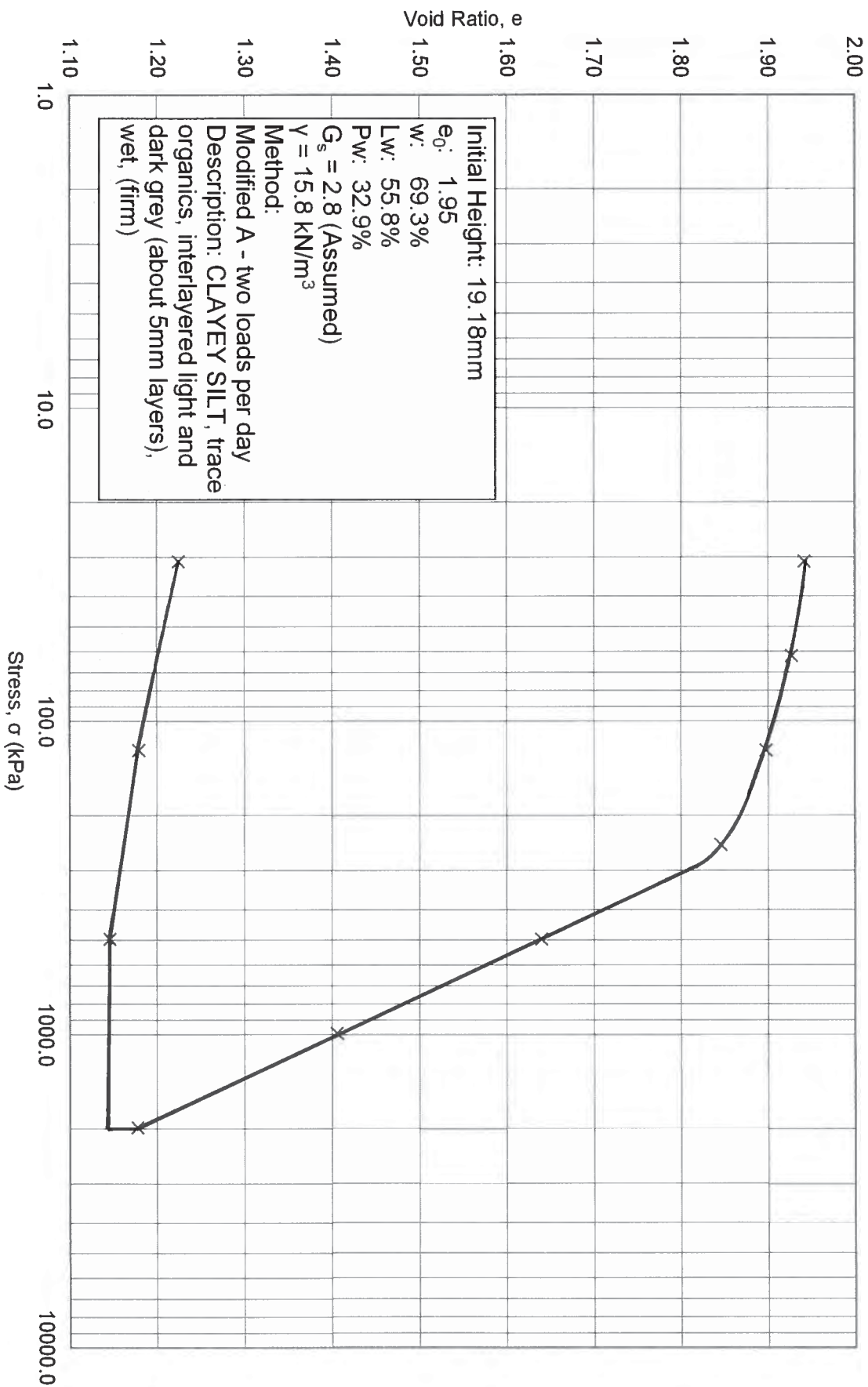
Appendix F

Consolidation Test Results



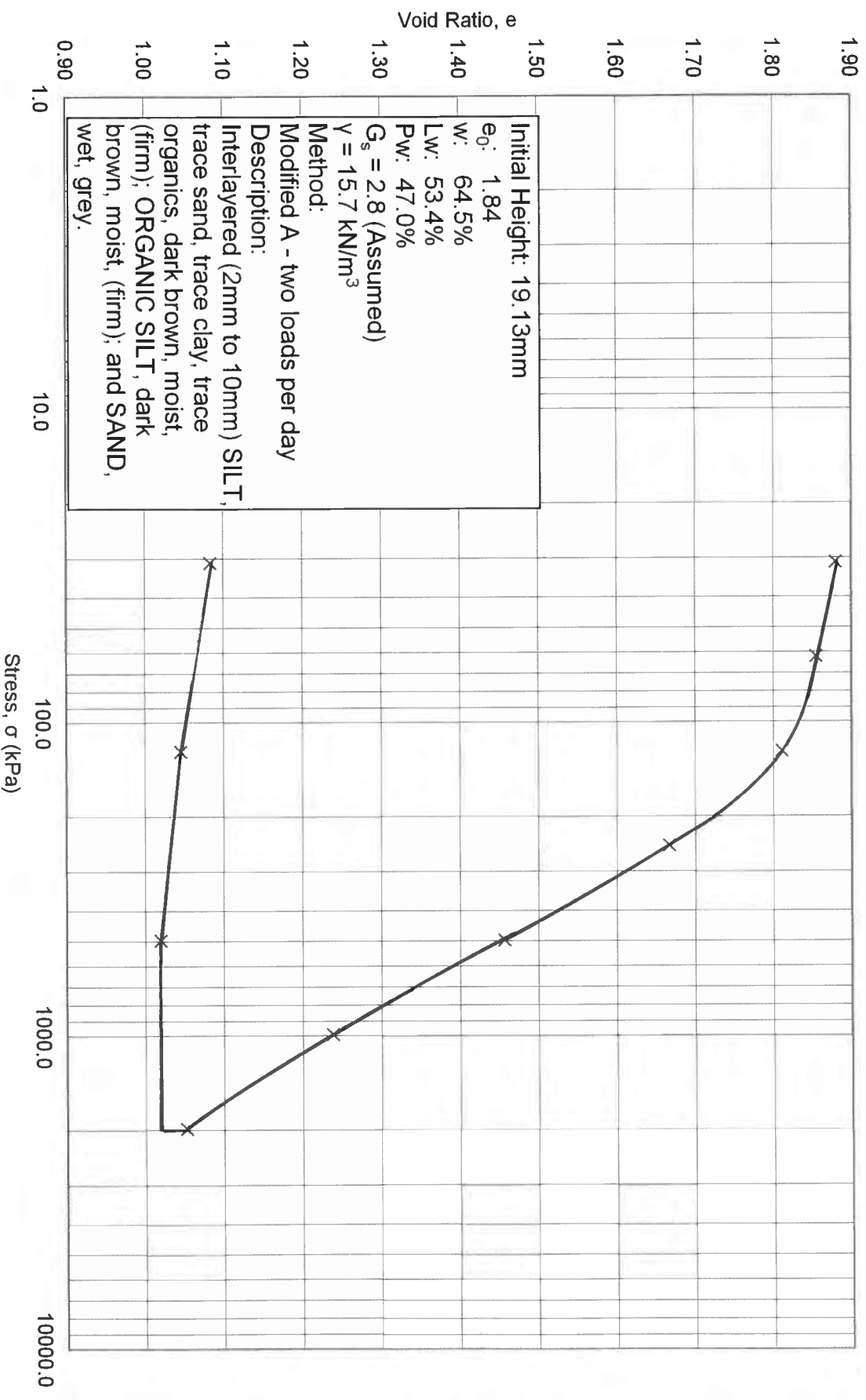
Consolidation: Void Ratio v. Applied Stress
BH15-05, Depth to Top of Tube: 27.1m, Depth of Sample: 27.38m

White Glacier Edgewater Resort
VAN-00226703-A0
2015-06-23 SCD



Consolidation: Void Ratio v. Applied Stress

BH15-01, Depth to Top of Tube: 14.94m, Depth of Sample: 15.48m



Appendix G

Topographic Survey



275 – 3001 Wayburne Drive
Burnaby, BC V5G 4W3 Canada
T: 604.874.1245 • www.exp.com

Memorandum

Date:	March 28, 2018	From:	Evan Sykes, P.Eng.
To:	Tom Vitous (Lamoureux Architects)	Project No.:	VAN-00226703
Prepared By:	Evan Sykes, P.Eng.		
Project Name:	8030 Alpine Way, Whistler, BC		
Subject:	Berm Influence on Groundwater		
Distribution:	Lamoureux Architects Inc.		

With respect to groundwater flow the influence of a lock block berm or rock stack been is considered to be minimal.

The berm would be backfilled with permeable material and subgrade structure would also consist of permeable material allowing groundwater to flow around or underneath the berm. In addition, a lock block berm would train surface water in a flood event; however, is not impermeable and groundwater would be able to flow through. Also, a drain pipe is to be installed to reduce hydrostatic pressure (water induced pore pressures) during a seismic event and will be outletted such that it would promote groundwater flow around the berm.

Sincerely,


EXP Services Inc.

March 27, 2018



Evan Sykes, P.Eng.
Senior Engineer

Reviewed by:



Rajesh Manandhar, P.Eng.
Geotechnical Engineer

March 26, 2018

ISSUED FOR REVIEW

FILE: 704.TRN-WTRM03059

Via Email: brad@lamoureuxarchitect.ca

Lamoureux Architect Incorporated
3392 Marine Drive
West Vancouver BC
Canada V7V 1M9

Attention: Brad Lamoureux**Subject:** White Glacier, Edgewater Resort, Whistler – Groundwater Question from RMOW

This 'Issued for Review' document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an 'Issued for Use' document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the 'Issued for Review' document should be either returned to Tetra Tech Canada Inc. (Tetra Tech) or destroyed.

The Resort Municipality of Whistler (RMOW) has provided some comments with regards to the White Glacier development project. Specifically in relation to groundwater, the RMOW has asked whether there is any impact to the water table due to the proposed development, particularly due to the proposed construction of a training berm adjacent to Nineteen Mile Creek.

For reference, the "Geotechnical Exploration Report" by EXP (2016) stated that:

"Inferred groundwater depth at the time of drilling was measured at about 1 to 2.5m below the existing grade. The groundwater level measured at the standpipe piezometer about two hours after the drilling was 0.6m below the existing grade. Based on previous test hole depth of ground water was about 10m below the existing grade at the intersection of Sea-to-Sky Highway and Alpine Way.

It should be noted that groundwater conditions may vary and fluctuate seasonally in response to climate conditions, and possibly also due to precipitation, runoff, changes in land use, and other factors. Water level in the Green Lake could make a big influence on the water level in the surrounding area."

Furthermore, the "Riparian Areas Regulation: Assessment Report" by Cascade Environmental (2016) delineated existing wetlands within the property. We note that both wetlands 3 and 4 are located downgradient from the proposed training berm.

There is a concern that the berm could pose as a barrier for the shallow groundwater flow that may be feeding the wetlands, from Nineteen Mile Creek. However, this impact is mitigated given that the berm will be backfilled with permeable material and the subgrade structure would also consist of permeable material allowing groundwater to flow around or underneath the berm. In addition a lock block berm, adjacent to wetland 4, is not waterproof and groundwater will be able to flow through. Also a drain pipe is to be installed below grade to reduce hydrostatic pressure and to promote groundwater flow around the berm.

The rest of the wetlands are located up-gradient from any proposed building or infrastructure and it is not expected that they will be impacted.

Prepared by:


Mauricio Herrera, PhD, P.Eng.
Senior Hydrotechnical Engineer
Tetra Tech Canada
Direct: 604.608.8612
Mauricio.herrera@tetrattech.com



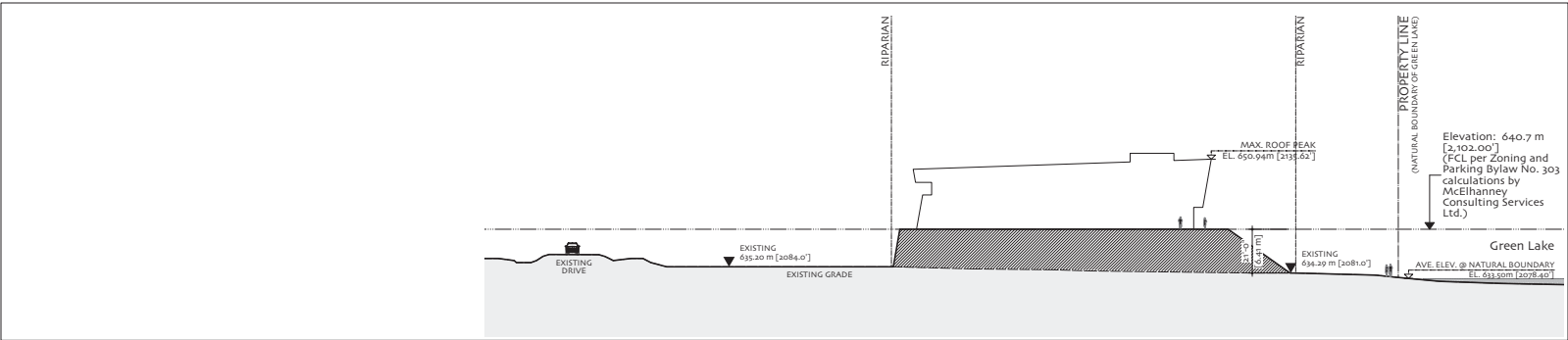
REFERENCES

Exp (2016) "Geotechnical Exploration Report". White Glacier, Edgewater Resort, Whistler.

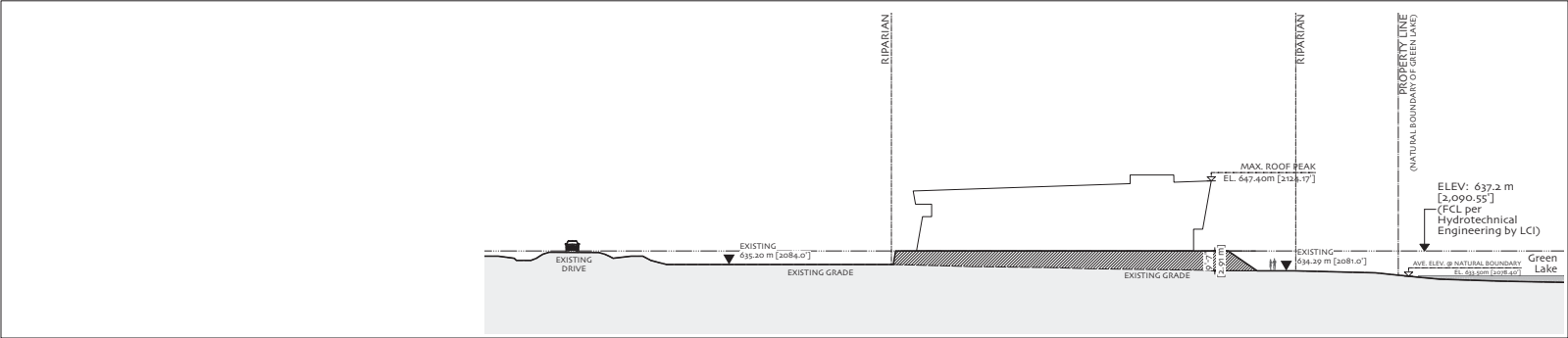
Cascade Environmental Resource Group Ltd (2016). "Riparian Areas Regulation: Assessment Report. Form 2 – Additional QEP Form.

LIMITATIONS OF LETTER

This letter and its contents are intended for the sole use of Lamoureux Architect Incorporated and their agents. Tetra Tech Canada Inc. (operating as Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Lamoureux Architect Incorporated, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

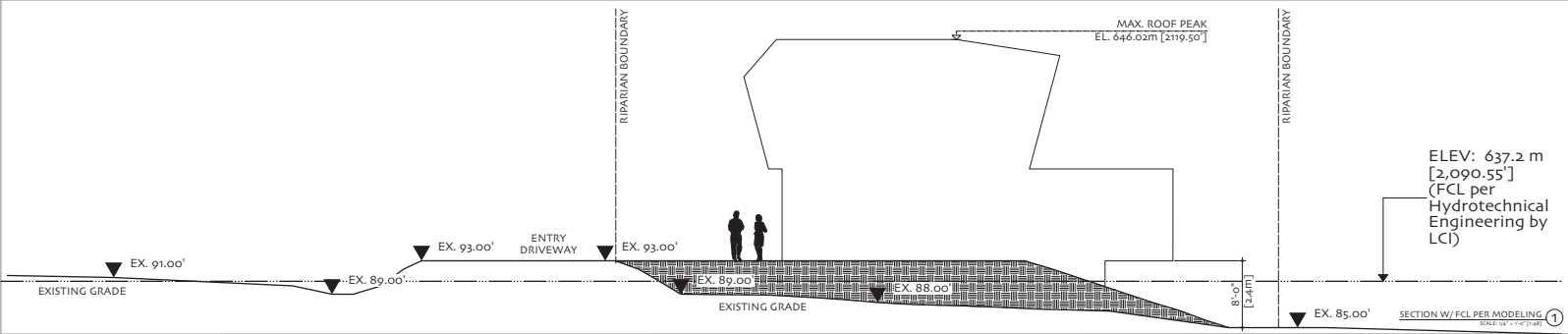


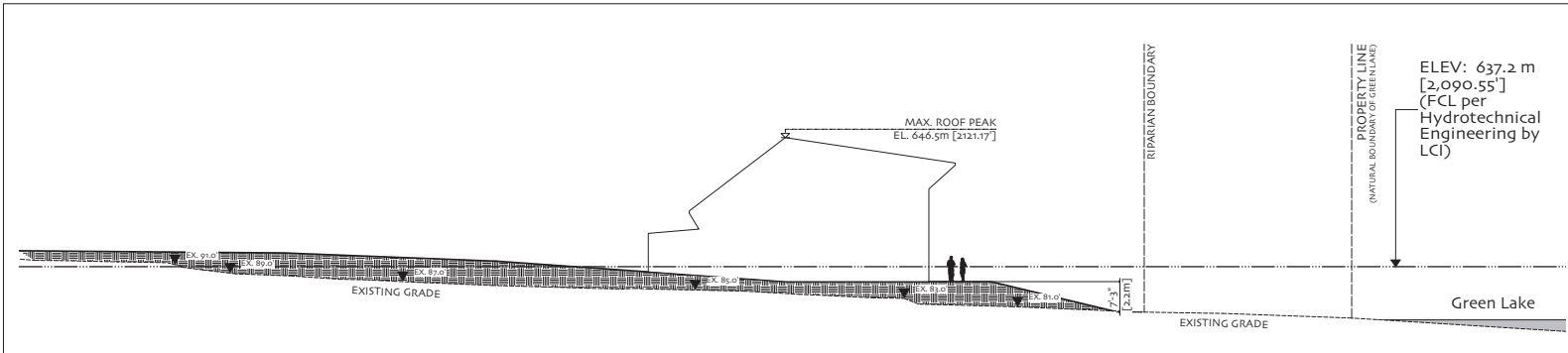
SITE SECTION W/ FCL PER CALCULATION 2
SCALE: 1/8" = 1'-0" (1:96)



SITE SECTION W/ FCL PER MODELING 1
SCALE: 1/8" = 1'-0" (1:96)

REPORT		DATE		DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NO.		PROJECT NAME		DATE		SCALE		SHEET NO.		SHEET TOTAL	
10/10/2023		10/10/2023		10/10/2023		10/10/2023		10/10/2023		01003		WHITE GLACIER		2/10/2023		1/8" = 1'-0"		0		A4.0	
10/10/2023		10/10/2023		10/10/2023		10/10/2023		10/10/2023		01003		WHITE GLACIER		2/10/2023		1/8" = 1'-0"		0		A4.0	

[illegible]



<p>ALL IMPERIAL ELEVATION VALUES ON THIS DRAWING ARE FROM A BASE ELEVATION 2000' ABOVE SEA LEVEL.</p>	<p>600 Feet</p> <p>This drawing is a preliminary design and is not intended for construction. It is subject to change without notice. The owner is responsible for obtaining all necessary permits and approvals. The architect is not responsible for the accuracy of the information provided by the owner or for the results of the design.</p>	<p>LAMOUREUX ARCHITECT 1000 10th Avenue, Suite 100 Berkeley, CA 94702 Tel: 415.863.1234 Fax: 415.863.1235 www.lamoureuxarchitect.com</p>	<p>PROJECT: C101</p>	<p>CLIENT: WHITE GLACIER WOODSHED WALK, WOODLAND, CA</p>	<p>10/26/18 AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>	<p>DESIGNER: AS NOTED</p>	<p>DATE: 10/26/18</p>	<p>OWNER: AS NOTED</p>
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MEMORANDUM

23 MARCH 2018

TO: Roman Licko
FROM: Tom Vitous + Brad Lamoureux

rlicko@whistler.ca
tom@lamoureuxarchitect.ca
brad@lamoureuxarchitect.ca

PROJECT #: 1501
PROJECT NAME: WHITE GLACIER PROJECT
8030 Alpine Way, Whistler, BC

RE: DESIGN RATIONALE: TO PRESERVE + PROTECT ENVIRONMENT

- REMOVE EXISTING LODGE STRUCTURE + DO NOT LOCATE NEW BUILDINGS ON PENINSULA.
(Especially the easternmost point, the location of previous lodge.)
 - Restore this most prominent Peninsula area of the site to a natural "Green" area.
 - Develop a garden landscape of indigenous species to enhance the natural beauty.
 - Size of peninsula area being returned to natural/indigenous garden uses.
- LOCATE THE MAIN BUILDING CLUSTER AT A PREVIOUSLY DISTURBED AREA AT THE CENTER/INTERIOR OF THE LARGE SITE.
 - Reduce the amount of trees and vegetation removed/affected by building footprints.
 - Places the largest structure away from the exposed periphery of the site.
 - Maintains the natural beauty of the site as viewed from adjacent properties and cross lake locations.
- UTILIZE TRAINING BERM ALONG NINETEEN MILE CREEK TO REDUCE FCL.
 - Lowers overall Building heights, as well as access Roads
 - Minimizes overall Building Footprint of the project, and, minimizes the impact of Development on SPEA Lands / Riparian Zones
- DISPERSE SMALLER INDOOR RECREATION STRUCTURES TO LESS IMPACTFUL AREAS.
 - Allows appreciation of the property's varied natural beauty in the everyday use of the structures.
 - The significant distances between structures ensures the forest remains the dominant 'structure' on the site.
- LEAVE SUBSTANTIAL PORTION OF AVAILABLE BUILDABLE SITE - DIRECTLY WEST OF THE DRIVE TO THE RESIDENCE IN NATURAL STATE.
 - Preserves the breadth and density of the forest along the western property line adjacent to Wedge Park and the Valley Trail.
 - Ensures a 'deeper' visual and acoustic separation between Valley Trail and nearest structures and drive.
 - Retains the crucial core vegetation and fallen trees to maintain the pristine forest environment.
 - Leaves in place a large area of the much appreciated skunk cabbage that grows almost prehistorically.
- UTILIZE PLANTED ROOFS WHERE POSSIBLE
 - Reduces impact of structures.



PRESENTED: April 10, 2018 **REPORT:** 18-042
FROM: Resort Experience **FILE:** SEC0025
SUBJECT: SEC0025 – 2038 KAREN CRESCENT – FLOOD PROOFING EXEMPTION

That the recommendation of the General Manager of Resort Experience be endorsed.

