City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	May 24, 2016
From:	Phyllis L. Carlyle General Manager, Law and Community Safety	**File:**	12-8350-05-AMANDA #/Vol 01
Re:	**Non-Farm Use Fill Application by Sixwest Holdings Ltd. No. BC1025692 for Property Located at 14791 Westminster Highway**		

Staff Recommendation

1. That the non-farm use application submitted by Sixwest Holding Ltd. to deposit fill on the property located at 14791 Westminster Highway to an agricultural standard suitable for the purpose of nursery tree farming be endorsed; and

2. That the endorsed application be forwarded to the Agricultural Land Commission (ALC) with the Agricultural Advisory Committee's (AAC) comments that the ALC incorporate the following as a condition of the permit:

   a) The applicant ensures that there is no drainage impact on neighbouring properties;
   b) The applicant commits to using only non-contaminated soil supported by a Phase 1 Environmental Site Assessment report and not to bring in construction materials and/or non-excavated soil;
   c) No soil sub-contractor, other than the designated soil provider, to be used to ensure the soil quality;
   d) A performance bond to be provided; and
   e) The property must be left to a condition that it can still be viable for agriculture once the tree nursery operation ceases.

Phyllis L. Carlyle
General Manager, Law and Community Safety
(604-276-4104)

Att. 5

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	
Engineering	☑	
Roads & Construction	☑	
Development Applications	☑	
Sustainability	☑	
Law	☑	
Policy Planning	☑	
Transportation	☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** DW	**APPROVED BY CAO**

Staff Report

Origin

The City of Richmond is in receipt of a non-farm use application by Doug Kavanagh of Sixwest Holdings Ltd. to deposit fill on the property located at 14791 Westminster Highway to an agricultural standard suitable for the purpose of nursery tree farming (Attachment 1).

The property is situated in the Agricultural Land Reserve (ALR) and is subject to the provisions of the Agricultural Land Commission (ALC) Act and associated regulations.

Non-farm use applications must be submitted to the City for review. Pursuant to section 25(3) of the ALC Act, a resolution from Council is required in order to authorize the subject non-farm use application to proceed to the ALC for final decision.

Analysis

The property located at 14791 Westminster Highway is zoned AG1 (Agriculture), which permits a wide range of farming and compatible uses consistent with the provisions of the ALC Act and regulations, the City's Zoning Bylaw and Official Community Plan.

The applicant has been involved in the farming industry in British Columbia through his purchase and ownership of Jones Nurseries Ltd. in Richmond and, in 2015, the planting of two vineyards in Richmond located at16200 Westminster Highway in 2010 and 16060 Westminster Highway.

Uses on Adjacent Lots

To the North: Greenacres Golf Course
To the East: Active agriculture
To the South: Westminster Highway
To the West: Active agriculture and commercial

Item	Existing	Proposed
Owner	Sixwest Holdings Ltd. (Doug Kavanagh)	No change
Applicant	Sixwest Holdings Ltd. (Doug Kavanagh)	No change
Authorized agent	NA	NA
Site size	14.46 hectares (35.74 acres)	No change
Land uses at 14791 Westminster Highway	Vacant land	Tree nursery specializing in large trees for the landscape industry.
OCP designation	Agriculture	No change
ALR designation	Agriculture	No change
Zoning	AG1	No change
Riparian Management Area	5 metres RMA	No change

Project Overview

The total project area of the subject property is approximately 14 hectares. The applicant maintains that excess "free" water for extended periods and general poor site drainage limit the agricultural capability. The applicant states "due to the very high water table, it is currently impossible to grow harvestable trees; by this we mean a tree with a good root system."

The project scope involves placing 140,000 cubic metres of fill to raise the land elevation by an average of 1.2 metres. The fill plan will have surface slopes of 2% to improve surface drainage and new ditches will be installed along the western and southern perimeter of the property. The applicant states that the combination of land elevation increase, improved surface and perimeter drainage will result in an improved agricultural capability rating.

The proposed fill would consist of clean soil from an uncontaminated source; it will have less than 20% coarse fragments; will not be rich in clay and will not contain any foreign material. All fill will meet the Contaminated Sites Regulations (CSR) schedule 7 standards. The applicant proposes to strip off the existing topsoil (on average 30cm), place 1.2 metres of fill and re-spread the 30 centimetres of topsoil.

Consultation – Richmond Agricultural Advisory Committee

The Richmond Agricultural Advisory Committee (AAC) reviewed the project on September 24, 2015. The AAC requested the applicant provide answers to questions previously asked by staff and to provide information on additional concerns by the AAC (Attachment 2).

The applicant submitted a comprehensive Agrologist report with addendums dated February 2, 2016 (Attachment 3). The Agrologist report concludes that: "The intent of fill placement is to improve drainage conditions that limit agricultural capability. After the addition of fill followed by soil profile construction as we have recommended, the agricultural capability will improve to Class 2 with some water limitations."

The updated fill and drainage plan