That Council grant an exemption in accordance with Section 524 of the *Local Government Act* – “Requirements in Relation to Flood Plain Areas”, to permit a new duplex to be constructed within flood proofing area specified in “Zoning and Parking Bylaw No. 303, 2015” at 2208 Lake Placid Road as shown in Architectural Plans A0, A1, A2, A3, A4, A6, A6.1, A7, prepared by Don Stuart Architect Inc, attached as Appendix “B” to Administrative Report to Council No.18-042 subject to registration of a Section 219 covenant for the exemption, indemnifying the Municipality and attaching the geotechnical report prepared by Terran Geotechnical, dated March 22, 2018 confirming that the proposed building location and design are safe for the intended residential use, to the satisfaction of the General Manager of Resort Experience.

Location: 2038 Karen Crescent
 Legal: Lot 11, District Lot 4749, Plan 13530
 Owner: Tynebridge 2038 Karen Developments Ltd. INC. No. BC1129378
 Zoning: RT3 (Two Family Residential Three)

Appendix “A” – Location Map

Appendix “B” – Architectural Plans

This Report seeks Council's consideration to grant an exemption to the flood proofing requirements under "Zoning and Parking Bylaw No. 303, 2015" for 2038 Karen Crescent, located in the Whistler Creek neighbourhood.

Council has the authority to exempt a parcel from flood proofing requirements enacted by bylaw under Section 524 of the *Local Government Act* provided a report prepared by a professional geotechnical engineer or geoscientist is received stating that the land may be used safely for the use intended.

The subject property is a developed parcel on the southwest side of Karen Crescent in the Whistler Creek neighbourhood as shown on the Location Map in Appendix “A”. The lands are zoned RT3 (Two Family Residential Three). This zone permits detached and duplex dwellings. There is an existing two storey detached dwelling on the lands that was constructed in 1978 under Building

Permit W-63-78. This building is reaching the end of its life cycle and the applicants propose to replace it. To that end staff released Demolition Permit DEM00615 in February 2018.

The applicants propose a new duplex as shown in Appendix “B”. The proposed development conforms to the distance requirements away from the high water mark of the nearest creeks and lakes, however, requires an exemption under Section 524 of the *Local Government Act* to the flood proofing requirements in Part 5 of “Zoning and Parking Bylaw No. 303, 2015” related to development on alluvial fans, as the Municipality’s flood proofing regulations have changed significantly since 1978.

The specific exemptions are noted in the table below:

Bylaw Section	Regulation	Proposed per Terran Geotechnical
5.4(2)(e)(v)	3 metres above the high water mark of Whistler Creek	Terran recommends that the underside of the floor joists be constructed 1 metre above surrounding grade.
5.4(2)(e)(viii)	For an alluvial fan area, 1 metre above the finished grade surrounding the building, or as in subparagraphs (e)(i) through (vii), which ever elevation is higher.	Application conforms to the 1 metre above finish grade requirement for an alluvial fan; however, the Zoning Bylaw requires that the highest regulated elevation is used. Therefore Subsection 5.4(2)(v) above is applicable (3 metres above the high water mark of Whistler Creek). Terran recommends that the underside of the floor joists be constructed 1 metre above surrounding grade.

The applicants have provided a geotechnical report (prepared by Terran Geotechnical Group) addressing the flood proofing requirements in “Zoning and Parking Bylaw No. 303, 2015” and further stating that the proposed building location and design are safe for the intended residential use. Staff recommend that the geotechnical report be attached to the title in perpetuity by way of a Section 219 covenant indemnifying the municipality.

WHISTLER 2020 ANALYSIS

W2020 Strategy	TOWARD Descriptions of success that resolution moves us toward	Comments
Built Environment	Limits to growth are understood and respected.	This project complies with all “Zoning and Parking Bylaw No. 303, 2015” requirements apart from flood proofing. Per the <i>Local Government Act</i> , a report prepared by a professional geotechnical engineer has been provided stating that the project, as designed, is safe for the intended residential use.
W2020 Strategy	AWAY FROM Descriptions of success that resolution moves away from	Mitigation Strategies and Comments
	None	

OTHER POLICY CONSIDERATIONS

Zoning and Parking Bylaw No. 303, 2015

Apart from the flood proofing exemption addressed in this report, all other aspects of the proposed development comply with Zoning Bylaw requirements.

BUDGET CONSIDERATIONS

The municipality's direct costs of processing and reviewing this application are covered through applicable application fees.

COMMUNITY ENGAGEMENT AND CONSULTATION

None required.

SUMMARY

This application is before Council for consideration to exempt a new duplex at 2038 Karen Crescent from the flood proofing requirements of "Zoning and Parking Bylaw No. 303, 2015". Per the requirements of Section 524 of the *Local Government Act*, a report in support of this application has been submitted by a professional geotechnical engineer stating that the proposed building location and design are safe for the intended residential use.

Respectfully submitted,

Roman Licko
PLANNING ANALYST
for
Jan Jansen
GENERAL MANAGER OF RESORT EXPERIENCE



Subject Lands – 2038 Appendix A

Appendix B

Architectural Specifications

ROOF & ROOF DECK MEMBRANE: Sopralene Plan 180 waterproof membrane as manufactured by Sopralene. Install one layer of Sopralene 180 followed by one layer of Sopralene Plan 180, then a final layer of Sopralene Plan 180 GR granular top coat. Prepare surface and install complete with all primers, underlayments, flashings, accessories, sealants, and protection layers in strict accordance with manufacturers written recommendations, using a roofing contractor approved by the manufacturer. Provide for manufacturers inspection and ten year materials and labour warranty.

FLASHINGS: Any flashings required shall be 22 Gauge prefinished aluminum with all seams fully folded. Colours by architect. STEELWORK: All concealed steelwork shall be shop primed with G.P., Ameron #187 primer prior to delivery to site. Touch up all areas damaged during installation with two coats. All exposed steelwork to also receive two finish coats of Amercoat 450. See architect for colors for finish coats.

BATT INSULATION/VAIR & VAPOUR BARRIERS: All batt insulation to be formaldehyde free. All batt insulation to be fitted snugly. The air barrier on this project is also the vapour barrier. Airtightness is essential. Review each assembly with the architect. Seal all openings in the air/vapour barrier at electrical boxes etc. with sealant. Lap joints 12" and tape. Repair all holes or damage with tape or sealant. All barriers to be inspected by architect prior to GWB installation.

DOORS: All doors shall be solid core construction, 1 3/4" thick (exterior), or 1 3/8" thick (interior), and shall be guaranteed for a period of two years from date of substantial completion against deformation, warping and waviness to the surface in accordance with CSA 0135-2M-1977. All exterior doors to be NAFS tested to meet requirements of NAFS 2008. NAFS performance class to be R, PG = 15, SDRWP = 171 Pa, SWL = 690 Pa. All Type 1 interior doors to be solid core Fir veneer single recessed panel "shaker" style. Door thickness to be 1 3/8". All Type 1 door frames to have 1/2" x 2 1/2" D.D. Fir casings. All Type 2 doors to be solid core paint grade single recessed smooth face panel "shaker" style. Door thickness to be 1 3/8". All Type 2 door frames to have 1/2" x 2 1/2" paint grade casings.

DOOR HARDWARE: All locksets to be keyed on a master key system. For pricing purposes only, assume passage sets for all doors except washrooms, ensembles, and bedrooms. Provide these rooms with privacy sets. In addition, each exterior door, as well as the door from the garage, will have a separate deadbolt. Allow for decorative hardware for main entry door.

EXTERIOR GLAZING: White Vinyl windows with 1" clear, Low E sealed units- Solarban 60 by PPG. Units are to be argon filled with warm edge spacer bars. All vent operators to be satin nickel roto operators. All lites in windows whose sills are within 12" of finished floor, 6 mm tempered. All new exterior windows to be NAFS tested to meet requirements of NAFS 2008. NAFS performance class to be R, PG = 15, SDRWP = 171 Pa, SWL = 690 Pa. Suppliers include: 1. Westco Windows - 4000 Series Vinyl Windows 1-877-606-1168 2. A1 Windows - Ultra Series Windows & R370 Patio Doors 604-777-8000

SKYLIGHTS: White Vinyl windows with 1" clear, Low E sealed units- Solarban 60 by PPG. Units are to be argon filled with warm edge spacer bars. All skylights to be NAFS tested to meet requirements of NAFS 2008. NAFS performance class to be R, PG = 15, SDRWP = 171 Pa, SWL = 690 Pa.

GLASS GUARDRAILS: All glass guardrails shall be clear tempered glass as indicated on the drawings and shall designed to meet all lateral loading requirements of the 2012 BC Building Code. All glass edges are to be polished. Review all attachment points, membrane penetrations with Architect.

SEALANTS: Provide adequate sealants and caulking to ensure moisture resistant seals between various building components. Obtain sealant manufacturers advice on product selection and apply in strict accordance with manufacturer's written recommendations. All sealants are to meet or exceed the California South Coast Air Quality Management Districts Standard #1168. Provide manufacturers product data sheet to Architect prior to use.

EXTERIOR STUCCO CLADDING: to be 3/4" two coat, Acrylic Portland Sand and Cement Stucco with galvanized expanded wire mesh screed, over either 1 x 3 strapping @ 16"oc or Keene Drivall 10mm Rainscreen drainage matt, over Tyvec building wrap.

EXTERIOR SIDING CLADDING: to be clear T & G Red Cedar siding, over either 1 x 3 strapping @ 16"oc or Keene Drivall 10mm Rainscreen drainage matt, over Tyvec building wrap. Sizes to be 1 x 6 or 1 x 4 as indicated on the drawings.

EXTERIOR STONE CLADDING: to be 4" cut basalt c/w stainless steel anchors, over either 1 x 3 strapping @ 16"oc or Keene Drivall 10mm Rainscreen drainage matt, over Tyvec building wrap.

EXTERIOR TRIM: All exterior siding and trim is to be primed with Benjamin Moore Primerlock and prefinished all sides with 2 coats of Benjamin Moore Aura Low Lustre paint, or specified alternate. If exterior stain is required for any new or existing trim, use Benjamin Moore Arbourscent K-640, or specified alternate. All colours to be approved by the architect.

EXTERIOR PAINTING & STAINING: All exterior siding and trim to be pre-stained with 2 coats of their specified finish prior to installation. Final coat to be field applied as required. Touch up all surfaces as required following installation. All exterior painting to be carried out when temperatures are and can be expected to remain for 24 hours within the manufacturers recommended range. Provide all VOC level information with Architect prior to use.

INTERIOR PAINTING & STAINING: All interior paint shall be Benjamin Moore's Aura zero VOC line, or specified alternate. All interior stains are to be low VOC. Provide manufacturers data sheet to Architect for review prior to use. All to meet or exceed Green Seal Standard GS11.

HEATING & VENTILATION: New forced air natural gas heating is to be provided throughout the main and upper floors of each unit. A duct supply run from each furnace will also be provided for the crawlspace. Furnace to be located in the mechanical room. A heat recovery ventilation system will also be provided.

SHOWER STALLS: Non-slip frost proof ceramic tile, quartz, granite or limestone finish on this-set bed over Schluter membrane sloped to drain. See also Architectural details.

SHOWER & TUB SURROUNDS: All glass shower surrounds shall be either 12 or 15 mm clear tempered glass as indicated on the drawings. All edges are to be polished. All attachment hardware to be satin stainless steel. Review with Archt.

FLOOR FINISHES & COVERINGS: Supply and install all floor finishes and coverings as indicated on the drawings. All carpeted areas to have underlayment as recommended by the carpet manufacturer for that type of installation. Both carpeting and underlayment to meet or exceed all VOC requirements of the Carpet and Rug Institute. All areas indicating new hardwood flooring shall be prepared in accordance with recommendations from the BC Floor Covering Association. All finishing to be low VOC. Submit manufacturers product data sheet to Architect for approval prior to use. All exterior slate/tile finishes to be frost proof & non slip. Seal all tile/slate surfaces when complete.

FIREPLACES: Living Room -Mortello Linear P 32,000 BTU direct vent natural gas Fireplace with driftwood log set LGSP black porcelain firebox liner, and remote control handset.

COUNTERTOPS AND CABINETRY: All kitchen, powder room and ensuite countertops to be caesarsstone with a 1" nose. Unless otherwise noted, all cabinetry to be either formaldehyde free plywood cores with veneers or solid wood stock. Cabinetry to be either paint or stain grade as indicated on the drawings. All site and rail doors to be made of solid stock only. All stain grade cabinetry to have all exposed gable surfaces finished in veneer to match doors. All edge pieces and trims to be stained to match doors. All stains to be low VOC. Provide manufacturers data sheet to Architect for review prior to use.



General Notes

All parts of this building are to be built in accordance with Part 9 of the Province of B.C. Building Code, 2012 including all energy provisions introduced in section 9.36 in 2014.

This building is intended for Group C occupancy.

All roof and attic spaces are to be vented in conformance with the B.C. Building Code, 2012.

Fire Blocking to be provided for all concealed spaces per BOSC 6.10.16

Mechanical ventilation shall be provided in conformance with Part 9.36 of the B.C. Building Code.

Smoke detectors are to be provided in conformance with Part 9 of the B.C. Building Code, 2012.

Provide cable runways from main electrical panel to enclosed outlet box in garage for future electric vehicle. Min conduit size to be 1 1/2". Review location with Architect.

Windows, Doors & Skylights shall comply with CSA A 440 Ratings, Climate Zone 8

DRAWING LIST

- A0 GENERAL NOTES
- A1 SITEPLAN & PROJECT DATA
- A2 FOUNDATION & PLUMBING FIXTURE SCHEDULE
- A3 LOWER FLOOR
- A4 UPPER FLOOR
- A5 ROOF PLAN
- A6 ELEVATIONS
- A7 SECTIONS
- A8 DETAILS & ASSEMBLY NOTES
- A9 DETAILS & ASSEMBLY NOTES
- A10 GFA & RSI CALCULATION & Typ. ENVELOPE DETAILS

- S1 Structural
- S2 Structural
- S3 Structural
- S4 Structural
- S5 Structural
- S6 Structural

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RESORT HUNTS
OF VICTORIA

888 ESCUMAL AVENUE
WEST VANCOUVER, B.C. V7T 1A9
TEL: 604-425-6896 FAX: 604-425-6876
info@donstuartarchitect.com

No.	Date	Appr.	Revision	Notes
B	01-08-2015			10-0000 FOR BP
A	11-14-2017			REVISED FOR BP

Project No

2038 Karen Crescent
Whistler, B.C

Project Data-Notes

This drawing is not complete and all items shown are subject to change without notice. It is not to be used for construction or for any other purpose without the written consent of the architect. It is the responsibility of the client to ensure that the drawing is used for the intended purpose and that all necessary permits are obtained. The architect is not responsible for any errors or omissions in this drawing. The client is responsible for the accuracy of the information provided to the architect. The architect is not responsible for any delays or costs incurred by the client as a result of the client's failure to provide the necessary information or to obtain the necessary permits. The architect is not responsible for any claims or damages arising from the use of this drawing. The client is responsible for the accuracy of the information provided to the architect. The architect is not responsible for any delays or costs incurred by the client as a result of the client's failure to provide the necessary information or to obtain the necessary permits. The architect is not responsible for any claims or damages arising from the use of this drawing.

Scale

1/8" = 1'-0"



PLANNING DATA:

Civic Address: 2038 KAREN CRESCENT, WHISTLER, BC
 Legal Description: LOT 11, B.V. 64.5
 DISTRICT LOTS 4742, GROUP 1, N.W.F. 15630

Zoning: PT 3
 Lot Area: 7811.79' (89.8 x 86.2 M)
 Lot Size 129' x 66.19'

Garage-House Floor Area

	Proposed	Allowed
Lower Floor	722.49 SF	0.45 x Lot
Upper Floor	870.30' SF	
Total	1617.53 SF x 2 = 3235.06 SF	3383.9' GF (314.54' 9.0 M)

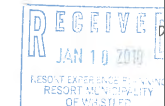
Building Height: 24.83' (7.6 M)

Exemptions:

Mechanical & Stairs	75 SF	(7.6 M)
Garage	570.16 SF	(56.9 M)
Front Yard	29' (7.6 M)	29' (7.6 M)
Side Yard	11.44' (3.28 M)	11.44' (3.28 M)
Rear Yard	34'-5" (10.5 M)	34' (10.4 M)

Site/Lot coverage: 2182.56' SF (244.2 9.0 M)

Parking: 4-off Street



CON STUART ARCHITECT INC
 608 ESCUDALTY AVENUE
 WEST VANCOUVER, B.C. V7T 1A9
 TEL: 604-825-6886 FAX: 604-825-6876
 info@constuartarchitect.com

Revision	By	Date	Appr	Revision Notes
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

11-04-2010	ISSUE FOR BP APPLICATION
01-08-2010	RE-SUBMIT FOR BP APPLICATION

2038 Karen Crescent
 Whistler, B.C.

Siteplan

This drawing is not intended to show the location of any building or structure on the site. It is intended to show the location of the building or structure on the site. It is not intended to show the location of any building or structure on the site. It is not intended to show the location of any building or structure on the site.

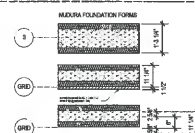
Project No.	2038-2017
Client	SD
Design	DB
Date	10 November 2017
Scale	As Shown
Sheet No.	A 1
Total	11



SHOWING SANITARY AND WATER SERVICE ALONG KAREN CRESCENT



888 ESQUIMALT AVENUE
WEST VANCOUVER, B.C. V7T 1J9
TEL 604-925-6888 FAX 604-925-6876
info@monstuartarchitect.com



Foundation Plan

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DO NOT SCALE DRAWINGS.

Project No.	2036-2017	
City/County	SD	Black Hills
Date	10 November 2017	
Scale	1/4" = 1'-0"	
Drawing No.	A2	

of 11

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908 ESQUIMAULT AVENUE
WEST VANCOUVER, B.C. V7T 1J8
TEL: 604-625-8888 FAX: 604-625-4675
info@constuartarchitect.com

Revision No.	Date	Author	Revision Notes
1	11-14-2017	AS	REVISION FOR 10/10/17 APPLICATION
2	11-14-2017	AS	REVISION FOR 10/10/17 APPLICATION
3	11-14-2017	AS	REVISION FOR 10/10/17 APPLICATION
4	11-14-2017	AS	REVISION FOR 10/10/17 APPLICATION
5	11-14-2017	AS	REVISION FOR 10/10/17 APPLICATION

Project No. 2038 Karen Crescent Whistler, B.C.
Drawing Title: Upper Floor Plan

Scale: 1/4" = 1'-0"

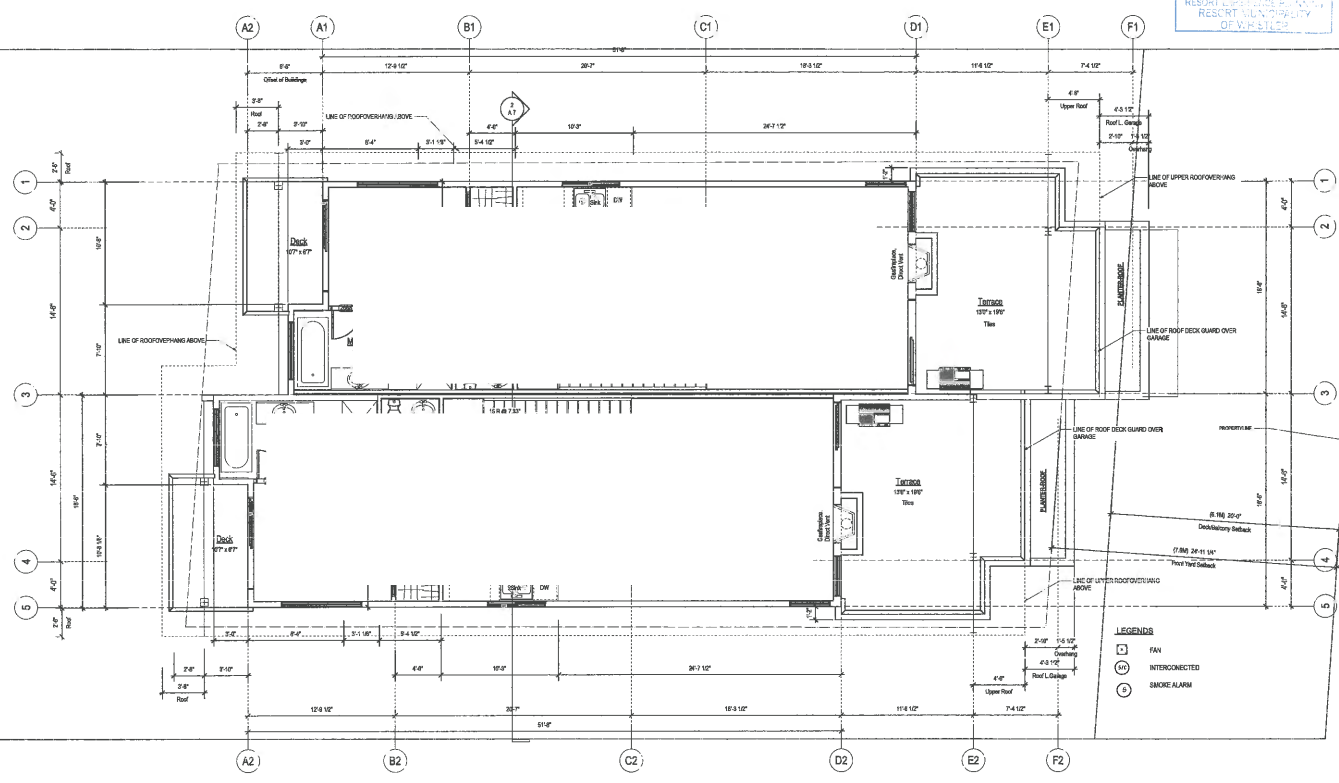
Upper Floor Plan

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AS NOT SCALE DRAWING
Project No. 2038-2017

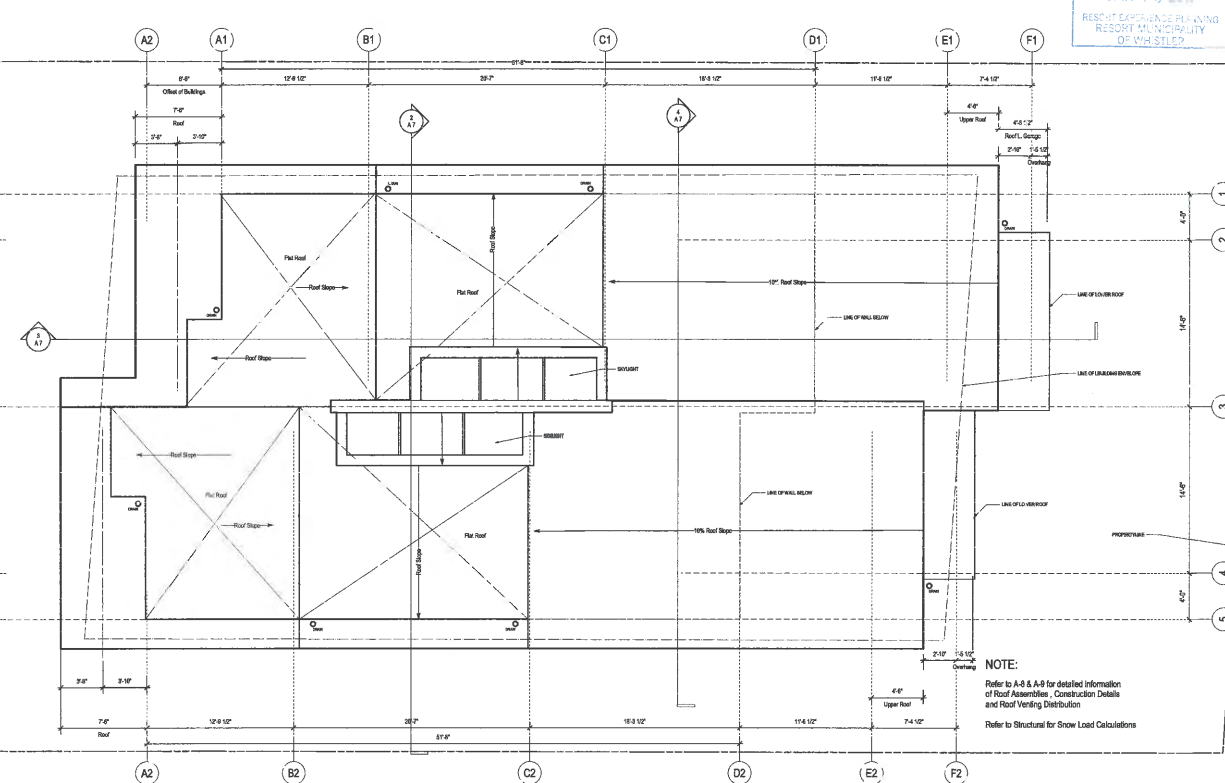
Sheet No. A 4
Total Sheets 11

1 Upper Floor
Scale: 1/4" = 1'-0"



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TEL: 604-855-8888 FAX: 604-855-8876
info@constuartarchitect.com



1 ROOF PLAN
Scale: 1/4" = 1'-0"

Revision	Date	Author	Revision Notes
B	01-08-2016		RE-DESIGN FOR SP APPLICATION
A	11-14-2017		RE-DESIGN FOR SP APPLICATION

No.	Date	Issue Notes
1	2016-08-20	2016 Karen Crescent Whistler, B.C.

Roof Plan	
Drawn by	SD
Check by	SD
Date	10 November 2017
Scale	1/4" = 1'-0"
Sheet No.	A5
of	11



2 Elevation North
Scale: 3/16" = 1'-0"



1 Elevation West
Scale: 3/16" = 1'-0"



3 Elevation South
Scale: 3/16" = 1'-0"



4 Elevation East
Scale: 3/16" = 1'-0"

DON STUART ARCHITECT
INC.

550 BROADWAY AVENUE
WEST VANCOUVER, B.C. V7T 1A9
TEL: 604-681-8888 FAX: 604-681-8889
info@donstuartarchitect.com

Revisions				
No.	Date	By	Reason	Notes

2038 Karen Crescent
Whistler, B.C.

Elevations

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Project No.	2038-2017
Drawn by	BD
Check by	DS
Date	12 November 2017
Scale	1/4" = 1'-0"
Sheet No.	A6.1
Sheet Count	11

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REPORT | ADMINISTRATIVE REPORT TO COUNCIL

PRESENTED: April 10, 2018

REPORT: 18-036

FROM: Infrastructure Services

FILE: 2179

SUBJECT: OUTDOOR POTABLE WATER USAGE BYLAW NO. 2179, 2018

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the General Manager of Infrastructure Services be endorsed.

RECOMMENDATION

That Council consider giving first, second and third readings to “Outdoor Potable Water Usage Bylaw No. 2179, 2018” as described in Administrative Report to Council 18-036.

REFERENCES

Comprehensive Water Conservation and Supply Plan, 2015 (Not attached)

Outdoor Potable Water Usage Bylaw No. 2179, 2018 (Not attached)

Water Use Regulation Bylaw No. 1538, 2001 (Not attached)

Long-Term Water Supply Plan, 2004 (Not attached)

PURPOSE OF REPORT

The purpose of this Report is to summarize the key components and decision making that resulted in the development of this Bylaw. This Bylaw regulates the outdoor use of potable water within the municipality in order to manage potable water demand, improve the efficiency of use and reduce consumption.

DISCUSSION

Why this Bylaw?

In March 2004, the Municipality completed a Long-Term Water Supply Plan. This study presented a comprehensive approach for ensuring that the municipal water utility continued to deliver high-quality domestic water and fire protection into the future. Major elements of the study included water conservation, water metering, water quality improvements, groundwater development and water distribution/storage improvements.

The Water Supply Plan was updated in 2012, and in February 2013 an initial comparison of potential water conservation and supply projects was made, evaluating each project on a cost per unit of water basis. The projects were prioritized on a least cost basis – whether it was for new supply or for conservation.

In 2015, the Water Supply Plan project comparisons were updated with new information, and the Outdoor Potable Water Use Bylaw (referred to as the “Comprehensive Water Usage Bylaw” in that document) was the second highest ranked project behind a bylaw to regulate once-through cooling devices (these projects were ranked on lowest cost for the highest potential benefit).

Focus of Proposed Bylaw No. 2179

Originally, it was proposed by staff that there would be one Comprehensive Water Use Bylaw for the Municipality. After discussion, staff decided to proceed, at this time, with bylaws concerning other water conservation measures (such as regulation of once-through cooling devices) under separate bylaws.

Predominantly this decision was made because stakeholder groups for water use have very different drivers. Since each component of a water use bylaw would require some level of consultation (consultation would need to take place with multiple different groups) this would likely extend the bylaw development and adoption process. It also means that as amendments to bylaws are required, they can be made to the specific topics to which they apply.

Additional potable water conservation efforts, such as once-through cooling, leak detection, non-potable irrigation sources and water metering, will be managed through other municipal processes, one of which is to update or create additional Bylaws.

Proposed Outdoor Potable Water Usage Bylaw No. 2179, 2018 versus Water Use Regulation Bylaw No. 1538, 2001 (the current bylaw)

The major difference between Bylaw No. 2179 and Bylaw No. 1538 are:

- Bylaw No. 2179 is much more specific in respect to water uses, bringing clarity to the community and making enforcement easier;
- Bylaw No. 2179 considers that approximately 80 -100% of private and public irrigation systems within the Municipality are professionally installed and managed and are using sensor driven automated systems;
- The Water Conservation Stages are not equivalent to the former Water Restriction Levels;
- The Water Conservation Stages are not being automatically activated by a certain date;
- Municipal operations are not exempt from this Bylaw (see Section 9.0 for specific Water Conservation Stage Exemptions).

Water Conservation Stages Defined

The year-round guideline is intended to encourage water conservation at all times. The decision to activate the next Water Conservation Stage will be determined by assessment of one or all of the following Municipal and Provincial data sets, and by asking the following questions:

Key raw water sources – are they online or offline?

- Potable Municipal supply can be from:
 - only surface water; or
 - only ground water; or
 - both (blended).
- Surface water (one supply location “creek”):
 - 21 Mile Creek supplies 50% of the raw water supply.
 - 21 Mile Creek supply is unavailable when the raw water is turbid (cloudy), this often occurs during rainfall events and rapid snowmelt.
- Groundwater (16 supply location “wells” located in seven (7) well fields):
 - Each well has a different Maximum Pump Capacity.
 - The Maximum Pump Capacity is based on a review of the pumping capacity of the pump or aquifer (whichever is the limiting factor).
 - Well supply would only be unavailable due to an emergency event such as contamination or equipment malfunction.

Reservoir Fire Storage – what is the fire storage trend?

- There are fourteen (14) reservoirs (physical locations), there are nineteen (19) level sensors (data sets).
- The fire storage capacity is determined by an equation supplied by the Fire Underwriters Survey.
- Each reservoir has a different balancing storage and fire storage capacity (and therefore storage level).
- The level of water in the reservoirs is collected by the Supervisory Control and Data Acquisition (SCADA) system.

Fire Danger Rating – what level is it at and what is it forecast to be?

- High or Extreme Fire Danger Rating means there is a high risk of a wildfire starting.
- The Municipality would need all available fire flow storage on hand if such an event were to occur within the service area.

Weather Forecast – will it affect our water supply?

- Rainfall
- Wind

WHISTLER 2020 ANALYSIS

W2020 Strategy	TOWARD Descriptions of success that resolution moves us toward	Comments
Water	All potable water is used sparingly and only used to meet appropriate needs.	Irrigation use is a significant component of potable water maximum day demand. Irrigation systems that use environmental data to assess the water needs of the landscape ensure that potable water is only used as needed.
Water	Water supply is distributed reliably, equitably and affordably – and is managed proactively within the context of effective and efficient emergency preparedness	As part of the decision making for Water Stage Conversation activation, managing the fire storage in the potable water system ensures we are prepared for that emergency use.
Water	With respect to future water resources, capital and long-term costs are managed in a financially prudent and fiscally responsible manner with conservation as a priority	Reducing potable water consumption decreases the amount of water that requires treatment, which reduces energy use and infrastructure costs.
Visitor Experience	A sustainable, comfortable carrying capacity of the resort, its amenities, and the surrounding natural environment is respected	Sustainable use of our potable water supplies ensure the expected high-quality visitor experience.
Economic	Whistler's Resort economy is progressive and ensures a balanced and effective use of limited financial, social and natural resources in the long-term	Sustainable use of our potable water supplies ensures a balanced and effective use of a finite natural resource in the long-term.

The Outdoor Potable Water Use Bylaw does not move our community away from any of the adopted Whistler 2020 Descriptions of Success.

OTHER POLICY CONSIDERATIONS

Reducing potable water consumption decreases the amount of water that requires treatment, which reduces energy use and infrastructure costs. As the existing infrastructure ages, staff will continue to allocate more of the operational and capital funds to system renewal. Expanding supply will be considered only if there is a change in variables such as the bed cap, and conservation methods have been exhausted or are not economical in comparison.

Official Community Plan (OCP)

The current OCP objectives for water are to ensure safe and reliable drinking water and water supplies for Whistler's residential and commercial needs and for its fire protection using methods that consider conservation measures, maintain a high quality infrastructure and minimize environmental impacts. Policies include but are not limited to:

- Evaluate the cost-effectiveness of conservation measures before developing the water supply system capacity required for planned development through conventional capital means.
- Pursue water conservation and demand-side management measures in an efficient and cost-effective manner. It is the opinion of staff that this bylaw will provide a meaningful step towards meeting this description of success for managing our fresh water resources.

Whistler 2020

The current Whistler Water Strategy envisions a future where, "all potable water is used sparingly and only used to meet appropriate needs" and, "residents and visitors are educated about, and encouraged to protect and conserve natural water resources". Wasteful use of fresh water resources is at odds with these policy considerations. It is the opinion of staff that this bylaw will provide a meaningful step towards meeting this description of success for managing our fresh water resources.

BUDGET CONSIDERATIONS

Expenses for this initiative have included consulting (engineering, meeting facilitation and communications), stakeholder engagement and public outreach activities.

COMMUNITY ENGAGEMENT AND CONSULTATION

An external stakeholder group comprising of the following community representatives: Hotels, Irrigation Management, Landscaping, Property Management, and Strata Management provided the following input into the Bylaw:

- Expertise on irrigation and landscaping methods;
- Development of water use categories; and
- Frequency and timing of water use.

An internal stakeholder group comprising of the following representatives: Resort Operations, Parks Operations including irrigation and horticulture, Utilities and Bylaw Services provided the following input into the Bylaw:

- Water uses for cleaning (health and safety related);
- Expertise on irrigation and landscaping methods; and
- Enforcement.

The following community engagement and consultation dates have occurred:

Date	Who	Focus
June 12, 2015	External Stakeholder Group	<ul style="list-style-type: none">• Introduction
April 27, 2016	External Stakeholder Group	<ul style="list-style-type: none">• Review 2015 data
September 28, 2017	External Stakeholder Group	<ul style="list-style-type: none">• Introduction (new staff)
February 19, 2018	External Stakeholder Group	<ul style="list-style-type: none">• Define next steps of engagement• Develop Schedule A
March 9, 2018	Work Group	<ul style="list-style-type: none">• Edit specific Bylaw text• Edit Schedule A
March 22, 2018	Public	<ul style="list-style-type: none">• Overview

SUMMARY

This Bylaw is an important component of the overall strategy to manage potable water demand, improve the efficiency of use and reduce consumption. Staff recommend that Council proceed with the first three readings.

Respectfully submitted,

Gillian Woodward P.Eng.
UTILITIES GROUP MANAGER
for

James Hallisey, P. Eng
GENERAL MANAGER OF INFRASTRUCTURE SERVICES



REPORT | ADMINISTRATIVE REPORT TO COUNCIL

PRESENTED: April 10, 2018

REPORT: 18-037

FROM: Corporate and Community Services

FILE: 4530

SUBJECT: FIVE-YEAR FINANCIAL PLAN 2018-2022 BYLAW

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the General Manager of Corporate and Community Services be endorsed.

RECOMMENDATION

That Council consider giving first, second and third readings to the “Five-Year Financial Plan 2018-2022 Bylaw No. 2176, 2018”.

REFERENCES

None.

PURPOSE

The Five-Year Financial Plan 2018-2022 sets out the proposed revenue sources and expenditures for the municipality for the period January 1, 2018 to December 31, 2022.

DISCUSSION

The *Community Charter* requires municipalities to approve a five-year financial plan bylaw each year prior to the adoption of the annual property tax bylaw before May 15, 2018. The attached bylaw and schedules reflect the following guidelines as presented at the March 6, 2018 Regular Council Meeting:

1. To implement a 2.25 per cent increase to property value taxes in 2018 (excluding non-market and property count changes);
2. To implement a 1.1 per cent increase to sewer parcel taxes and user fees in 2018 (excluding property count changes);
3. To implement a 4.5 per cent increase solid waste parcel taxes and fees in 2018 (excluding property count changes); and
4. To include the project amounts as described in Appendix “A” to Administrative Report to Council No. 18-020.

OTHER POLICY CONSIDERATIONS

Section 165 of the *Community Charter* requires municipalities to prepare a five-year financial plan to be adopted annually by bylaw. Once adopted, the plan is in effect until it is amended, and may be amended by bylaw at any time.

Section 165 (3.1) requires additional disclosure regarding the proportion of revenues from each source and the objectives and policies in relation to the distribution of property value taxes among the different classes. This information is provided in Schedule "C" of the Bylaw.

COMMUNITY ENGAGEMENT AND CONSULTATIONSUMMARY

Community engagement and consultation is an ongoing process throughout the year and includes the Community Life Survey, FE&A Oversight Committee, public meetings and online information.

Engagement and consultation specifically focused on financial planning has taken place at a separate public meeting.

On February 22, 2018 a public open house was held for community members to view budget information, provide comments and ask questions of staff and Council. This provided an opportunity to hear about community planning, proposed projects and changes proposed for the 2018 operating budget.

An Administrative Report advising Council of the proposed budget guidelines for 2018 and to obtain a Council resolution for the guidelines to be used when preparing the 2018-2022 Five-Year Financial Plan was presented at the Regular Council Meeting held on March 6, 2018.

All presentations are available to the public on the budget pages of the municipal website.

SUMMARY

The Financial Plan Bylaw sets out the proposed revenues, expenditures and transfers for the years 2018 through 2022 and must be adopted prior to adoption of the Property Tax Bylaw and before May 15, 2018. This Bylaw is being presented to Council for consideration of the first three readings prior to adoption.

Respectfully submitted,

Ken Roggeman
DIRECTOR OF FINANCE
for
Norm McPhail
GENERAL MANAGER OF CORPORATE AND COMMUNITY SERVICES



REPORT | ADMINISTRATIVE REPORT TO COUNCIL

PRESENTED: April 10, 2018

REPORT: 18-038

FROM: Office of the CAO

FILE: 3004

SUBJECT: 2018 COMMUNITY ENRICHMENT PROGRAM GRANT FUNDING AWARDS

COMMENT/RECOMMENDATION FROM THE CHIEF ADMINISTRATIVE OFFICER

That the recommendation of the Director of Corporate, Economic and Environmental Services be endorsed.

RECOMMENDATION

That Council approve the 2018 Community Enrichment Program grants funded from general revenue as follows:

Association of Whistler Residents for the Environment – Sea to Sky Climate Change Symposium	\$4,000
Association of Whistler Residents for the Environment – Zero Waste	\$6,000
Whistler Naturalists Society	\$10,000
Pathways Serious Mental Illness Society (formerly North Shore Schizophrenia Society)	\$3,700
Sea to Sky Community Services Society – Communities that Care	\$2,500
Community Foundation of Whistler	\$2,500
Sea to Sky Community Services Society – Whistler Parent and Tot	\$10,000
Sea to Sky Community Serviced Society – Whistler Multicultural Network	\$5,000
Howe Sound Women's Centre – Whistler Women's Centre – Drop In	\$12,000
Howe Sound Women's Centre – Prevention, Education, Advocacy, Counselling and Empowerment	\$8,000
Whistler Waldorf School Society	\$3,000
Zero Ceiling Society of Canada	\$4,000
Whistler Centre for Sustainability – Resilient Streets	\$4,000
Whistler Adaptive Sports Program	\$8,000
BC Luge Association	\$3,000
Whistler BMX Club	\$3,000
Oros Whistler Gymnastics Centre – (Whistler Gymnastics Club)	\$6,250
Whistler Mountain Ski Club	\$2,125
Whistler Nordics Ski Club	\$5,000
Whistler Blackcomb Freestyle Ski Club	\$1,750
Whistler Sailing Association	\$5,650
Whistler Sea Wolves Swim Club	\$1,875
Whistler Skating Club	\$3,000
Whistler Youth Soccer	\$8,000
Whistler Writing Society	\$3,000
The Point Artist-Run Society	\$4,500
Whistler Singers	\$2,350
Whistler Valley Quilters' Guild Society	\$2,000
Whistler Secondary Scholarships	\$2,000

TOTAL	\$136,200
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REFERENCES

Appendix "A" – Council Policy A7: *Community Enrichment Program*

PURPOSE OF REPORT

The purpose of this Report is to request that Council approve the 2018 Community Enrichment Program (CEP) grant successful applicants and corresponding amounts as listed.

DISCUSSION

Each year, through the CEP program, the Resort Municipality of Whistler (RMOW) financially supports local not-for-profit organizations or societies that benefit the resort municipality, and move it closer to the Whistler2020 vision..

To qualify for a grant through the CEP, applicants must operate in one of the following categories: Environment, Social Service, Community Service, Recreation and Sport, or Arts and Culture. The amount provided to each selected organization varies, but cannot exceed 50 per cent of a program's total cost.

Funding must contribute to the general interest and advantage of the Whistler community and is evaluated by Council in accordance with Council Policy A-7: *Community Enrichment Program*.

The RMOW received 29 CEP applications for 2018 requesting a total of \$230,252.77. The 2018 CEP budget is \$136,200.00. From the 29 applications, 28 have been recommended for funding. Included in the CEP budget, as part of Council Policy A-7: *Community Enrichment Program* is \$2,000 allotted to Whistler Secondary School for Scholarships.

Council received copies of all applications, and presentations were made by the applicant organizations to Council during the Committee of the Whole meeting on March 6, 2018. Council also reviewed RMOW Staff CEP Advisory Group recommendations.

WHISTLER 2020 ANALYSIS

W2020 Strategy	TOWARD Descriptions of success that resolution moves us toward	Comments
Arts, Culture and Heritage	<p>The community is passionate about the arts, culture and heritage, which have become a part of Whistler's spirit and community life, and is alive with creative energy and aesthetic appreciation.</p> <p>A range of authentic and creative arts, cultural and heritage opportunities are meaningful, accessible and financially affordable to residents and visitors.</p> <p>Arts, cultural and heritage opportunities attract visitors and contribute to the experience and local economy.</p>	This will be supported through the grants for the Whistler Quilters' Guild, the Point-Artist Run Centre Society and the Whistler Writers Group.

Health and Social	<p>Community members and visitors maintain and improve their physical, mental and spiritual and social health through prevention and treatment services.</p> <p>Community members eat healthy food, exercise and engage in leisure and other stress relieving activities that assist in preventing illness.</p> <p>Whistler is accessible and inclusive for community members and visitors with disabilities.</p>	<p>This will be supported through the grants for the Howe Sound Women's Centre, Pathways Serious Mental Illness Society, Sea to Sky Community Services Society, and the Whistler Adaptive Sports Program, and Zero Ceiling Society.</p>
Learning	<p>A high quality kindergarten through post-secondary education system offers a diversity of programs that meet the needs and expectations of the community.</p> <p>Diverse, affordable and accessible lifelong learning opportunities exist to meet the community's needs.</p>	<p>This will be supported through the grants for the AWARE Nature Based Programs, Whistler Secondary School Scholarship, Whistler Naturalists, and the Whistler Waldorf School.</p>
Natural Areas	<p>An ecologically functioning and viable network of critical natural areas is protected and, where possible restored.</p> <p>Backcountry areas are protected from overuse and degradation.</p> <p>Community members and visitors act as stewards of the natural environment.</p>	<p>This will be supported through the grants for the AWARE Nature-Based Youth program and Zero Waste Program, and the Whistler Naturalists Society.</p>
Recreation & Leisure	<p>Residents and visitors of all ages and abilities enjoy activities year-round that encourage healthy living, learning and a sense of community.</p> <p>Recreation and leisure are part of the Whistler lifestyle and all community members are able and encouraged to participate.</p> <p>The resort community is globally recognized as a leader in innovative recreation products and services.</p> <p>Recreational experiences reflect an appropriate balance between adventure, challenge and safety, and exist within the comfortable carrying capacity of the amenity.</p>	<p>This will be supported through the grants for the Whistler Adaptive Sports Program, Whistler Nordics Ski Club, Whistler Sailing Association, Whistler Sea Wolves Swim Club and Whistler Youth Soccer Club.</p>
Partnership	<p>Residents, taxpayers, business and local government hold a shared vision for the resort community and work in partnership to achieve that vision.</p> <p>Partners work together to achieve mutual benefit.</p>	<p>All grants work towards these descriptions.</p>

OTHER POLICY CONSIDERATIONS

Council may provide CEP funding to any not-for-profit organization or society pursuant to section 8 (2) of the *Community Charter*: "A municipality may provide any service that the council considers

necessary or desirable, and may do this directly or through another public authority or another person or organization". Grants are issued on an annual basis and are subject to the availability of funds in the RMOW's current year's budget. Approval of a funding application in any year does not imply or suggest that approval will be received in subsequent years.

Council is guided by Council Policy A-7: *Community Enrichment Program*, attached as Appendix "A", which outlines the requirements of organizations wishing to apply for financial assistance. Assistance may be provided to not-for-profit organizations or societies contributing to the general interest and advantage of the municipality.

BUDGET CONSIDERATIONS

The 2018 Operating Budget provides for \$136,200.00 for the CEP. Staff is recommending that Council award \$136,200 as outlined above.

COMMUNITY ENGAGEMENT AND CONSULTATION

The Whistler.ca/cep website was the main portal of communication which included a calendar of important dates/timetable, Council Policy A-7: *Community Enrichment Program* and other important links to previous year's applications, presentations, the 2017 Council Report and other related resources. Associated Reporting Forms Application packages were also available to be picked up at the front desk and downloaded from whistler.ca.

Notices for the 2018 CEP application period were placed in the Pique Newsmagazine on January 25, 2018, February 1, 2018 and February 8, 2018.

Each organization requesting funding presented their application to Council at the March 6, 2018 Committee of the Whole Meeting.

SUMMARY

Through the CEP, the RMOW provides grants to local not-for-profit organizations or societies on a yearly basis. The 2018 application period generated 29 CEP requests.. This Report provides recommended funding based on the applications and presentations from each applicant organization and Staff Advisory Group recommendations. Approval of funding amounts is now requested.

Respectfully submitted,

Wendy Faris

LEGISLATIVE AND PRIVACY COORDINATOR

for

Brooke Browning

MUNICIPAL CLERK

for

Ted Battiston

DIRECTOR OF CORPORATE, ECONOMIC AND ENVIRONMENTAL SERVICES



COUNCIL POLICY

POLICY NUMBER: A-7	DATE OF RESOLUTION: DECEMBER 6, 2004 AMENDED: JANUARY 22, 2007, JANUARY 26, 2016, JANUARY 23, 2018
COMMUNITY ENRICHMENT PROGRAM	

- 1.0 The Community Enrichment Program (CEP) funding, will provide funding to non-profit organizations and societies based within the Resort Municipality of Whistler (RMOW) that are considered by Council to be contributing to the general interest and advantage of the Whistler Community.
- 2.0 Funding under this Program will not be approved for special events.
- 3.0 **Applying for CEP Funding:**
 - 3.1 All applications are to be submitted to:

Legislative Services Department
 (Community Enrichment Program)
 Resort Municipality of Whistler
 4325 Blackcomb Way
 Whistler, BC V0N 1B4
 corporate@whistler.ca
 Tel: 604-935-8117
 Fax: 604-935-8109
 - 3.1 The CEP application period opens January 25 of each year.
 - 3.2 CEP Grant Application Forms must be received by 4 p.m. on February 15 of each year.
 - 3.3 Applicants must submit their application on the Grant Application Form. All questions on the application must be answered, or have included a written reason for incomplete answers. Applicants are not to submit any documentation that has not been expressly requested in the application form.

- 3.4 Applicants must provide a brief (five minute maximum) in-person presentation of their application at a future scheduled Committee of the Whole Council Meeting; Legislative Services Department staff will provide applicants with a date.
- 3.5 Applicants must be a registered society or charity and must provide evidence of the same by attaching proof of registered not-for-profit society status or registered charity status.
- 3.6 Applicants must raise a minimum of 50 per cent of their annual budget from other sources beyond CEP funding.
- 3.7 Applicants must ensure the accuracy of their organization's contact information and update the Legislative Services Department of any changes.
- 3.8 Applicants must provide their most recent audited financial statements and/or valid financial information supporting the request for funding.
- 3.9 Applicants must provide an itemized budget for their project, or an operating budget, to disclose how the grant will be spent. Salaries, rent, physical assets etc. must be specifically identified.
- 3.10 The cost of renting municipal facilities is not to be part of a grant request as the rental rates set for non-profit organizations are already subsidized.
- 3.11 All approved funding will be issued to successful grant recipients no later than April 30 each year.
- 4.0 Non-compliance with any part of this Policy may disqualify the applicant.
- 5.0 Under special conditions, Council shall have the discretion to exempt any of the above terms.
- 6.0 **Reporting to the RMOW:**
 - 6.1 All grant recipients must complete a Grant Reporting Form and submit it to the Legislative Services Department by 4 p.m., December 1 of the year that the grant was awarded.
 - 6.2 Grant Reporting Forms must be completed and all accompanying documentation must be submitted by the stated due date and time; failure to do so may result in ineligibility for grant funds for one granting cycle (one year).
 - 6.3 Organizations that received \$10,000 or less must:

- 6.3.1 Complete the prescribed Grant Reporting Form and send it to the attention of the Legislative Services Department at the contact information set out.
- 6.3.2 Include a financial breakdown of how CEP grant monies were spent.
- 6.3.3 Include copies of receipts pertaining to how CEP grant monies were spent.
- 6.4 Organizations that received \$10,000 or more must:
 - 6.4.1 Complete the prescribed Grant Reporting Form and send it to the attention of the Legislative Services Department.
 - 6.4.2 Write a press release and distribute to local media, post to the organization's website and on their social media platforms (where applicable) that outlines the project and acknowledges the RMOW's contribution, and provide copies of the release to the Legislative Services Department.
 - 6.4.3 Include a financial breakdown of how CEP grant monies were spent.
 - 6.4.4 Include copies of receipts pertaining to how CEP grant monies were spent.
 - 6.4.5 Make a five minute in-person presentation to Council at a Regular Council Meeting outlining to Council and senior staff how the CEP grant money was utilized.
 - 6.4.5.1 Inform the Legislative Services Department of the name(s) of those presenting by 4 p.m., December 1.
 - 6.4.5.2 Provide copies of all presentation materials (speeches, speaking notes, PowerPoint presentations) to the Legislative Services Department by 4 p.m., December 1.

7.0 Whistler Secondary School Grant

- 7.1 As part of the yearly CEP Grant Budget, Council will award two \$1,000 scholarships to two members of the Whistler Secondary School graduating class. The Scholarship Committee of Whistler Secondary School will put forward to Council a list of recommendations and Council will make two selections based on the following criteria:
 - 7.1.1 Strong academic performance: the student must achieve a "B" average or higher.

- 7.1.2 Demonstrated school and community involvement: students should indicate on their application form any extra-curricular activities and community involvement.
- 7.1.3 Preference will be given to those identifying financial need: if applicable, students should identify financial need on their application form and include any initiatives taken to help offset post-secondary costs (e.g., summer and/or part-time employment, etc.)
- 7.2 Process and timeline:
 - 7.2.1 Whistler Secondary School will provide the application forms to the students.
 - 7.2.2 Whistler Secondary School will submit their recommendations, including applications, to the Legislative Services Department by the end of April.
 - 7.2.3 Council will select the two recipients at a Council Meeting in May.
 - 7.2.4 The two selected recipients will receive their scholarships in June.

Certified Correct:

Brooke Browning
Municipal Clerk



MINUTES

TRANSIT MANAGEMENT ADVISORY COMMITTEE (TMAC) WORKSHOP

MONDAY OCTOBER 11, 2017, STARTING AT 12:00PM

In the Piccolo Room

4325 Blackcomb Way, Whistler, BC V0N 1B4

PRESENT:

TMAC Chair – RMOW Councillor, J. Ford

BC Transit, Senior Regional Transit Manager, L. Trotter

Whistler Transit Ltd. – Operations Manager, S. Antil

RMOW – General Manager Infrastructure Services, J. Hallisey

RMOW – TDM Planner & Recording Secretary, E. DalSanto

GUESTS:

BC Transit – Senior Transit Planner, L. Megenbir

Whistler Transit Ltd. – Transit Supervisor, C. Hoffmann – *Alternate*

MOTI – Operations Manager, Howe Sound & Sunshine Coast, D. Legault

MOTI – Area Manager, Squamish, J. Morwood

ADOPTION OF AGENDA

Agenda

Moved by S. Antil

Seconded by L. Megenbir

That the Agenda of the Transit Management Advisory Committee (TMAC) workshop of July 5, 2017 be adopted as amended to include discussion of Pilot Project for transporting residential waste on buses.

CARRIED

ADOPTION OF MINUTES

Minutes

Moved by L. Megenbir

Seconded by J. Hallisey

That the Minutes of the Transit Management Advisory Committee (TMAC) workshop of July 5, 2017 be adopted as circulated.

CARRIED

PRESENTATIONS/DELEGATIONS

Staff Updates

S. Antil will be the main Whistler Transit Ltd. contact for TMAC with C. Hoffman as the alternate.

Residential waste
pilot program

BC Transit has agreed to a pilot program starting winter 2017/2018 allowing passengers to transport residential waste – recycling, compost and landfill waste - on Whistler Transit System buses subject to conditions. BC Transit is working with RMOW and Whistler Transit Ltd. staff on communications. The pilot program is being coordinated to start on the first day of the Early Winter schedule.

Whistler Transit Facility Commercial Bus parking	BC Transit has indicated that due to the arrival of the CNG vehicles this winter and the associated facility upgrades, there is no excess commercial leasing space available at the Whistler Transit Facility during winter 2017/2018 other than six covered parking spaces currently being leased to PCL.
CNG / SmartBus Update	<p>BC Transit updated TMAC members on the status of the CNG related facility and fueling upgrades as well as the scheduled arrival of the vehicles. CNG buses have started arriving in Whistler with the 25th bus scheduled to arrive in November. The new CNG buses will be in service for winter 2017/2018. The diesel buses will start being removed from Whistler in January 2018.</p> <p>The new buses will arrive equipped to have software installed enabling the automatic passenger counters, and automatic vehicle locators that will be used to show real-time location of vehicles. The software installation is scheduled for summer 2018. Nanaimo and Comox will have the software installed first followed by Squamish and Whistler and then Kamloops, Kelowna and Victoria.</p>
Sea to Sky Regional Transit	The Sea to Sky Regional Transit Study Report final draft is complete. BC Transit staff are preparing a media release and will present the report to all partner Boards and Councils in October and November starting with the Squamish Lillooet Regional District Board at their October meeting. The report will then be posted at www.bctransit.com/SeaToSky
Whistler Transit System Performance	Discussion deferred to a future meeting.
TAG 2017 Action Plan	<p>E. DalSanto updated TMAC members on the results of the 2017 Summer Action Plan. The full report can be found at www.whistler.ca/MovingWhistler. TMAC members discussed transit related fall/winter actions. The Whistler Experience Spirit Transit pass product will be on sale starting November 1, 2017 with a valid Whistler Experience number. The Whistler Chamber of Commerce will promote this product.</p> <p>TMAC recommends starting full winter service prior to December 15 to allow the community and drivers extra time to adjust to the new route numbering and full winter schedule before peak winter parking regulations start in Day Lots 4 and 5. TMAC also recommends using a portion of the 1,000 expansion hours to provide extra weekend service during Early Winter and over the American Thanksgiving weekend based on 2016 and 2015 early winter peak parking days.</p>
Winter 2017/2018 Implementation	<p>L. Megenbir led the discussion regarding the rollout of the winter 2017/2018 schedule which includes the implementation of the recommendations from the Valley Connector Review Service Discussion Document presented to Council on July 18, 2017. The communication approach will include radio, print, social media highlighting the new route names and numbers for routes 1-2-3.</p> <p>TMAC recommends that a videos outlining the changes be produced and promoted through the @WhistlerTransit Twitter account.</p>

J. Moorwood and D. Legault arrived at 1:30 p.m.

Customer Service Hours S. Antil confirmed that current Customer Service Hours are Monday to Friday from 8:00 a.m. to 4:30 p.m. excluding holidays. TMAC discussed the 2017 and 2016 results of the Whistler Transit System Extended Office Hours.

TMAC recommends that Customer Service Hours once again be extended for winter 2017/2018 from the start of Early Winter through to the end of Late Winter subject to cost being less than the budgeted PCL Parking Revenue.
ACTION: Whistler Transit Ltd submit a cost of the winter 2017/2018 Customer Service Hours to be reviewed and approved by BC Transit and the RMOW.

Transit Related Infrastructure Updates E. DalSanto presented the Bus Shelter and Infrastructure wishlist that was circulated with the agenda. These items have been forwarded to the Ministry of Highways and Infrastructure (MOTI) to be considered for funding of less than \$100,000 through the Transit Minor Betterment Program. Due the MOTI Highway Capacity Study from Function to Lorimer, the RMOW and BC Transit will submit projects to the 2018 program that are north of Lorimer Road and will benefit both the local transit system as well as a future regional transit system.

TMAC has deferred discussion about proposed upgrades to Gondola Transit Exchange to the next workshop where it will be the main focus.

ACTION: BC Transit will conduct an operational review of the Gondola Transit Exchange based on the winter 2017/2018 schedule to help understand the Whistler Transit System infrastructure needs.

2018 Actions and Workplan TMAC discussed 2018 actions and proposed Workplan for implementation.

- BC Transit staff recommend delaying the 10 Valley Express Pilot Project until such time as there are sufficient bus stops on the Highway 99 to service the main neighbourhoods in Whistler. BC Transit and the RMOW will apply to the Transit Minor Betterment Program for new highway bus stops at Rainbow and at Nesters/Spruce Grove northbound as well as improvements to the Spruce Grove southbound existing stop and the southbound stop at Alta Lake Road.
- 2018/2019 Whistler Transit Expansion Workplan will be announced in February with the Provincial budget.
- RMOW Council has authorized a 6,500 hour/three bus expansion for 2018/2019. Some of these hours should be earmarked for expansion of the free summer weekend and holiday free transit service from June 15 through September 15 as well as an expanded Early Winter service level.
- Expansions that cannot be accomplished in 2018/2019 should be planned for 2019/2020.

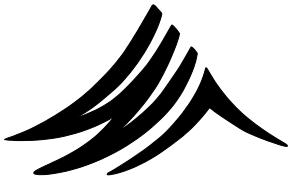
Next Meeting The next TMAC meeting will be scheduled in early 2018.

ADJOURNMENT

Moved by S. Antil

That Transit Management Advisory Committee (TMAC) adjourns the October 11, 2017 TMAC Workshop at 3:11 p.m.

CARRIED



MINUTES

DRAFT

**TRANSPORTATION ADVISORY GROUP (TAG)
WORKSHOP 13
MONDAY, January 08, 2018 STARTING AT 2:05 P.M.**

**In the Meeting Room Flute – Resort Municipality of Whistler
4325 Blackcomb Way, Whistler, BC, V0N 1B4**

PRESENT:

Chair – Mayor, N. Wilhelm-Morden
RMOW Councillor, C. Jewett
RMOW – CAO, M. Furey
Citizen-at-Large, B. Murray
Citizen-at-Large, J. Sobieniak
Citizen-at-Large, C. Doak
Citizen-at-Large, S. Pass
Whistler Blackcomb – Director of Community & Government Relations, S. McCullough
Tourism Whistler – VP Market Development & Sales, K. Goodwin
Whistler Chamber of Commerce – GM, The Whistler Experience, M. Facundo
MOTI – Operations Manager, Howe Sound and Sunshine Coast, D. Legault
RMOW – General Manager Infrastructure Services, J. Hallisey
RMOW – GM of Resort Experience, J. Jansen
RMOW – TDM Planner & Recording Secretary, E. DalSanto

FACILITATOR:

Whistler Centre for Sustainability – Executive Director, C. Ho

REGRETS:

RMOW Councillor, S. Anderson
Whistler Blackcomb– VP Information Technology, M. Sedgwick
BC Transit, Senior Regional Transit Manager, L. Trotter

ADOPTION OF AGENDA

Moved by J. Jansen

Seconded by S. Pass

That the Transportation Advisory Group (TAG) adopt the agenda of Monday, January 8, 2018 as circulated.

CARRIED

ADOPTION OF MINUTES

Moved by M. Facundo

Seconded by B. Murray

That the Transportation Advisory Group (TAG) adoption of the Minutes of June 15, 2017, September 18, 2017 and October 11, 2017 TAG workshops as circulated.

CARRIED

PRESENTATIONS/DELEGATIONS

2017-2018 Winter Transportation Action Plan discussion:	<p>Staff updated TAG on the 2017-2018 Winter Transportation Action Plan and led a discussion on initial data and observations regarding the recent holiday season. The monitoring program for winter 2017-2018 is on-going with in-depth parking studies scheduled for February. Discussion included Gateway Loop construction and operations, commercial bus parking for this winter, parking availability in the Day Lots, average daily traffic counts on Highway 99 at Brio, the uptake on the Carpool Parking Passes, the number of Resident/Employee parking passes and general parking passes, the uptake on Spirit Transit Pass that is being offered to Whistler Experience participants, winter transit service, New Year's Eve transit service, and skier download traffic exiting the Village.</p> <p>ACTION: Councillor C. Jewett will forward correspondence received regarding the new winter Whistler Transit System schedule to staff for review and response.</p> <p>ACTION: Staff will take into consideration the feedback provided regarding the Gateway Loop improvements (assigned stalls for buses).</p>
November Community Forum discussion	<p>E. DalSanto provided an overview of the November 2nd Community Forum and TAG members reviewed the summarized feedback.</p> <p>The main themes related to transportation from the Community Forum were:</p> <ul style="list-style-type: none">• General support of 2018-19 transportation actions• Desire for more transit overall, and more incentives/facilities (e.g. ski lockers, bike parking, free passes for students) to support transit and active transportation use• More regional transit• Better Valley Trail connections, and lighting• Better information about parking and how fees are used
2018-2019 Transportation Actions Review Exercise	<p>C. Ho facilitated a review of the 2018/2019 Transportation Actions that were circulated with the agenda package. The actions were revised based on the comments from the November Community Forum with additions and deleted noted. After working in small groups to review and revise the 2018/2019 actions, TAG finalized the medium term transportation action plan as a group.</p> <p>ACTION: Staff will circulate the final draft 2018/2019 Transportation Action Plan to TAG members for review with the minutes.</p>
Confirming CTIF Criteria and Desired outcomes	<p><i>Community Transportation Initiative Fund (CTIF) Criteria</i></p> <p>C. Ho facilitated an exercise for TAG members to test the Goals and Criteria that TAG developed for the CTIF at the June meeting. This exercise was not completed and will be continued at the next TAG workshop.</p> <p>ACTION: Staff will update the goals and criteria of the CTIF based on preliminary input and will have TAG members review and test the criteria at the next TAG workshop.</p>

Communications Update

Communications Task Team Update and Discussion

E. DalSanto provided an update on the TAG Communications Task Team initiatives. Leading up to winter, the TAG Communications Task Team met to understand the winter transportation actions and develop shared messaging and focused campaigns. It was decided that for December the focus would be to get out the information on the actions in general and concentrate on transit Family Travel Program. January is focused on Active Travel carrying on the theme of new year's resolutions and health. February's focus will be Shared Travel and carpools.

ACTION: TAG requested that communications also include messaging related to progress on Regional Transit, how parking fees (CTIFs) are being used to create other transportation options for residents, employees and visitors.

ACTION:

Staff will circulate the communications material to TAG for information as they are completed.

OCP Update Process

Official Community Plan (OCP) Update and TAG's Role

J. Hallisey explained that at the December 19, 2017 Council meeting, an accelerated process to update the Whistler OCP was approved. The 2011 OCP (see Official Community Plan Adoption Bylaw No. 1983, 2011) which was adopted May 7, 2013 is the base document being used for the OCP update. TAG's work over the past two years will be used to update the transportation policies section of the OCP.

RMOW staff are reviewing the transportation policies in the 2011 OCP with the TAG long-term actions list and the draft transportation indicators and performance measures. These topics will be the focus of the next two TAG workshops with the goal of finalizing the Transportation plan this summer.

OTHER BUSINESS/UPDATES

The next two TAG workshops will be scheduled in March 2018 and April/May 2018.

ADJOURNMENT

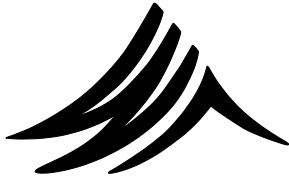
Moved by C. Jewett

That Transportation Advisory Group (TAG) adjourn the January 8, 2018 TAG workshop at 5:00 p.m.

CARRIED

CHAIR: N. Wilhelm-Morden

RECORDING SECRETARY: E. DalSanto



WHISTLER

MINUTES

REGULAR MEETING OF FOREST & WILDLAND ADVISORY COMMITTEE

WEDNESDAY, FEBRUARY 14, 2018 STARTING AT
3:00 P.M.

In the Flute Room
4325 Blackcomb Way, Whistler, BC V0N 1B4

File: 8221.03

Name	Meetings to Date: 2
Present:	
Member at Large, Derek Bonin, Chair	2
Member at Large, Kathi Bridge	1
AWARE, Claire Ruddy	2
Member at Large, Arthur DeJong	2
WORCA, Todd Hellinga	2
Member at Large, Mac Lowry	1
Member at Large, Colin Rankin	1
Member at Large, Johnny Mikes	2
Regrets:	
Council, Cathy Jewett	1
Member at Large, Trevor Burton	0
Member at Large, Candace Rose-Taylor	1
Recording Secretary	
Heather Beresford	2

Adoption of Agenda

ADOPTION OF AGENDA

Moved by K. Bridge
Seconded by T. Hellinga

That the Forest & Wildland Advisory Committee adopt the Forest &
Wildland Advisory Committee agenda for February 14, 2018.

CARRIED

Adoption of Minutes

ADOPTION OF MINUTES

Moved by M. Lowry

Seconded by T. Hellinga

That the Forest & Wildland Advisory Committee adopt the Forest & Wildland Advisory Committee minutes for January 10, 2018.

CARRIED

Verbal Reports

AWARE

- OCP Vision Community Forum, March 5.

WORCA

- T. Cole (CCF Forest Manager) attended trail planning workshop. Discussed Cheakamus01 plans and development of trail objectives.
- WORCA is developing events policy to manage impacts from large bike races/events

RMOW:

- FWAC term extensions: J. Mikes requests to extend term to November 2018. Report going to Council March 20.

CCF

- Wildfire projects to be continued in spring 2018 (Callaghan FSR, CCF5/Alpine Meadows, Cheakamus Lake road)
- 2016 and 2017 annual reports in development

Trail Planning Working Group

- Emergency response and safety planning underway with SAR

OCP Chapter 6 Review

A presentation by H. Beresford and a discussion held regarding quashed OCP Chapter 6, Natural Environment.

Courtney Beaubien, RMOW Planner responsible for OCP update, attended FWAC meeting.

FWAC comments entered into digital version of draft Chapter 6. FWAC deferred other agenda items.

Key points:

- Link to related policies in other relevant chapters. E.g. Chapter 7, Recreation, has related policies
- Goals and objectives should be revised, some read more as policies
- Reorganize chapter to place most important ideas up front.
- Best Management Practices need to be defined

- Riparian development permit maps should be updated, policies should provide wording to avoid gaps in protecting streams. Discussion on how to reference provincial Riparian Area Regulation.

A. *DeJong arrived at 4:15 p.m.*

- Chapter 6 should include policy for establishing protected area networks, connectivity, biodiversity conservation plan, identify most important habitats/ecosystems.

OCP revisions will be available in late April/early May for further review at public forums.

OTHER BUSINESS

- Peter Ackhurst's letter to the editor regarding the Cheakamus Community Forest


Future Agenda Items:

- March: TPWG project referral system (flow chart) and autumn 2017 newsletter; WIF management; Biodiversity Conservation Plan
- April – CCF Road-based access plan

ADJOURNMENT

Moved by C. Rankin

That the Forest & Wildland Advisory Committee adjourn the February 14, 2018 meeting at 5:01 p.m.

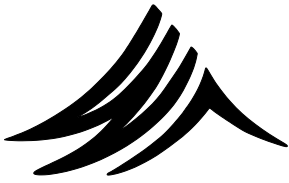


CHAIR: D. Bonin

CARRIED



RECORDING SECRETARY: H. Beresford



WHISTLER

MINUTES

REGULAR MEETING OF WHISTLER BEAR ADVISORY COMMITTEE

WEDNESDAY, FEBRUARY 14, 2018 STARTING AT 8:30 A.M.

In the Decker Room

8020 Nesters Road, Whistler, BC V0N 1B8

PRESENT:

RMOW Council, S. Maxwell
Co-Chair, RMOW, H. Beresford
RCMP, R. Knapton
RMOW Bylaw Services, T. Lunn
Conservation Officer Service, B. Mueller
AWARE/C2C Grizzly Bear Initiative, C. Ruddy
Whistler Blackcomb, A. DeJong
Get Bear Smart Society, N. Fitzgerald
Member at Large, N. Dudley
Member at Large, M. Toom (on phone)

PUBLIC:

Whistler Wildlife Protection Group, I. Minic-Lukac

REGRETS:

Carney's Waste Systems, P. Kindree
RMOW Environmental Coordinator, L. McIvor

ADOPTION OF AGENDA

Moved by S. Maxwell
Seconded by R. Knapton

That Whistler Bear Advisory Committee adopt the Whistler Bear Advisory Committee agenda of February 14, 2018.

CARRIED

ADOPTION OF MINUTES

Moved by S. Maxwell
Seconded by A. DeJong

That Whistler Bear Advisory Committee adopt the Regular Whistler Bear Advisory Committee minutes of January 10, 2018

CARRIED

C. Ruddy nominated to act as WBAC co-chair as per Terms of Reference adopted by Council on January 23, 2018.

Moved by R. Knapton
Seconded by A. DeJong

CARRIED

Updates

Conservation Officer Service

- No bear reports in Sea to Sky corridor

Bylaw Services

- No bear activity
- Solid Waste Bylaw amendments underway as per previous WBAC discussions
- Discussion re: solid waste plan requirements for special events. Review WB approach for alignment.

ACTION: Distribute special event solid waste plan guidelines to WBAC. Request update regarding new Special Events bylaw.

RCMP

- No bear activity

Whistler Blackcomb

- No bear activity

AWARE/Grizzly Initiative

- No bear activity
- Encourage WBAC members to attend RMOW Community Vision Forum, March 5

Carney's – N/A

PRESENTATIONS/DELEGATIONS

2018 Communications Plan

Reviewed 2018 Communications Plan and 2017 social media review.

- Include relevant key message(s) in every social media post
- Educational messages appear to get fewer viewers than public safety messages (e.g. bear in certain neighbourhood). Consider using photos to prove the point.
- Emphasize that there are consequences (tickets) to non-compliance with the bylaw
- Missing message – it only takes once for a bear to get a reward and become food conditioned
- AirBNB and VRBO rentals should provide bear-related and garbage disposal information to guests.

ACTION: Create a "one-pager" on RMOW bears and waste management that could be on whistler.ca for download.

- Include message that people should call Bylaw Services if an attractant issue is observed in Whistler. Bylaw Services can then contact the right person/department to address the problem.
- Inspiration aspects – need to change public perception of COS. Share positive information at start of season.
- Further refine target audiences in communications plan

R. Knapton left at 9:20 a.m.

- Some revision of communications plan key messages
- BC Transit pilot project

ACTION: Staff to receive monthly report from BC Transit identifying any issues, and develop communications solutions to provide to public.

ACTION: Update 2018 Communications Plan as discussed, and forward to WBAC and RMOW Communications team.

S2S Bear Management Workshop

The S2S Bear Management Workshop is scheduled for April 18 at the Squamish Lil'wat Cultural Centre.

- Invitations sent to corridor local governments, First Nations, WBAC, other partners.
- Mike Badry and Simon Gravel to speak

Licence Inspectors Forum

T. Lunn discussed opportunity for RMOW to share bear management approach at upcoming Licence Inspectors and Bylaw Officers Association of BC zone meeting or annual conference in 2019.

ACTION: T. Lunn investigate how to get on zone meeting agenda.

Past Actions Review:

Bylaw Services will meet with H. Beresford and L. McIvor to examine wording issues in the Solid Waste Bylaw discussed in December WBAC meeting; will bring ideas back to WBAC at February meeting	Heather and Lindsay met with bylaw in early January. New wording has been developed and agreed to; Bylaw Services will take the amended bylaw to Council ASAP.
Environmental Coordinator to use stats received from RMOW Communication department and start improving pre-existing Communications Calendar.	In progress. Communications Calendar can be updated after the Communications Plan is updated during February WBAC meeting
Bylaw Services to revise wording of offences in the Municipal Ticketing Information system to fit on a ticket (i.e. wording too long currently).	In progress. Is being led by Bylaw Services and will occur as part of larger updates to MTI system.

L. McIvor to follow up with Emma DalSanto and Communications Department to offer assistance again on the garbage on buses initiative.	In progress. Lindsay met with Emma and Whistler Transit on Jan 31 st and Lindsay has created a high-level communications framework and shared this with Emma/Anyssa
WBAC requests that Bylaw Services review the Solid Waste Bylaw with respect to the identified issues and bring back to WBAC for further discussion.	In progress. Lindsay/Heather met with Bylaw Services. Lindsay working with internal partners to move amendments forward.
L. McIvor will circulate the amended Terms of Reference to the WBAC.	Completed
L. McIvor/H. Beresford to touch base with Parking Lot Committee and RMOW Communications Department.	The Day Lot Committee has approved signage. Some suggestions/comment <ul style="list-style-type: none"> • Lot 3 zone by the skateboard would be a good zone as there is high traffic • Placement: Be mindful of other signage (I informed the committee that you will be using the wayfinding sign template so it should be in keeping with what we have.) The group would like to see the draft signage and proposed locations when ready.
L. McIvor/H. Beresford to invite a rep from the Communications Department to the February meeting to participate in communications planning.	Communications unable to attend individual meetings at this time. Provide plan to Comms when complete.
L. McIvor to circulate existing communications plan prior to February meeting with request for members to review.	Completed.

Other Business

COS and RMOW annual agreement to be prepared in Q1.

Hunting boundary change along Callaghan Road

ACTION: H. Beresford to follow up on process.

Briefly discussed Whitehorse bear program researcher request for information.

ADJOURNMENT

Moved by T. Lunn

That the Whistler Bear Advisory Committee adjourn the February 14, 2018 Council meeting at 10:05 a.m.

CARRIED

H. Beresford
CO-CHAIR: C. Ruddy H. BERESFORD

H. Beresford
RECORDING SECRETARY: H. Beresford

RESORT MUNICIPALITY OF WHISTLER

FIVE-YEAR FINANCIAL PLAN 2018-2022 BYLAW NO. 2176, 2018

A BYLAW TO ADOPT A FIVE-YEAR FINANCIAL PLAN FOR 2018-2022

WHEREAS the Council must have a financial plan pursuant to Section 165 of the *Community Charter*;

AND WHEREAS the Council deems it necessary and appropriate to adopt a five-year financial plan for the years 2018 to 2022;

NOW THEREFORE, the Municipal Council of the Resort Municipality of Whistler
ENACTS AS FOLLOWS:

1. This Bylaw may be cited for all purposes as the "Five-Year Financial Plan 2018-2022 Bylaw No. 2176, 2018".
2. That Council adopt the Five-Year Financial Plan for the years 2018-2022 inclusive, for each year of the plan, as set out in Schedules A, B and C attached hereto and forming a part of this Bylaw as follows:

Schedule A – Consolidated Operating Summary

Schedule B – Consolidated Project Summary

Schedule C – Supplementary Information

GIVEN FIRST, SECOND, and THIRD READINGS this __ day of _____, ____.

ADOPTED this __ day of _____, ____.

Nancy Wilhelm-Morden,
Mayor

Brooke Browning,
Municipal Clerk

I HEREBY CERTIFY that this is a
true copy of "Five-Year Financial
Plan 2018-2022 Bylaw No. 2176,
2018".

Brooke Browning,
Municipal Clerk

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022
CONSOLIDATED PROJECT SUMMARY**

**BYLAW 2176, 2018
SCHEDULE A**

	2018	2019	2020	2021	2022
REVENUE					
General Fund					
Property Taxes	38,076,411	38,933,130	39,809,125	40,704,831	41,620,689
Other Property Tax	1,002,567	1,006,728	1,012,418	1,018,183	1,024,025
Government Grants	747,782	747,782	747,782	747,782	747,782
Fees and Charges	10,797,111	11,093,677	11,396,174	11,704,722	12,019,440
Investment Income	1,534,566	1,506,404	1,455,146	1,573,807	1,867,302
RMI Grant	6,500,000	6,500,000	6,500,000	6,500,000	6,500,000
2% MRDT	7,153,332	7,224,866	7,297,114	7,370,085	7,443,786
Works and Service Charges	520,951	520,951	520,951	520,951	520,951
Water Fund					
Parcel Taxes	3,889,402	3,960,281	3,992,818	4,025,621	4,058,691
Fees and Charges	2,956,397	3,009,010	3,032,637	3,056,451	3,080,452
Works and Service Charges	39,653	39,653	39,653	39,653	39,653
Sewer Fund					
Parcel Taxes	4,088,852	4,130,492	4,172,576	4,215,108	4,258,094
Fees and Charges	3,777,805	3,816,903	3,856,409	3,896,328	3,936,665
Works and Service Charges	188,697	188,697	188,697	188,697	188,697
Solid Waste Fund					
Parcel Taxes	-	-	-	-	-
Fees and Charges	5,721,632	5,872,144	6,038,826	6,209,706	6,384,890
Government Grants	470,000	470,000	470,000	470,000	470,000
	87,465,157	89,020,717	90,530,328	92,241,925	94,161,117
EXPENDITURE					
General Fund					
Payroll and Goods & Services	51,272,821	52,293,412	53,341,394	54,409,287	55,497,471
Debt Interest & Principal	680,569	239,299	239,301	239,301	239,301
Residents & Partners	5,177,677	5,236,796	5,296,720	5,357,462	5,419,035
Contingency	617,078	629,773	642,791	656,060	669,584
Water Fund					
Payroll and Goods & Services	1,690,870	1,740,650	1,791,425	1,843,216	1,896,042
Debt Interest & Principal	-	-	-	-	-
Sewer Fund					
Payroll and Goods & Services	2,930,306	3,008,313	3,087,912	3,169,136	3,252,017
Debt Interest & Principal	1,376,486	1,376,486	1,376,486	1,376,486	1,376,486
Solid Waste Fund					
Payroll and Goods & Services	5,813,816	5,934,892	6,058,390	6,184,358	6,312,845
Debt Interest & Principal	510,490	510,490	510,490	510,490	510,490
	70,070,112	70,970,110	72,344,909	73,745,796	75,173,271

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022
CONSOLIDATED OPERATING SUMMARY**

**BYLAW 2176, 2018
SCHEDULE A Cont'd LE A Cont'd**

	2018	2019	2020	2021	2021
TRANSFERS TO (FROM)					
OTHER FUNDS / RESERVES					
Interest Paid to Reserves	1,318,719	1,101,902	1,064,839	1,096,294	1,288,633
Recreation Works Charges Reser	277,950	277,950	277,950	277,950	277,950
Transportation Works Charges Re	211,532	211,532	211,532	211,532	211,532
Employee Housing Charges Rese	31,469	31,469	31,469	31,469	31,469
RMI Reserve	2,253,100	2,253,100	2,253,100	2,253,100	2,253,100
2% MRDT Reserve	153,380	187,203	221,364	255,867	290,715
General Capital Reserve	4,380,590	4,783,247	4,653,586	4,653,551	4,653,551
Vehicle Replacement Reserve	932,506	999,222	999,222	999,222	999,222
General Operating Surplus (Defic	(108,000)	(0)	0	0	(0)
General Operating Reserve	1,545,507	1,726,103	1,968,710	2,188,848	2,428,836
Water Works Charges Reserve	39,653	39,653	39,653	39,653	39,653
Water Capital Reserve	3,089,414	3,100,000	3,100,000	3,100,000	3,100,000
Water Operating Reserve	452,376	499,043	487,643	475,343	462,121
Water Operating Surplus (Deficit	(0)	(0)	0	0	(0)
Sewer Works Charges Reserve	188,697	188,697	188,697	188,697	188,697
Sewer Capital Reserve	1,962,856	1,962,856	1,962,856	1,962,856	1,962,856
Sewer Operating Reserve	346,109	341,219	335,436	328,734	321,086
Sewer Operating Surplus (Deficit	0	(0)	(0)	0	0
Solid Waste Capital Reserve	377,326	396,996	415,656	435,767	457,663
Solid Waste Operating Reserve	(58,138)	(49,583)	(26,294)	(2,753)	20,764
Solid Waste Surplus (Deficit)	(0)	0	(0)	(0)	(0)
	17,395,046	18,050,608	18,185,419	18,496,130	18,987,847
REVENUE LESS EXPENDITURE AND TRANSFERS	0	0	0	0	0

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022
CONSOLIDATED PROJECT SUMMARY**

**BYLAW 2176, 2018
SCHEDULE B**

	2018	2019	2020	2021	2022
REVENUE AND OTHER SOURCES OF FUNDING					
General Fund					
Government Grants	773,105	593,847	546,134	537,826	510,347
Contribution from Developers	-	-	-	-	-
Equipment disposal proceeds	640,075	100,000	100,000	100,000	100,000
WHA construction loan	2,700,000	-	-	-	-
Other Contributions	342,404	363,505	5,928	10,163	-
WCSS loan payments	38,000	50,000	50,000	50,000	50,000
Water Fund					
Government Grants	557,500	12,500	-	-	-
Other Contributions	9,459	11,949	34,215	10,910	6,468
Sewer Fund					
Government Grants	800,000	700,000	-	-	-
Solid Waste Fund					
Government Grants	-	-	-	-	-
	5,860,543	1,831,800	736,278	708,899	666,815
EXPENDITURE					
General Fund					
Non-capital Expenditure	5,911,755	964,426	746,314	535,216	481,881
Infrastructure Maintenance	10,760,653	8,482,792	5,557,534	5,053,855	3,735,702
Capital Expenditure	12,217,805	5,486,805	2,518,486	2,279,665	545,330
WCSS loan	1,000,000	-	-	-	-
Water Fund					
Non-capital Expenditure	230,500	150,000	110,000	110,000	80,000
Infrastructure Maintenance	3,343,000	785,000	1,865,000	925,000	475,000
Capital Expenditure	1,150,000	670,000	2,615,000	285,000	-
Sewer Fund					
Non-capital Expenditure	540,000	415,000	350,000	350,000	300,000
Infrastructure Maintenance	2,735,000	1,670,000	2,340,000	1,485,000	340,000
Capital Expenditure	3,057,000	2,340,000	5,655,000	3,140,000	727,500
Solid Waste Fund					
Non-capital Expenditure	70,000	30,000	30,000	30,000	30,000
Infrastructure Maintenance	250,000	170,000	150,000	150,000	-
Capital Expenditure	75,000	75,000	50,000	-	-
All Funds					
Depreciation	11,840,893	12,012,329	12,229,099	12,343,192	12,368,649
	53,181,607	33,251,353	34,216,434	26,686,928	19,084,061

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022
CONSOLIDATED PROJECT SUMMARY**

**BYLAW 2176, 2018
SCHEDULE B Cont'd**

	2018	2019	2020	2021	2022
TRANSFERS (TO) FROM OTHER FUNDS (RESERVES)					
RMI Reserve	4,429,690	3,578,000	543,000	523,000	223,000
2% MRDT Reserve	645,270	537,000	767,000	537,000	537,000
General Capital Reserve	12,614,985	3,746,666	5,527,594	2,568,779	1,742,330
Recreation Works Charges	43,000	-	-	-	-
Parking Reserve	-	-	-	-	-
Parkland Reserve	-	-	-	-	-
Vehicle Replacement Reserve	2,589,925	1,830,000	1,480,000	1,230,000	(100,000)
Library Reserve	74,963	37,378	29,072	49,837	-
General Operating Reserve	4,236,653	2,354,846	2,156,106	1,902,130	1,815,235
Housing Works Charges	-	-	-	-	-
WVLC Surplus	-	-	-	-	-
Transportation Works Charges	2,637,643	1,942,782	217,500	1,710,000	210,000
Water Capital Reserve	3,650,041	1,297,051	5,054,785	1,433,090	395,032
Water Operating Reserve	344,000	293,500	193,500	193,500	163,500
Water Works and Service Charges	-	-	-	-	-
Sewer Capital Reserve	4,942,000	3,170,000	4,745,000	3,000,000	775,000
Sewer Operating Reserve	602,500	395,000	357,500	357,500	307,500
Sewer Works and Service Charges	-	-	-	-	-
Solid Waste Capital Reserve	325,000	245,000	200,000	150,000	-
Solid Waste Operating Reserve	82,500	30,000	30,000	30,000	30,000
	<u>37,218,170</u>	<u>19,457,223</u>	<u>21,301,057</u>	<u>13,684,836</u>	<u>6,098,598</u>
ADJUSTMENTS FOR NON CASH ITEMS AND CHANGES TO NET FINANCIAL ASSETS					
Depreciation	11,840,893	12,012,329	12,229,099	12,343,192	12,368,649
WCSS loan	962,000	(50,000)	(50,000)	(50,000)	(50,000)
WHA construction loan	(2,700,000)	-	-	-	-
	<u>10,102,893</u>	<u>11,962,329</u>	<u>12,179,099</u>	<u>12,293,192</u>	<u>12,318,649</u>
REVENUE AND TRANSFERS LESS EXPENDITURE	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022
CONSOLIDATED PROJECT SUMMARY**

**BYLAW 2176, 2018
SCHEDULE C**

Proportion of total proceeds proposed to be raised from each funding source in 2018

Funding Source	% of Total Revenue	Dollar value
Property Taxes	42%	39,078,978
Parcel Taxes	9%	7,978,254
Fees and Charges	26%	24,002,245
Investment income	2%	1,534,566
Debt	3%	2,700,000
Government Grants	4%	3,348,387
Transfer taxes	15%	13,653,332
Other	1%	1,029,938
Total	100%	93,325,701

The municipality will continue to pursue revenue diversification to minimize the overall percentage of revenue raised from property taxes wherever possible. The objective is to maintain a reasonable tax burden by maximizing other revenue sources, lowering the cost of municipal services and shifting the burden to user fees and charges where feasible.

Proposed distribution of property tax revenue in 2018

Property Class	% of Total Property Taxation	Dollar value, completed roll
Class 1 - Residential	67.20%	25,585,515
Class 2 - Utilities	1.49%	566,717
Class 5 - Light industry	0.12%	46,488
Class 6 - Business other	29.71%	11,313,483
Class 8 - Recreational	1.48%	564,207
Total	100%	38,076,411

The municipality will continue to set tax rates to ensure tax stability by maintaining a consistent proportionate relationship between classes. The proposed distribution shown above is consistent with the prior year. In order to maintain the current share of taxation between property classes, minor adjustments are made to the tax ratios to account for market based assessment variation between the classes. This policy provides a balanced tax impact among property classes.

**RESORT MUNICIPALITY OF WHISTLER
FIVE-YEAR FINANCIAL PLAN 2018 - 2022**

**BYLAW 2176, 2018
SCHEDULE C Cont'd**

PERMISSIVE EXEMPTIONS

As permitted by the Community Charter, council has granted exemptions from municipal property taxes for the following general purposes:

- * Land and improvements surrounding a statutorily exempt building for public worship.
- * Properties owned or held by a not-for-profit organization whose purpose is to contribute to the well-being of the community with the provision of cultural, social, educational or recreational services.

Permissive exemptions for municipal property taxes in 2018 are estimated to be \$549,816.

**RESORT MUNICIPALITY OF WHISTLER
OUTDOOR POTABLE WATER USAGE BYLAW NO. 2179, 2018**

A BYLAW TO REGULATE THE USE OF OUTDOOR POTABLE WATER

WHEREAS Council wishes to conserve potable water and therefore regulate the use of potable water outdoors within the Resort of Municipality of Whistler in an effort to manage potable water demand, improve the efficiency of use and reduce consumption;

NOW THEREFORE the Council of the Resort Municipality of Whistler, in open meeting assembled,
ENACTS AS FOLLOWS:

SECTION 1.0: TITLE

1.1. This Bylaw may be cited for all purposes as “Outdoor Potable Water Usage Bylaw No. 2179, 2018”.

SECTION 2.0: GENERAL DEFINITIONS AND INTERPRETATION

2.1. In this Bylaw, the following terms shall have the following meanings:

“Automatic” means the irrigation system has a programmable controller attached to it such that a specific amount of water is distributed at a set time;

“By Hand” means to apply water by hand with a spray nozzle attached to a flexible hose with an outside diameter of no more than 25 mm, the spray nozzle must be equipped with a with a spring-loaded shut off valve;

“Drip Irrigation” means an automatic in-ground irrigation method that uses lower pressure and flow than traditional in-ground automatic systems (also known as “Micro Irrigation”);

“Fire Danger Rating” is a Provincial indicator of the risk of a wildfire starting;

“General Manager” means the Resort Municipality’s General Manager of Infrastructure Services;

“In-Ground Irrigation” means a buried-pipe irrigation system that distributes water through sprinkler heads;

“Irrigation” means the application or distribution of water to landscaping;

“Landscaping” means any activity that modifies the visible features of an area of land with plants. It includes hanging baskets, flower beds, lawns, fairways, fields or any other area consisting primarily of sod or turf, shrubs, trees, and vegetable/edible gardens;

“Low Head Drainage” means water draining out of an irrigation system after the system is turned off, that results from the installation of an irrigation system on a slope;

“Manual” means to apply water by hand or with a simple timer attached to a flexible hose with an outside diameter of no more than 25 mm with a spring-loaded automatic shut off;

“Municipal” or “Municipality” means the Resort Municipality of Whistler (RMOW);

“Overspray” means water that lands beyond the planted or target area;

“Parcel” means parcel of land within the Municipality;

“Person” includes a corporation, partnership or party, and the personal or other legal representatives of a person to whom the context can apply according to law;

“Sensor Driven Automated Irrigation Systems” means programmable automatic in-ground irrigation systems that incorporate best landscaping practices and environmental data in order to determine optimal water use;

“Waste” means to purposelessly use water, such as but not limited to leaving a flowing hose unattended, leaving a broken irrigation head unattended, or oversaturation of a landscape; and

“Water” means potable water supplied by the Resort Municipality of Whistler.

SECTION 3.0: GENERAL

3.1. Attached to and hereby forming part of this Bylaw are the following schedules:

i. Schedule “A”: Outdoor Water Conservation Stages;

3.2. No person shall waste or allow to be wasted, water supplied by the Municipality.

3.3. No person shall use or cause or allow to be used water contrary to the Outdoor Water Conservation Stages as set out in Schedule “A”.

3.4. Overspray resulting from the effect of wind or an act of vandalism shall not be considered an offense.

SECTION 4.0: ENFORCEMENT

4.1. Municipal Infrastructure Services staff are authorized to enter on any parcel at all reasonable times to ascertain whether the regulations and directions of this Bylaw are being observed.

4.2. The Municipal Bylaw Officer staff are authorized to enter on any parcel at all reasonable times to ascertain whether the regulations and directions of this Bylaw are being observed.

4.3. Every person who violates or fails to comply with a provision of this Bylaw, or an order, direction or notice given under this Bylaw, commits an offence and is liable on summary conviction to a fine per the “Bylaw Notice Enforcement Bylaw No. 2174”.

4.4. Each day during which an offence under this Bylaw continues is a new and separate offence.

SECTION 5.0: DELEGATION OF AUTHORITY

5.1. The General Manager and those designated to act on behalf of the General Manager, are hereby authorized to determine the applicable Water Conservation Stage, provide notice of Schedule “A”: Outdoor Water Conservation Stages, or extend exemption durations.

SECTION 6.0: NOTICE OF WATER CONSERVATION STAGE

6.1. The General Manager may issue a notice conserving the use of water as set out in Schedule “A”, Outdoor Water Conservation Stages, attached hereto and forming part of this Bylaw.

- 6.2. As Per 6.1, notice shall be considered sufficiently given if published or circulated within the Municipality via standard methods of communication which may include one or all of the following communication methods: the Municipal website, printed media, social media, and local radio broadcasting.
- 6.3. Except in emergency circumstances, the Municipality shall provide notice of an impending Stage increase at least one (1) week prior to enforcement commencing.

SECTION 7.0: NEW LANDSCAPING PERMITS

- 7.1. A person who has installed new (never been installed or a repair of more than 50 per cent of existing landscaping may) apply to the Municipality for an irrigation permit that will allow the landscaping to be irrigated outside of permitted timelines outlined in Schedule "A". Permits indicating the use of sensor driven automated irrigation systems will be prioritized.
- 7.2. A permit shall be conspicuously displayed at the premises for which it is issued.
- 7.3. After expiration of a permit, the permit may be extended by the General Manager.
- 7.4. Permits will be issued at the discretion of the General Manager during Water Conservation Stage 2.
- 7.5. Permits will not be issued or be valid during Water Conservation Stages 3 or 4.

SECTION 8.0: FIRE DANGER RATING AND CONSTRUCTION

- 8.1. Some construction activities are restricted when the Fire Danger Rating is High or Extreme. A person whose property is under construction during such times may apply to the Municipality for an Interface Construction Restriction Exemption form in order to mitigate those activities.
- 8.2. Tree removal is restricted when the Fire Danger Rating is High or Extreme. A person whose property requires tree removal during such times may apply to the Municipality for an Interface Construction Restriction Exemption Form – Tree Service Companies in order to mitigate this activity.
- 8.3. An exemption form shall be conspicuously displayed at the premises for which it is issued.
- 8.4. After expiration of an exemption, the exemption form may be extended by the Fire Chief in consultation with the General Manager.
- 8.5. Exemption forms will not be issued or be valid during Water Conservation Stages 3 or 4.

SECTION 9.0: EXEMPTIONS FROM WATER CONSERVATION STAGES

- 9.1. The following are exempt from the Schedule "A": Outdoor Water Conservation Stages 1 and 2.
- i. Edible/ vegetable gardens;
 - ii. A person that uses water to facilitate normal business activities related to health and safety such as but not limited to:
 - a) Cleaning, including cleaning of motorized and non-motorized equipment; and
 - b) Dust control.
 - iii. A person that uses water to facilitate normal business activities such as but not limited to car washing and detailing, power washing, window washing;
 - iv. Fire hydrant testing;
 - v. Irrigation of the following public facilities if failure to do so will result in permanent loss of turf:
 - a) Meadow Park Sports Fields;

- b) Myrtle Phillip School Sports Field;
- c) Whistler High School Sports Field;
- d) Spring Creek School Sports Field; and
- e) Whistler Olympic Plaza Lawn.
- vi. Nurseries; and
- vii. Sampling at and flushing of water mains as required.

9.2. For Schedule "A": Outdoor Water Conservation Stage 3, the General Manager will recommend to Council whether or not the following are exempt with the exception of items iv) and vii) which are exempt:

- i. Edible/ vegetable gardens;
- ii. A person that uses water to facilitate normal business activities related to health and safety such as but not limited to:
 - a) Cleaning, including cleaning of motorized and non-motorized equipment;
 - b) Dust control.
- iii. A person that uses water to facilitate normal business activities such as but not limited to car washing and detailing, power washing and window washing;
- iv. Fire hydrant testing;
- v. Irrigation of the following public facilities if failure to do so will result in permanent loss of turf:
 - a) Meadow Park Sports Field;
 - b) Myrtle Phillip School Sports Fields;
 - c) Whistler High School Sports Field;
 - d) Spring Creek School Sports Field.
 - e) Whistler Olympic Plaza Lawn
- vi. Nurseries; and
- vii. Sampling at and flushing of water mains as required.

9.3. The following are exempt from the Schedule "A": Outdoor Water Conservation Stage 4:

- i. Fire hydrant testing;
- ii. Sampling at and flushing of water mains as required.

SECTION 10.0: SEVERABILITY

10.1. If a portion of this bylaw is held invalid by a Court of competent jurisdiction, then the invalid portion must be severed and the remainder of the bylaw is deemed to have been adopted without the severed section, subsection, paragraph, subparagraph, clause or phrase.

SECTION 11.0: REPEAL

11.1. The Resort Municipality of Whistler "Water Use Regulation Bylaw No. 1538, 2001" as amended, is repealed.

Given FIRST, SECOND and THIRD READINGS this ____day of ____, 2018.

ADOPTED by Council on this ____day of ____, 2018.

Nancy Wilhelm-Morden,
Mayor

Brooke Browning,
Municipal Clerk

I HEREBY CERTIFY that this is a true copy of the
"Outdoor Water Usage Bylaw No. 2179, 2018".

Brooke Browning,
Municipal Clerk

SCHEDULE A – OUTDOOR POTABLE WATER CONSERVATION STAGES

CATEGORIES	STAGE 1 Year Round	STAGE 2 As Determined Enforced	STAGE 3 As Determined Voluntary	STAGE 4 As Determined Enforced
	Allowable times:	Allowable times:	Allowable times:	Allowable times:
Operating Drinking Water Fountains	Any Day Any Time	Any Day Any Time	Any Day Any Time	Any Day Any Time
Watering Edible/vegetable gardens <i>Any irrigation method</i>	Any Day Any Time	Any Day Any Time	Any Day Any Time	NOT PERMITTED
Watering Lawns, Trees, Shrubs and Flower Beds <i>By Hand/Manual</i>	Any Day Between 8 PM and 10 AM	Monday, Wednesday and Saturday Only Between 8 PM and 10AM	Wednesday and Saturday Only Between 8 PM and 10 AM	NOT PERMITTED
Watering Lawns, Trees, Shrubs and Flower Beds <i>Automatic In-Ground Irrigation</i>	Any Day Between 10 PM and 7 AM	Any Day Between 10 PM and 7 AM	Tuesday and Thursday Only Between 10 PM and 7 AM	NOT PERMITTED
Watering Lawns, Trees, Shrubs and Flower Beds <i>Automatic Drip Irrigation</i>	Any Day Any Time	Any Day Any Time	Any Day Between 10 PM and 7 AM	NOT PERMITTED
Watering New Landscaping and Repairs	Any Day Any Time	ONLY With Permit	NOT PERMITTED	NOT PERMITTED
Watering Decorative Hanging Baskets/Containers <i>Manual/Drip Irrigation</i>	Any Day Any Time	Any Day Any Time	Any Day Between 10 PM and 7 AM	NOT PERMITTED
Washing Vehicles, Boats, Motorized Equipment	Any Day Any Time	Any Day Any Time	NOT PERMITTED	NOT PERMITTED

CATEGORIES	STAGE 1 Year Round	STAGE 2 As Determined Enforced	STAGE 3 As Determined Voluntary	STAGE 4 As Determined Enforced
Washing Non-motorized bikes	Any Day Any Time	Any Day Any Time	NOT PERMITTED	NOT PERMITTED
Washing Hardscapes, Sidewalks, Roofs or any Outdoor Surfaces	Any Day Any Time Only With Low Volume, High Pressure Devices	Any Time but not on weekends and only as necessary for applying paint/similar product or preparing a surface prior to paving	Any Time but not on weekends and only as necessary for applying paint/similar product or preparing a surface prior to paving	NOT PERMITTED
Filling Residential Hot Tubs and Pools	Any Day Any Time	ONLY to comply with Health and Safety Laws	NOT PERMITTED	NOT PERMITTED
Filling Hotel/Multi-family/Commercial Hot Tubs and Pools	Any Day Any Time	ONLY to comply with Health and Safety Laws	NOT PERMITTED	NOT PERMITTED
Filling Decorative Fountains and Pools	Any Day Any Time	Any Time, but not on weekends	NOT PERMITTED	NOT PERMITTED
Operating Outdoor Showers and Water Parks	Any Day Any Time Only With Automatic Shut Off Valves	ONLY to comply with Health and Safety Laws	NOT PERMITTED	NOT PERMITTED
Testing Irrigation Systems for Broken Heads/Hoses	Any Day Any Time	Any Day Any Time	NOT PERMITTED	NOT PERMITTED

**RESORT MUNICIPALITY OF WHISTLER
ZONING AND PARKING AMENDMENT BYLAW NO. 2165, 2017**

A BYLAW TO AMEND THE WHISTLER ZONING AND PARKING BYLAW NO. 303, 2015

WHEREAS Council may, in a zoning bylaw pursuant to *Section 479 of the Local Government Act*, divide all or part of the area of the Municipality into zones, name each zone and establish the boundaries of the zones, regulate the use of land, buildings and structures within the zones, and require the provision of parking spaces for uses, buildings and structures;

NOW THEREFORE the Council of the Resort Municipality of Whistler, in open meeting assembled, ENACTS AS FOLLOWS:

1. This Bylaw may be cited for all purposes as "Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017".
2. Resort Municipality of Whistler Zoning and Parking Bylaw No. 303, 2015 is amended in Part 9 section 6 by replacing the regulations for the CL3 zone with the regulations attached to and forming part of this Bylaw as Schedule 1.

GIVEN FIRST READING this 23rd day of January, 2018.

GIVEN SECOND READING this 23rd day of January, 2018.

Pursuant to Section 464 of the *Local Government Act*, a Public Hearing was held this 6th day of February, 2018.

SECOND READING RESCINDED this 6th day of March, 2018.

GIVEN SECOND READING AS REVISED this 6th day of March, 2018.

Pursuant to Section 464 of the *Local Government Act*, a Public Hearing was held this 20th day of March, 2018.

GIVEN THIRD READING this __ day of ____, 2018.

Approved by the Minister of Transportation and Infrastructure this __ day of ____, 2018.

ADOPTED by the Council this __ day of ____, 2018.

Nancy Wilhelm-Morden,
Mayor

Brooke Browning,
Municipal Clerk

I HEREBY CERTIFY that this is a true copy of "Zoning Amendment Bylaw (Creekside Plaza) No. 2165, 2017."

Brooke Browning,
Municipal Clerk

SCHEDULE 1

6. CL3 Zone (Commercial Local Three)

Intent

- (1) The intent of this zone is to provide for small commercial uses and auxiliary employee housing, adjacent to a residential area.

Permitted Uses

- (2) The following uses are permitted and all other uses are prohibited:
 - (a) auxiliary buildings and auxiliary uses;
 - (b) residential dwelling units for employee housing, auxiliary to other uses located in the CL3 zone;
 - (c) restaurant and establishments licenced for the sale and consumption of alcoholic beverages on the premises;
 - (d) office;
 - (e) personal services; and
 - (f) retail.
- (3) The second storey of a principal building shall not be used for retail or restaurant uses.
- (4) No portion of the first storey of a building may be used for auxiliary residential dwelling units.
- (5) Auxiliary residential dwelling units are permitted only in the building in the CL3 zone that is nearest the intersection of Lake Placid Drive and the Sea to Sky Highway.

Density

- (6) The maximum permitted floor space ratio is 0.48.
- (7) The maximum permitted gross floor area of buildings and structures for all uses in the CL3 zone is 1,515 square metres, of which not more than 263 square metres shall be for auxiliary residential dwelling use for employee housing.

Height

- (8) The maximum permitted height of a building is 7.6 metres.

Parcel Size

- (9) The minimum permitted parcel area is 2,500 square metres. The minimum frontage is 1/10th of parcel perimeter.

Site Coverage

- (10) The maximum permitted site coverage is 27 percent.

Setbacks

- (11) The minimum permitted setback is 5.0 metres from all parcel boundaries.

Off-street Parking and Loading

- (12) Off-street parking and loading spaces shall be provided and maintained in accordance with the regulations contained in Part 6 of this Bylaw.

Other Regulations

- (13) A maximum of two principal buildings on a parcel are allowed.

From: Kevan Kobayashi <koby@fanatykco.com>

Sent: Thursday, March 8, 2018 7:02 PM

To: Council

Subject: Opposition to 2077 Garibaldi Way Rezoning from Small Business Fanatyk Co Ski and Cycle.

To Whistler Council and Mayor Nancy Wilelm-Morden

This is a letter of opposition against the rezoning of 2077 Garibaldi Way from the Owners and Management of Fanatyk Co Ski and Cycle.

Fanatyk Co is a Locally owned and operated Whistler business that has been employing long and short term staff for over 20 years and we oppose the rezoning of 2077 as "employee housing."

We feel that any rezoning should be carefully scrutinized and be deemed to be in the best interest of both the neighbouring residences and for the greater good of Whistler. In simple terms, the benefits must outweigh the consequences.

This rezoning seems to primarily benefit the developer and builders and not the community. This apartment complex does not fall into the category of "affordable housing" for most of the local workforce nor does it seem suitable and appropriate for the neighbourhood. Businesses like ours and most of the Whistler employees including management level will never see the rewards of this rezoning.

Passing this rezoning will potentially set a precedent allowing private developers to take advantage the housing issue to force unwanted rezoning simply to maximize their profit on a piece of land with high rents and unrealistic density. In this case with very little regard to the existing neighbourhood.

This type of privatized development for profit and not within the Whistler Housing Authority guidelines should not be considered for such a major rezoning. Passing a rezoning like this may start us down a slippery slope. A slope that the local residences of these Whistler neighbourhoods have to suffer from while leaving business owners like us in no better position for house our staff.

Thank you

Sincerely
Fanatyk Co

Scott Humby
Bruce Pegram
Kevan Kobayashi
Paul Maki

March 19, 2018

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighbourhood;
3. does not have appropriate access: 120+ additional vehicles will enter and exit through a quiet residential cul-de-sac;
4. will make Highway 99 access more difficult and dangerous from the affected neighborhoods;
5. is affordable for less than 10% of Whistler's employee population;
6. will not be governed by Whistler Housing Authority's regulations and oversight.

I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

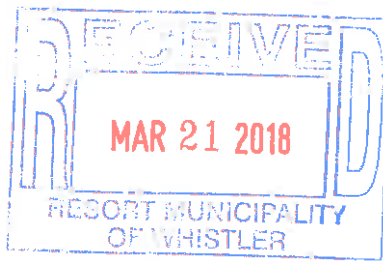
Sincerely,



8361 RAINBOW DR. WHISTLER

neil_collins@hotmail.com





March 19, 2018

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighbourhood;
3. does not have appropriate access: 120+ additional vehicles will enter and exit through a quiet residential cul-de-sac;
4. will make Highway 99 access more difficult and dangerous from the affected neighborhoods;
5. is affordable for less than 10% of Whistler's employee population;
6. will not be governed by Whistler Housing Authority's regulations and oversight.

I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Sincerely,

John Crawford
#402 2101 Castle Drive
Whistler, BC VON1B2
604-935-9139

March 19, 2018

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighbourhood;
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I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Sincerely,

Patrick Basanah

402-2101

CASTLE DR

WHISTLER BC

V0W-1B2

cell - 604 818 2152

March 19, 2018

Dear Mayor and Council,

Re: 2077 Garibaldi Way re-zoning application

As Whistler residents and property owners have become aware of the captioned re-zoning application heated debate has developed throughout the community. It is not difficult to understand that the magnitude and scale of this development will have a great negative impact upon the surrounding neighborhoods. It also has the potential to change the future of the re-zoning process and, ultimately, the sustainability of Whistler as a welcoming community for both visitors and residents. Whistler residents are proud of our little town and especially proud that resort communities all over the world hold us up as a model regarding growth management and quality of life! This is not just one neighborhood fighting to prevent approval of this application, it is the community of Whistler raising concerns about the future of the re-zoning process and development.

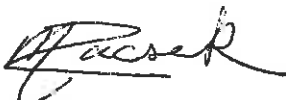
We would like to join the opposition to this development proposal and raise some strong concerns:

- **SIZE AND DENSITY OF THE PROPOSED DEVELOPMENT** – from current single family dwelling with 6 bed units, to multifamily zoning, three 4 storey apartment style buildings, 74 apartments, 222 bed units and 122 parking stalls. We are not aware of any development in residential areas with similar density.

Such development would drastically change the existing character of the family friendly Nordic area which is mostly comprised of single family homes, duplexes/triplex style homes and town home developments. Single family homes are predominantly 2 storey buildings and town homes are 3 levels or less. Increased density would affect noise and traffic levels creating an undesirable impact, including loss of quiet enjoyment and the loss of privacy. These factors are what have contributed to making the Nordic area a desirable place to live and own property.

- **Additional pressure to already difficult TRAFFIC PATTERNS AND PARKING** – we are already noticing more parking on the streets and extremely difficult access to the HWY when turning south. Our understanding is that council previously denied development of additional day skiers' parking on the timing flats for these reasons.
- **The Developer suggested that this development proposal was discussed with one or two of the largest employers in Whistler.** Was the same consultation offered to small business owners? Will they have the same benefit as larger employers? We cannot see how this re-zoning can be beneficial to a business that is not in a position to commit to years of rental and to subsidize their employees in the same manner as larger businesses. Proposed rental rates are not affordable and much higher than WHA rates offered.
- **WHA INVOLVMENT IS NOT PART OF THIS DEVELOPMENT-** The majority of the employee restricted accommodation is currently developed and monitored by WHA. Part of the WHA mandate is to keep employees' interest in the forefront and make things fair to all in need of affordable accommodation. We are not aware of any long term rules in place for private employee restricted developments in Whistler. Did Council and staff explore all other options to provide affordable housing managed and controlled by WHA? Are there any other properties owned by the Municipality that would better suit a development of this scale and density?
- **ENVIRONMENTAL CONCERNS** were ignored in the process of development on this property. It is now a distressed piece of land due to the owner's previous actions. The owner decided to clear cut the entire property years before submitting a re-zoning application. Did he acknowledge and properly manage the wet lands that are part of this land? Were any environmental assessments and recommendations done?

Sincerely,



Mariano Zacsek
#2 2120 Nordic Dr
Whistler, BC V0N1B2
604-905-8080

March 19, 2018

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighbourhood;
3. does not have appropriate access: 120+ additional vehicles will enter and exit through a quiet residential cul-de-sac;
4. will make Highway 99 access more difficult and dangerous from the affected neighborhoods;
5. is affordable for less than 10% of Whistler's employee population;
6. will not be governed by Whistler Housing Authority's regulations and oversight.

I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Sincerely,



Robert Currie
2309- 7531 Seppos Way
Whistler, BC VON1B7
604-902-7494

March 19, 2018

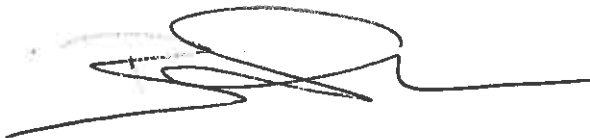
Dear Mayor and Council,

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6. will not be governed by Whistler Housing Authority's regulations and oversight.

I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brittany Schumcher', with a long horizontal line extending to the right.

Brittany Schumcher
#6 2070 Garibaldi Way
Whistler, BC VON1B2
604-966-7970

March 19, 2018

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighbourhood;
3. does not have appropriate access: 120+ additional vehicles will enter and exit through a quiet residential cul-de-sac;
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I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Sincerely,



Erin Rolandi
#402-2101 Castle Drive
Whistler BC V0N 1B2
604-935-9199

March 15, 2018

To Mayor and Council

Re: Rezoning application RZ1144, 2077 Garibaldi Way

We absolutely support the RMOW doing all it can to increase employee housing.

However, we feel that it is unfair to the residents of Garibaldi way, who purchased their homes on a quiet cul-de-sac, and now are faced with the prospect that the RMOW will allow a 222 unit apartment complex to be built at the end of the cul-de-sac, depreciating the values of their homes, and creating a high-traffic zone. Their ability to allow their children and grandchildren to play outside will be ended because of the danger of more than 100 cars belonging to both residents and visitors coming and going.

In addition, for residents of Nordic in general, the traffic situation will be dramatically worsened. It is currently very difficult to access highway 99 going south during busy traffic hours. The only possible solution with the increased traffic would be to put in traffic lights. However, the result of that will be that on days where there are icy road conditions, the cars that are stopped at the light on Highway 99 and have poor tires, and or inexperienced winter drivers, will not be able to start up again on the steep uphill on the sides of both of the entrances, and will jam traffic on Highway 99. As everybody in Whistler knows, there are many cars with poor tires and inexperienced drivers, even rental cars that our visitors use which almost never have the proper winter tires.

Also, for all of the children who wait at the bus stop for the school bus, they will have greatly increased traffic to deal with. Just this morning, my son, as he was rushing for the school bus, crossing at the stop sign, was almost hit by a car who did not see him and accelerated from the stop.

The plan for the RMOW was to put employee housing in Cheakamus, and I suggest that is the proper location for an apartment complex like this. Perhaps the RMOW can swap a piece of land with the developer to allow him to put it in the proper location, and not anger all of the current residents of Nordic with decreased home values, increased traffic, and traffic jams at the entries. This is not a slight change to the neighbourhood, but a very large change to a quiet residential area, and does not seem to have the support of anybody who lives here-the rezoning has angered most residents. I believe that city Council has a responsibility to act in the best interests of it's citizens.



Stephen Aikins and Leslie Scott,

2116 Nordic Rd., Whistler, V0N 1B2

From: Renee Unger [<mailto:ungerenee@gmail.com>]
Sent: Thursday, March 22, 2018 13:28
To: Wanda Bradbury <WBradbury@whistler.ca>
Subject: proposed development in Noridic

Bradley and Irene Unger
#21, 4652 Blackcomb Way
Whistler, BC
V0N1B4

March 22, 2018

Mayor & Council
Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, B.C.

Dear Mayor & Council:

We are writing council in support of the employee rental housing project to be located at 2077 Garibaldi Way, Whistler.

Affordable employee housing has been identified as a priority by both the community and the Whistler Chamber of Commerce. This proposed rental development will provide an opportunity for business to participate in a housing solution for their employees.

Our understanding is the development will be targeting technically skilled, supervisory, and management employees that companies are finding very difficult to recruit and retain due to a lack of housing, that is both appropriate and affordable. Securing long-term leases in purpose built rental accommodation at a rate that that can be managed within a company's compensation package would be very positive for local business. This type of development will ensure Whistler business can both attract and retain key employees as they grow within local company's and our community.

We've resided fulltime in Whistler since 2010 and have known and seen firsthand that many employees leave Whistler due to challenges securing appropriate and affordable housing. For business to attract and retain key employees, there must be solutions such as this Garibaldi Way built rental accommodation. Retaining employees are key ingredients to our local business success. Successful business' are integral to maintaining our world class resort and to building a vibrant and caring community. We need to be creative, innovative and move forward on housing solutions like Garibaldi Way. Adding projects like this will help to ensure the long-term success of our local business' and our community.

Sincerely,

Brad and Irene Unger

From: Braden Douglas <bradenbandit@hotmail.com>
Sent: Friday, March 23, 2018 7:01 PM
To: Council
Subject: 2077 Garibaldi Way

Dear Mayor and Council,

I'm a 20 year resident in the Whistler Highlands. I'm writing to oppose the rezoning of 2077 Garibaldi Way.

In addition to the rezoning there used to be a small creek, wetland on the lot that was backfilled recently which likely never had any environmental work done. I also have concerns over increased traffic at both intersections in Nordic. Both intersections are currently barely adequate and sometimes dangerous to turn out of being that they are both on blind corners and lack traffic signals. Long cues of cars are already the normal and already impact our neighbours, even the transit busses have a hard time turning left at the best of times.

Again I oppose further development on this lot other than its original zoning.

Regards
Braden Douglas

Contact info
Braden Douglas
#32 2301 Whistler Rd
bradenbandit@hotmail.com

From: Michel Berthoud [<mailto:meesh@gravityguides.com>]

Sent: Tuesday, March 27, 2018 23:45

To: Council <Council@whistler.ca>

Cc: Mayor's Office <mayorsoffice@whistler.ca>; Nancy Wilhelm-Morden <nwilhelm-morden@whistler.ca>; Jack Crompton <jcrompton@whistler.ca>; Jen Ford <jford@whistler.ca>; John Grills <jgrills@whistler.ca>; Sue Maxwell <smaxwell@whistler.ca>; Steve Anderson <sanderson@whistler.ca>; Cathy Jewett <cjewett@whistler.ca>

Subject: RZ1144 - Re-zoning at 2077 Garibaldi Way

RE: 2077 Garibaldi Way Re-zoning Application

Dear Mayor and Council,

I am writing to **oppose** the proposed re-zoning and development of 2077 Garibaldi Way. This application goes beyond the simple re-zoning of a single lot as it has the potential to adversely impact the existing character of the family friendly Nordic neighbourhood as well as set a precedent for future developments in other established Whistler neighbourhoods.

As others, we bought our property in Nordic because it was a quiet, peaceful, family oriented neighbourhood. Research showed that the adjacent forested block of undeveloped land was zoned as RSE1 and that factored into our decision to purchase. I strongly believe that the proposed 222 bed unit apartment style development – an increase from 6 bed units – is in no way appropriate for the existing Nordic neighbourhood. The higher density will result in an increase in traffic, increased demands on the current infrastructure and overall have a negative impact on the Nordic community.

While I acknowledge that Whistler is in need of affordable employee housing, I believe that this development is neither affordable, or actually employee housing as the developer is proposing renting to businesses rather than employees. Having accommodation tied to employment is a slippery slope and goes against the current OCP. Also the current rental structure is higher than the WHA rates and is beyond what many Whistler workers can afford.

I believe that building affordable housing controlled by the WHA is best long-term solution and that the Legacy Lands in Cheakamus is the ideal location and should be pursued and completed before gifting bed-units to a private developer and a for-profit development.

It seems that the developer and big businesses are using the current housing situation and flexing their combined muscle to justify this development. Who benefits from this proposed development? Businesses benefit by securing housing for their staff – by-passing the existing WHA controlled waiting list – while the developer lines his pockets under the ruse of affordable “employee” housing. Meanwhile, the employee is held hostage as their accommodation is directly tied in to their employment.

This is not just one neighbourhood fighting to prevent approval of this application, it is the community of Whistler raising concerns about the future of the re-zoning process and development. I am only one voice but I speak for our local community when I say please say **NO** to this proposed development.

Michel Berthoud
5-2070 Garibaldi Way
Whistler, BC V0N1B2
(604) 698-7380

meesh@gravityguides.com

From: Lorna Doucette [<mailto:ldouce@telus.net>]
Sent: Wednesday, March 28, 2018 10:10
To: Council <Council@whistler.ca>
Subject: 2077 Garibaldi Way Re-zoning Applicaton

March 3, 2018

Dear Mayor and Council,

Re: 2077 Garibaldi Way re-zoning application

As Whistler residents and property owners have become aware of the captioned re-zoning application heated debate has developed throughout the community. While I can't speak to the difficulty that surrounding neighbourhoods may encounter, I do believe that there are major flaws with this rezoning. It also has the potential to change the future of the re-zoning process and, ultimately, the sustainability of Whistler as a welcoming community for both visitors and residents. I would like to join the opposition to this development proposal and raise some strong concerns, as follows:

- **SIZE AND DENSITY OF THE PROPOSED DEVELOPMENT** – from current single family dwelling with 6 bed units, to multifamily zoning, three 4 storey apartment style buildings, 74 apartments, 222 bed units and 122 parking stalls. To change this zoning at this point in time does not seem fair to property owners living close to the development.
- **Additional pressure to already difficult TRAFFIC PATTERNS** – both roads into Nordic provide extremely difficult access to the highway when turning south. I understand that council had previously denied development of additional day skiers' parking on the timing flats for these reasons.
- **The Developer suggested that this development proposal was discussed with one or two of the largest employers in Whistler.** Was the same consultation offered to small business owners? Will they have the same benefit as larger employers? Proposed rental rates are not affordable to the majority of Whistler employees and are much higher than WHA rates offered.
- **WHA INVOLVMENT IS NOT PART OF THIS DEVELOPMENT-** The majority of the employee restricted accommodation is currently developed and monitored by WHA. Part of the WHA mandate is to keep employees' interest in the forefront and make things fair to all in need of affordable accommodation. I am not aware of any long term rules in place for private employee restricted developments in Whistler. Did Council and staff explore all other options to provide affordable housing managed and controlled by WHA?
- **I understand that ENVIRONMENTAL CONCERNS were ignored in the process of development on this property.** It is now a distressed piece of land due to the owner's previous actions. The owner decided to clear cut the entire property years before submitting a re-zoning application. Did he acknowledge and properly manage the wet lands that are part of this land? Were any environmental assessments and recommendations done?

I would like to finish with a quote from the OCP that was discussed in 2011. There are many similar notes through adopted bylaws, rules and regulations that read in a similar fashion and support my objection to this development.

“Through the active application of balanced resort capacity and this OCP, the RMOW will work with resort partners, stakeholders and the local community to effect and create sustained prosperity. That is, the state of being not only economically successful, but being happy, healthy, with entirety being viable for long term. To sustain prosperity means we maintain an essentially steady-state condition, where economic well being is maintained without requiring continued land development and physical growth that would ultimately compromise the unique attributes which make up social, cultural and natural environments that are the cornerstone of Whistler’s community character and resort success-the Whistler experience.”

Whistler residents are proud of our little town and especially proud that resort communities all over the world hold us up as a model regarding growth management and quality of life! This is not just one neighborhood fighting to prevent approval of this application, it is the community of Whistler raising concerns about the future of the re-zoning process and development.

Sincerely,

Lorna Doucette
2761 Cheakamus Way
Whistler, BC V0N 1B2
604 905 3857
ldeuce@telus.net

From: Daryl Crozier [<mailto:crozier@sfu.ca>]

Sent: Monday, April 02, 2018 15:03

To: Council <Council@whistler.ca>; Mayor's Office <mayorsoffice@whistler.ca>; Nancy Wilhelm-Morden <nwilhelm-morden@whistler.ca>; Jack Crompton <jcrompton@whistler.ca>; Sue Maxwell <smaxwell@whistler.ca>; John Grills <jgrills@whistler.ca>; Steve Anderson <sanderson@whistler.ca>; Cathy Jewett <cjewett@whistler.ca>; Jen Ford <jford@whistler.ca>

Cc: crozier@sfu.ca

Subject: Questions RZ1144 Rezoning 2077 Garibaldi Way

Dear Mayor and Council

I appreciate your efforts to represent the interest of all Whistler owners and tax payers.

For your consideration I provide my comments/questions and recommendations on the Rezoning Application in the attached 'Questions RZ1144 Rezoning 2077 Garibaldi .pdf'

Thank you

Sincerely

Edgar Daryl Crozier
2243 Aspen Drive
Whistler, BC, V0N 1B2
email: crozier@sfu.ca
Tel: 604-938-9591

RZ1144 – 2077 GARIBALDI WAY EMPLOYEE RESTRICTED HOUSING REZONING

Dear Mayor and Council

I appreciate your efforts to represent the interest of all Whistler owners and tax payers.

I am opposed to the present Rezoning Application for 2077 Garibaldi Way.

The proposed high density of the project is inconsistent with the Nordic neighbourhood. If accepted it will have a major negative impact. 2077 Garibaldi is presently zoned for 6 beds. Constructing 74 units with 222 beds will increase neighbourhood noise, increase car and truck traffic.

The quality of life of the residents of Garibaldi Way will be severely diminished. The constant traffic will imperil the physical safety of children, adults and seniors living on Garibaldi Way.

The proposed buildings will dominate the north end of Aspen Drive. The proposed four-storey buildings, contrary to the developers Public Presentation will be higher than the adjacent 2241/2243/2245 triplex and the 2242/2246 duplex.

Listed below are some of my comments/questions and recommendations on the Rezoning Application.

1. Environmental assessment/impact of development of 2077 Garibaldi

Public Presentation by developer: 180219-presentation small,

page 3. FAQ 2. Why was the site disturbed prior to this proposal?

An excavation permit was initially taken out for site preparation of a single-family home. A Riparian Areas Regulation Assessment was requested by the RMOW and completed to obtain the excavation permit.

Questions

Q1.1. Stream on undisturbed lot

There was a stream on the northwest side of the undisturbed 2077 Garibaldi lot. The Department of Fisheries and Ocean requires that the Land Developer conduct an environmental assessment/impact of a Riparian Area before destroying the stream. When was the study conducted, what were the results and what is the file number of the archived results?

Q1.2. Bear cave on undisturbed lot

A mother bear and her cubs lived for years in a cave on the lot before the trees were removed. What was done to protect the bear and her cubs before the cave was destroyed? Were the bears hibernating in the cave when it was destroyed? Were the bears relocated to a different area?

Q1.3. Excavation Permit for undisturbed site

Reference: Administrative Report to Council, Dec 19/2019 Report 17-142, RZ1144

Page 27. Item 15. *Previously disturbed sites, and sites that require minimal alteration and disruption are supported.*

Developer statement: The project site is a .98 ha parcel that has been cleared, grubbed and levelled for use as large estate residence.

After the lot was grubbed (tree roots and stumps removed), the lot was levelled. This levelling was non-trivial. Over a period of at least 2 years large rocks were trucked to the site and used to increase the elevation of the lot. Was this extensive work detailed in the excavation permit? What is the file number of the archived excavation permit?

Q1.4. How can the devastation rendered on the previously disturbed site be ignored?

Easily: It seems that it is acceptable to make extensive alterations to a lot, submit a new rezoning application, label the altered lot "previously disturbed" and then state that there are no environmental concerns regarding the lot in its present state.

How Example 1. Public Presentation: page 5, item 7

Sustainable Planning Strategies and Green Building Standards

- *proposal to use previously disturbed infill site*
- *minimized site disturbance*
- *no net environmental impact to site*

How Example 2. Report 17-142, RZ1144

Pdf Page 27, Item 16

16. An Initial Environmental Review must be conducted. The proposed development shall not have unacceptable negative impacts on any environmentally sensitive lands, and shall adhere to all development permit guidelines for protection of the natural environment and applicable provincial and federal regulations.

Developer statement: An environmental review was completed by Cascade Environmental and no concerns identified.

How Example 3. Pages 6 and 7, Report 17-142, RZ1144

Official Community Plan OCP

Section 4.13.2 of the OCP provides four tests for evaluating rezonings that propose to increase the accommodation capacity of the municipality. Staff consider that the proposal under RZ1144 satisfies these requirements as noted:

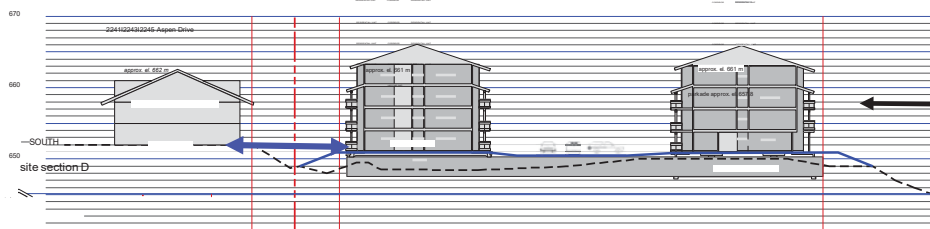
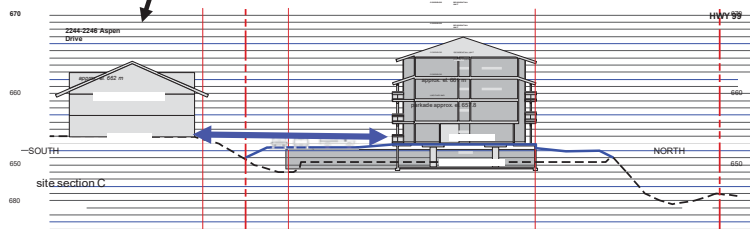
The third test, labelled c) addresses environmental impact.

Section 4.13.2 Criteria		Comment
c)	<i>Will not cause unacceptable impacts on the community, resort, or environment</i>	<i>No significant environmental, social, or economic impacts are expected to result from the proposal. This will be confirmed through further processing of RZ1144</i>

Recommendation. Given questions Q1.1 to 1.4, Council should request a thorough re- examination of the environmental assessment beginning with the undisturbed lot. Given the extensive excavation on the undisturbed lot a geotechnical study of the disturbed lot is required.

'M_PROSPERO_PLANNING_RZ001144_RZ1144-20171219_AdministrativeReportCouncil.pdf'-
Page 18

2244/2246 Aspen Drive



2241/2243/2245
Aspen Drive

180219-presentation-small.pdf
Page 21

Note: No adjacent homes have orientations that create significant sightlines for primary views towards site. Primary views of existing buildings are toward Aspen Dr.

Dense Buffer and Site Depression Concealing Building from adjacent properties

Note: Roof lines of existing buildings are similar or exceed possible roof lines of proposed buildings

????

Really?

2. Size of the proposed buildings

Reference 1: Administrative Report to Council, Dec 19/2019 Report 17-142, RZ1144

Appendix C, pdf page 18, Architectural Drawings

Reference 2: 180219-presentation-small.pdf

Pdf page 21

For your convenience the relevant sections have been placed on the following page.

The scaled drawings of the architect indicate the proposed four storey buildings will exceed the heights of the duplex 2244/2246 and triplex 2244/2246 units on the adjoining Aspen Drive.

Recommendation. Determine why the developer when addressing the view from Aspen Drive, page 21 of his public presentation makes the false statement that "Roof lines of existing buildings are similar or exceed possible roof lines of proposed buildings"

3. RMOW restrictions on number and use of beds in Garibaldi Way Apartments

Reference, **Report 17-142, RZ1144**, Pdf page 26

Item 7. Rental agreements, rent rolls, and unit occupancy must be submitted by the project owner/agent to the RMOW/WHA on an annual basis so that employee occupancy, rent restrictions and rates are verified. Failure to submit this documentation on an annual basis will result in enforceable penalty.

The RMOW Bylaw on tourist rentals with penalties of \$1000 per night for each infraction might be an effective deterrent to tourist rentals in the proposed development. However, there is no restriction on subletting to Whistler employees.

How can an annual report prevent an employee approved as a resident at 2077 Garibaldi Way from filling bedrooms with bunkbeds with either other Whistler employees or seasonal Whistler employees to help pay the rent? At \$3.00 per square foot the proposed initial monthly rents for 1 and 2 bedrooms at \$1974 and \$2475 are unreasonably high.

According to the CMHC October 2017 Rental Market Report the Squamish monthly rents for 1 and 2 bedrooms, \$1036 and \$1161, are substantially lower. After the first year the rent will be permitted to increase by the annual maximum allowed by the BC Government. Assuming the increase remains at the present 2018 maximum of 4 %, at the beginning of the 6th year the 1 and 2 bedroom units at Garibaldi Way Apartments will be permitted to rent for \$2401 and \$3011 per month, respectively. That is, after 5 years the rents will have increased by 21.7%. Are Whistler employers going to commit to increase salaries by 21.7%?

The proposed development is overwhelmingly opposed by the surrounding Nordic neighbourhood.

Recommendation: The proposed limit of 222 beds for Garibaldi Way Apartments is far too high.

Regardless of whatever significantly reduced bed limit is determined, the RMOW Council must enact procedures and legislation to prevent the bed limit from being exceeded by subletting or other subterfuges.

Thank you for your attention.

Sincerely

Daryl Crozier

2243 Aspen Drive
Whistler, BC, V0N 1B2
Email: crozier@afu.ca
Tel: 604-938-9591

Re: 2077 Garibaldi Way re-zoning application

Dear Mayor and Council!

Just prior to Christmas a private re-zoning proposal for the above property was submitted to Council. Many Whistler residents and property owners are now aware of this application and heated debate has developed throughout community. It is not difficult to understand that the magnitude and scale of this development will have a great negative impact upon the proposed neighborhood. It also has the potential to change the future of the re-zoning process and, ultimately, the sustainability of Whistler as a welcoming community for both visitors and residents. As Whistler residents we are proud of our little town and especially proud that resort communities all over the world hold us up as a model regarding growth management and quality of life! This is not just one neighborhood fighting to prevent approval of this application; it is the community of Whistler raising concerns about the future of the re-zoning process and development.

We would like to join the opposition to this development proposal and raise some strong concerns:

- **SIZE AND DENSITY OF THE PROPOSED DEVELOPMENT** – from current single family dwelling with 6 bed units, to multifamily zoning, three 4 storey apartment style buildings, 74 condominiums, 222 bed units and 122 parking stalls. We are not aware of any development in residential areas with similar density.
Such development would drastically change the existing character of the family friendly Nordic neighborhood which is mostly comprised of single family homes, duplexes/triplex style homes and town home developments. Single family homes are predominantly 2 storey buildings and town homes are 3 levels or less. Increased density would affect noise and traffic levels creating an undesirable impact, including loss of quiet enjoyment and the loss of privacy. These factors are what have contributed to making the Nordic neighborhood a desirable place to live and own property.
- **Additional pressure to already difficult TRAFFIC PATTERNS AND PARKING** – we are already noticing more parking on the streets, extremely difficult access to the HWY when turning south. Our understanding is that council previously denied development of additional day skiers' parking on the timing flats for the same reasons.
- **The Developer suggested that submitted re-zoning application was discussed with one or two of the largest employers in Whistler. Was the same consultation offered to small business owners? Will they have the same benefit as larger employers? We cannot see how this re-zoning can be beneficial to a business that is not in a position to commit to years of rental and to subsidies their employees in the same manner as larger businesses. Proposed rental rates are not affordable and much higher than WHA rates offered.**
- **WHA INVOLVMENT IS NOT PART OF THIS DEVELOPMENT.** Majority of the employee restricted accommodation is currently developed and monitored by WHA. Part of the WHA mandate is to keep employees' interest in the forefront and make things fair to all in need of affordable accommodation. We are not aware of any long term rules in place for private employee restricted developments in Whistler. Did Council and staff explore all other options to provide

affordable housing managed and controlled by WHA? Are there any other properties owned by the Municipality that would better suit a development of this scale and density?

- ENVIRONMENTAL CONCERNS that were ignored in the process of development on this property. It is now a distressed piece of land due to the owner's previous actions. The owner decided to clear cut the entire property years before submitting a re-zoning application. Did he acknowledge and properly manage the wet lands that are part of this land? Were any environmental assessments and recommendations done?

These are the most obvious and immediate concerns but we are certain that many more will be discussed in the future.

We would like to finish with a quote from OCP that was discussed in 2011. There are many similar notes through adopted bylaws, rules and regulations that read in a similar fashion and would support our objection to this development.

"Through the active application of balanced resort capacity and this OCP, the RMOW will work with resort partners, stakeholders and the local community to effect and create sustained prosperity. That is, the state of being not only economically successful, but being happy, healthy, with entirety being viable for long term. To sustain prosperity means we maintain an essentially steady-state condition, where economic well being is maintained without requiring continued land development and physical growth that would ultimately compromise the unique attributes which make up social, cultural and natural environments that are the cornerstone of Whistler's community character and resort success-the Whistler experience."

Cathy Goddard
Name

14-2200 Taylor Way Whistler
Whistler address

March 15, 2018
Date

[Signature]
Signature

Dear Mayor and Council,

I understand and support Whistler's need for affordable employee housing. However, I oppose the rezoning of 2077 Garibaldi Way and the proposed development because it:

1. does not meet the requirements of Whistler's Official Community Plan;
2. has a density and design that is wildly at odds with the surrounding neighborhood;
3. does not have appropriate access: 120+ additional vehicles will enter and exit through a quiet residential cul-de-sac;
4. will make Highway 99 access more difficult and dangerous from the affected neighborhoods;
5. is affordable for less than 10% of Whistler's employee population;
6. will not be governed by Whistler Housing Authority's regulations and oversight.

I feel that this site should be developed in a manner consistent with existing housing in the area and zoning should not be changed to allow multi-story apartment buildings.

Yours faithfully,

Name Lynda Hydamaoka

Address #12-2240 Gondola Way

Phone / Email 604-376-9136 / lhydamaoka@hotmail.com

Date March 18/18

From: Sarah Valentine [<mailto:sarafinavalentine@hotmail.com>]

Sent: Thursday, March 22, 2018 9:41 AM

To: corporate <corporate@whistler.ca>

Subject: No to the artificial turf field

To whom it may concern,

I am writing to express my concern about the proposed \$800K artificial turf field as it does not meet Whistler's 'green initiatives, and in the long-run, do more harm than good for this community. I do hope you take the time to look further into this and not silence those on council hoping to discuss it further.

Thank you kindly,

Sarah Valentine

-----Original Message-----

From: Debra Browning [<mailto:debbiebrowning1@hotmail.com>]

Sent: Friday, March 23, 2018 2:58 PM

To: corporate <corporate@whistler.ca>

Subject: Artificial Turf

To the Mayor and Council

First off let me thank all of you for the hours of service you put in for the Wonderful Municipality of Whistler.

It is much appreciated.

I just wanted to put in my 2 cents about the artificial soccer field that has been proposed.

I am shocked and surprised that it is even being considered in this day and age when plastics are epidemic!

Even the water in Howe Sound has been tested and found to have so many ppm of plastic particles in it.

Now we want it in our water system?

I feel grateful that my kids have finished with their short lived soccer careers and won't be exposed to these plastic particles.

Please reconsider your decision and lets move forward not backward in our environmental approaches to a healthy and green Whistler.

Sincerely D. Browning.

From: kaytering@shaw.ca [<mailto:kaytering@shaw.ca>]

Sent: Friday, March 23, 2018 2:51 PM

To: corporate <corporate@whistler.ca>

Subject: Soccer field in question?

Dear Mayor and council

I have to admit I have sat on the sidelines about the soccer field, thinking in my mind never in a million years would anyone vote to have this in our community. Now it seems it is too close for comfort.

Beside the environmental damage did anyone take into consideration the health of our children. There are many articles about the health risks from these carcinogenic chemicals you want your children to play on. Try arsenic, acetone, benzene, chromium, lead and mercury to name a few. If it is made of crumb rubber, (recycled tires) the small black pellets are constantly released and kids bring it home in their clothes and shoes, when laundered end up in our water systems. If they get cut during practice these pellets end up in the wound. Another site states plastic fields get very hot and should be watered down, and weeds can still grow on the fields so bring out the pesticides. Toxic paints used for lines, more injuries and concussions, the list is endless. I am actually sad parents would even consider letting their children play on toxic field. Personally if I lived anywhere near that field I would be very worried about the gassing off in the heat of the summer. Has any research been done on the product in question? Sounds to me an expensive disaster waiting to happen with a cost to our children, our community and environment. Our 3 kids grew up here playing soccer, if that was the option back then, I would not have let my kids anywhere near that field.

What happened to letting our kids play in nature? Is a soccer game really worth the risks?

Karen Kay

From: John and Karen Wood [<mailto:jkwood2@shaw.ca>]

Sent: Friday, March 23, 2018 8:00 AM

To: corporate <corporate@whistler.ca>

Subject: Say no to artificial turf

Dear Mayor and council,

I write to support the thoughts expressed in the March 22 Pique by Lyall Fetherstonehaugh and the continued efforts of other whistler residents and members of RMOW council to oppose the installation of an artificial turf field in whistler.

Yours truly

John and Karen Wood
8573 Drifter Way

From: Cathy Owen [<mailto:owencathy@hotmail.com>]

Sent: Saturday, March 24, 2018 6:22 PM

To: corporate <corporate@whistler.ca>

Subject: NO to the artificial plastic soccer field

TO: Whistler Mayor and Council

I strongly object to the proposed artificial plastic soccer field at Bayly Park.

As a resident of Whistler since 1994, I have witnessed many poor decisions by council but this is the first time I have ever objected.

The artificial plastic soccer field is environmentally irresponsible and backward looking. Period.

Additionally, this use of taxpayer money benefits only the smallest fraction of Whistler's population: The Whistler Youth Soccer Club.

Please make the right decision for the environment and the community, don't allow this project to move forward.

Cathy Owen

From: Alison Bradford [<mailto:alisonb@wrec.com>]

Sent: Monday, March 26, 2018 7:31 PM

To: corporate <corporate@whistler.ca>

Subject: Artificial turf - Attn Mayor and Council

To the Mayor and Council,

I am writing to express my opposition to the proposed artificial turf. It is unsustainable and I do not agree with Whistler and our community contributing to more plastic getting washed into our waterways and oceans. The fact that it needs to be replaced every 10 Years is crazy. Please reconsider this project and come up with a sustainable solution for the soccer players to play on grass that is natural, that is local and that is much more cost effective and easier to maintain.

Thank you.

Kind Regards,

Alison

Alison Bradford

Whistler Resident since 2005

Licensed Associate to Dave Burch PREC

Whistler Real Estate Co.

Cell: 604-906-0797

From: Susie Zabilka <susiez345@gmail.com>
Sent: Wednesday, March 28, 2018 8:48 AM
To: corporate
Subject: To Mayor and council- Artificial Turf Field

It is of great concern that you would bypass the environmental impact of bringing an artificial grass turf to Whistler. This also comes with a cost that is absurd as well.

Why not stick to the natural options we have. Being immersed in nature and dirt is so important for our health and immune system!!

Please consider what is important to us as humans and this planet in the Future!!!

Susie Zabilka

4-7450 Prospect St.
Pemberton BC
V0N2L1

From: Kary Firstbrook <karyfirstbrook@me.com>
Sent: Wednesday, March 28, 2018 10:13 PM
To: corporate
Subject: PLASTIC TURF

Dear Mayor and COUNCIL,

AS a supposedly Green, environmentally friendly town of Whistler.... WHY are we thinking this option for a soccer turf is desirable??? Micro plastics are a problem world wide...OCEAN WIDE.....Disposal is even scarier environmentally and expensive??? We need to go the natural grass route! So what if its muddy sometimes??? The pro's would rather play on it so why ruin our environment and pay a fortune for plastic turf??? WE VOTE NO!!!

Kary Firstbrook and Geordie Trusler
2621 Wolverine Crescent,
Whistler,B.C.
VON 1B2

From: Sandra Jorgenson [<mailto:sandrajorgenson@gmail.com>]
Sent: Saturday, March 24, 2018 10:55 AM
To: corporate <corporate@whistler.ca>
Subject: Artificial Turf Field

To Mayor and Council,

I read recently that Council intends to proceed with the white elephant, also known as an artificial turf soccer field. I will not go into the many reasons why this project is the most ridiculous use of taxpayer money I have ever seen. These reasons have been well documented by many commentators. I just want Council to know that at the upcoming municipal elections I will not vote for any councillor who was in favour of proceeding with this boondoggle. I will however vote for those who voted against it.

Just saying.

Sandra Jorgenson
Taxpayer
72-6127 Eagle Drive
Whistler, BC

From: Stephanie Sloan [<mailto:stephanie@wrec.com>]

Sent: Thursday, March 22, 2018 11:42

To: Wanda Bradbury <WBradbury@whistler.ca>

Cc: Sue Maxwell <smaxwell@whistler.ca>; Cathy Jewett <cjewett@whistler.ca>; Jen Ford <jford@whistler.ca>; John Grills <jgrills@whistler.ca>; Steve Anderson <sanderson@whistler.ca>; Jack Crompton <jcrompton@whistler.ca>; Roman Licko <rlicko@whistler.ca>; wescottkitt@gmail.com <[westcottkitt@gmail.com](mailto:wescottkitt@gmail.com)>; bahalholdings@gmail.com; 'Buff & Nigel Woods' <woodsland.whistler@gmail.com>; dannycox@shaw.ca; Derek Bonin <dereksbonin@gmail.com>; Lauren Shaw <lauren.shaw@shaw.ca>; McNeils <mcneils5125@gmail.com>; Ray Longmuir <ray@wrec.com>; Stephanie Sloan <stephanie@wrec.com>; Stuart Sambel (stuart@whistlerreservations.com) <stuart@whistlerreservations.com>

Subject: Mayor and Council Letter Regarding Rezoning/Variance Application for 5140 Raven Lane

Dear Mayor and Council,

Please review the attached letter and map.

Old Gravel Road/Raven Lane residents are concerned about this application by the owners of 5140 Raven Lane because if approved, it will negatively impact our neighbourhood.

I downloaded the tax report and it looks like they paid \$2000 for this lot (probably with an agreement in place to pay more if their rezoning/variance application is approved). If this is the case, there is very little financial hardship if this application is rejected.

Hopefully you will have time to drive along Old Gravel Road and up to the top of Raven Lane to take a look at this lot.

Thanks,

Stephanie Sloan

5121 Old Gravel Road on behalf of Old Gravel Road and Raven Lane residents.

March 22, 2018

TO: Mayor and Council,

RE: Development Permit Rezoning/Variance Application for 5140 Alta Lake Road

On January 29th Old Gravel Road and Raven Lane residents attended the Board of Variance meeting to protest the application for variance setbacks for 5140 Alta Lake Road. The Board of Variance did not approve the requested setbacks and now we (Old Gravel Road/Raven Lane Residents) understand that the application for rezoning/variance for setbacks is making its way through the planning department and will be presented to Mayor and Council.

Old Gravel Road was created back in the 1960's or 70's, when the original owners were granted permission to buy their lots from the Crown. At that time, the staff person in the crown's office wrote 'road' on the map which meant that the lots suddenly had a road running through them, dividing the lots into two or three sections. This 'road' should have been designated as an easement across the lots to allow access to lot owners further along the road, keeping each parcel as individual lots.

As you will see by the attached map, the green part of the road still runs across crown land and where it narrows (pink) it starts to run through the various lots. There are some very small parcels that were created with the road slicing through the lots. These small parcels range in size from 348 square metres to 431 square metres for 5140 Alta Lake Road - the subject property I am writing to you about.

This lot was never intended to be a building lot. The current zoning/setbacks do not allow for development of this site. The zoning requires a minimum build of 500 square feet. Using the current setbacks, the maximum buildable on this site is 197 square feet.

If approved, the development of this 'lot' will result in inappropriate development of the site, it will adversely affect the natural environment (it has old growth trees and is a wildlife corridor), substantially affect the use and enjoyment of the adjacent lands (crowding, snow clearing, emergency vehicle access issues) and vary the zoning densities.

If rezoning/variance for setbacks are approved, it will then set a precedent for the small 408 square metre triangle of land located below it (where Old Gravel Road forks with Raven Lane), to be developed, as well as the two rectangular pieces at 348 and 276 square metres (see attached map).

The subject property has a road easement off Alta Lake Road and has an Alta Lake Road address. That said, the planning department has told the owners that, if there is to be any development, it cannot be accessed off Alta Lake Road, but that it must be accessed by Old Gravel Road and Raven Lane.

Raven Lane is a very narrow and steep lane access that does not meet municipal standards. The top of Raven Lane is even more sub-standard – it is very narrow and there is no room for a fire truck or an ambulance to manoeuvre or to turn around, especially in the winter. An additional residence in that area will just make an impossible situation much worse.

Old Gravel Road is maintained by Old Gravel Road and Raven Lane residents and cannot support more traffic. It is very expensive to maintain both in the winter and the summer. Despite a very expensive summer and winter maintenance program, it becomes full of pot holes and is very, very dusty which contributes greatly to Whistlers poor air quality rating in the summer.

Please take time to drive along Old Gravel Road and up Raven Lane to take a look at this lot so you can see for yourselves and make an informed decision. We would also urge you to review all the letters written to the Board of Variance by the affected residents in the original Board of Variance application.

Thank you,

Stephanie Sloan, 5121 Old Gravel Road, on behalf of Old Gravel Road and Raven Lane residents who attended the Board of Variance Meeting and are opposition to granting setbacks to 5140 Alta Lake Road:

Ray Longmuir, 5121 Old Gravel Road

Danny Cox and Lauren Shaw 5142 Raven Lane

Kitt and Seth Wescott, 5134 Alta Lake Road

Ron and Shirin Jagday, 5138 Raven Lane

Cathy and Derek Bonin, 5130 Old Gravel Road

Isobel MacLaurin 5129 Old Gravel Road

Rod and Mary McNeil, 5125 Old Gravel Road

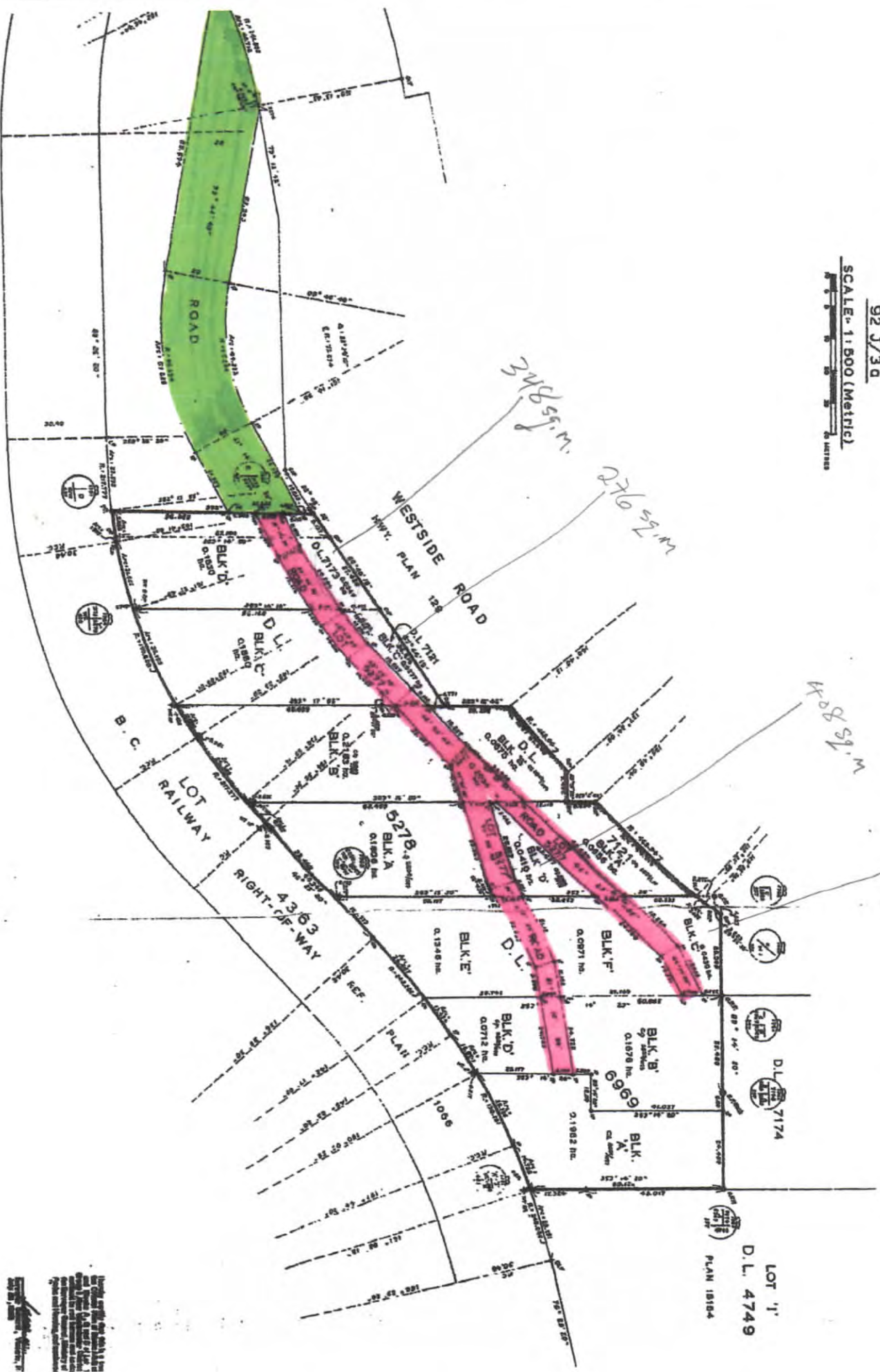
Buffy and Nigel Woods, 5117 Old Gravel Road

Stuart and Linda Sambell, 5145 Old Gravel Road

LOT 7173, BLOCKS 'A', 'B', 'C' And 'D' OF LOT 7121,
BLOCKS 'A', 'B', 'C', 'D', 'E' And 'F' OF LOT 6969, LOT 5272,
AND BLOCKS 'A', 'B', 'C' And 'D' OF LOT 5278, ALL IN
GROUP ONE, NEW WESTMINSTER DISTRICT

92 J/3d

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March 23, 2018

Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, BC
V0N 1B4

Dear Mayor and Council,

Nancy and team,

As part of our commitment to strengthening our municipalities and regional districts, our government has tabled Budget 2018.

I'm delighted to provide you with a summary of the budget and initiatives that may be of interest to you.

Species at risk

Through Budget 2018, our government is proposing providing \$1.3 billion over five years to protect support British Columbia's biodiversity and protect its species at risk. This includes \$500 million from the federal government and \$500 million in matching funds from conservation stakeholders to create a new \$1 billion Nature Fund. The Fund will support conservation efforts on private land, support provincial species protection efforts, and help build Indigenous capacity to conserve land and species.

Endangered whale species

Budget 2018 proposes to provide \$167.4 million over five years to Fisheries and Oceans Canada, Transport Canada, and Environment and Climate Change Canada to recover endangered whale species in Canada, including science funding to help better understand factors affecting the health of whale populations, and actions to mitigate threats from human activity.

Rental Construction Financing Initiative

We have proposed increasing loans provided by the Rental Construction Financing Initiative from \$2.5 billion to \$3.75 billion over the next three years, supporting projects that address modest and middle-income households in our communities. This measure is expected to spur construction of more than 14,000 new rental units across the country, and is complementary to the National Housing Strategy announced last fall.

.../2

Home care and mental health

The Budget builds upon previous investments, such as those in home care and mental health. In Budget 2017, we committed \$1.4 billion to British Columbia to improve access to mental health, addiction services, and home and community care. The province received \$39 million in 2017-2018 for this project and is working on a plan on how to dedicate funding for the first five years.

Early learning and childcare

Our government is investing \$7.5 billion over 11 years, starting in 2017-18 to increase support for early learning and child care. On February 23, 2018, the Canada-British Columbia bilateral agreement was signed, allocating over \$153 million, over three years, towards early learning and child care investments. Children in our communities will have access to low-cost infant and toddler spaces at significantly reduced fees, including children from low-income families in free child care.

Seniors

- In 2016, the government boosted the Guaranteed Income Supplement paid to low-income single seniors. This gives seniors in need in our community as much as \$947 more each year, and is helping nearly 900,000 low income seniors in communities across the country.
- All Canadians deserve a secure retirement, free of financial worries. The government is committed to strengthening public pensions and to improving the quality of life for seniors now, and for generations to come. Since 2016, the Government has:
 - Ensured that senior couples who receive GIS and Allowance benefits and have to live apart can receive higher benefits based on their individual incomes.
 - Restored the eligibility age for OAS and GIS benefits to 65, putting thousands of dollars back in the pockets of Canadians as they become seniors.
 - \$20 million over five years, starting in 2018–19, and \$4 million per year ongoing, to the Public Health Agency of Canada to support community-based projects that address the challenges of dementia in seniors. Projects include programs that provide mental health supports and information about self-care for family caregivers, or initiatives that help Canadians locate resources in their communities quickly, including information about best practices for providing care for people living with dementia.

Infrastructure

\$4.1 billion for British Columbia through integrated bilateral agreement with the federal government, which the Minister of Infrastructure and Communities, the Honourable Minister Sohi, will put in place soon. This agreement will support investments in public transit; green infrastructure; community, cultural and recreational infrastructure; and rural and northern communities.

Small communities

In February 2018, Minister Sohi announced that for small communities of 5,000 people or fewer, including many in our community, the federal government will be increasing the amount it contributes to infrastructure projects from 50% to 60%, and will require the province continue to contribute at least 33% of the project cost. This means some communities will only need contribute a maximum of 7%, to reduce your budgetary burden and provide direct funding to services our community rely on.

I and our staff team are ready to work with you to ensure that the community benefits from Budget 2018.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Pam', written in black ink.

Pamela Goldsmith-Jones, M.P.
West Vancouver-Sunshine Coast- Sea to Sky Country



Walk for Values
A Walk for me, my family and my community!
Celebrating 16 Years of Walk For Values
www.walkforvalues.com



Mayor and Councillors, The Resort Municipality of Whistler

Re: Proclamation Human Values Day April, 24th 2018

Dear Mayor Nancy Wilhelm-Morden and Councillors

On behalf of the Steering Committee and the large number of community volunteers at the Walk for Values, we like to express our deep gratitude to raise awareness to practice Human Values and to building the "Communities of Character". Canada is a great country and we are proud of its multiculturalism and the rich values we hold.

This is the 16th year that we again take an important step walking together at the Walk for Values 2018, not for "fund" raising but taking a pledge to transform self and the community by practicing values. The Walk for Values started in 2003 when street violence took place in Malvern area of Toronto. Your support for this Walk and the proclamation of "HUMAN VALUES DAY" on April 24, 2018 will bring greater awareness about human values that shape our lives and the future of our children. Please be rest assured, we will continue to work diligently to spread your message of living in harmony, caring for each other and our environment, in every city in Canada and around the world.

We have attached with this mail the following documents for your records:

- A write up about the Walk for Values and how it is spreading the Values and helping us to be better citizens of this great country
- Message from Prime Minister of Canada, The Right Honourable Justin Trudeau
- Proclamation and messages from the Province of Alberta , Province of British Columbia, Province of Manitoba and Province of Ontario
- Proclamation from Cities , Towns , Districts , Counties , Municipalities and Villages
- One page summary of 90 Human Values Day Proclamations received in 2017 from across Canada

We look forward to the The Resort Municipality of Whistler proclaiming April 24, 2018 as the "Human Values Day".

In addition, if you have any suggestions in bringing the transformation and it will be very much appreciated. Through a separate invitation, we will send to you the calendar of the Walk for Values to be held in nine Cities across Canada.

Thank you in advance.

Sincerely,

Manish Rughani ~ Advisory Team Walk For Values

Values In Action ~ Go Green

PROCLAMATION

HUMAN VALUES DAY

APRIL 24, 2018

WHEREAS, raising and increasing the AWARENESS of the basic **Human Value** of *truth, right conduct, peace, love and non-violence*, as well as all the multiple sub values like honesty, integrity, kindness and caring in The Resort Municipality of Whistler is a primary goal of this wonderful Resort Municipality; and

WHEREAS, these values are *inherent in all creeds, countries, cultures and communities*, making these values truly **Values without Borders**": and

WHEREAS, making the The Resort Municipality of Whistler 'A **Resort Municipality of Character**' is for the greatest benefit of all our citizens; and

WHEREAS, reducing and even erasing the incidents of violence of all types in our communities and our Resort Municipality will bring PEACE and PROGRESS in all aspects and activities of this Resort Municipality; and

WHEREAS, unlike other walks, **Walk for Values** is not a fund-raiser, but a way to make the city richer and healthier by pledging our commitment to practice these human values, and be motivated to serve our community through volunteer work, or by donating blood or food for the needy; and

WHEREAS, **Walk for Values** is designed to raise the awareness of Human Values and to promote individual responsibility towards the collective future of Humanity, **Walk for Values** is a platform to educate people on the importance of practicing these five Human Values in daily life and the awareness it creates in the making of enlightened citizens for universal peace.

NOW THEREFORE, I, Mayor of The Resort Municipality of Whistler, do hereby proclaim April 24, 2018 as "**Human Values Day**" Day in The Resort Municipality of Whistler.



A REASON TO HOPE. THE MEANS TO COPE.
BRITISH COLUMBIA SCHIZOPHRENIA SOCIETY
BC SCHIZOPHRENIA SOCIETY FOUNDATION
SUPPORTING THE BC SCHIZOPHRENIA SOCIETY

Medical Advisory Board

Dr. Bill MacEwan, FRCPC
Dr. William G. Honer, MD, RCPC
Dr. Anthony Phillips, PhD, FRSC

Mayor Nancy Wilhelm-Morden
Resort Municipality of Whistler
4325 Blackcomb Way
Whistler, B.C. V0N 1B6

April 4, 2018

Dear Mayor Wilhelm-Morden and City Council Members,

On Thursday, May 24, 2018, B.C. Schizophrenia Society will be celebrating National Schizophrenia and Psychosis Awareness Day. On that day we ask people show their support of those dealing with schizophrenia to wear purple as a way to increase awareness.

We are requesting the support of the City of Whistler by “wearing purple” for this important cause and through lighting its landmarks in purple.

Schizophrenia affects one in 100 people, with the predominant age of onset between 15 and 25 years old. It is a debilitating disease that interferes with a person's ability to think clearly, manage emotions, make decisions and relate to others. If treated early, schizophrenia can be managed effectively, allowing for a reasonable quality of life. Even though schizophrenia and other mental illnesses are diseases of the brain, people with mental illnesses and the families that support them face stigma.

National Schizophrenia and Psychosis Awareness Day aims to smash the stigma and make it possible for people to talk about mental illness without shame. B.C. Schizophrenia Society will also be hosting a public event highlighting art, music and writing demonstrate that society just to re-position and re-imagine what success looks like for those who have serious mental illness.

B.C. Schizophrenia Society is a not-for-profit organization that was created in 1982 by family members for family members that provide support and education to families affected by severe and persistent mental illness. Please find attached a completed application form for our request.

If you have any questions, please feel free to email me at communications@bcss.org or give me a call at 604-270-7841.

Best regards,
Jean Fong

1100 – 1200 West 73rd Avenue, Vancouver, B.C. V6P 6G5
Tel: (604) 270-7841 Toll-free Phone: 1-888-888-0029 Email: prov@bcss.org
Charitable Registration #11880 1141 RR0001

bcss.org | facebook.com/BCSchizophreniaSociety | twitter.com/BCSchizophrenia



Landmark Lighting Request Form

Please complete the form and scan/email to corporate@whistler.ca.

This application does not guarantee that your event lighting request will be approved or your date is available.

We will contact you to confirm the status of your request.

Contact Name	
Organization	
Business Address	
City/Province/Postal Code	
Business Phone Number	
Business Email	
Website Address	
Brief description of the event associated with your request <i>(Information here will be used for communications and the sign on the bridge. Max 75 words. RMOW will edit copy if necessary.)</i>	
Optional: Social Media Campaign Title <i>(include hashtags)</i>	
Landmark Choice	<input type="checkbox"/> Fitzsimmons Covered Bridge
Date of Event	
Colour Request	

Signature: _____

Date: _____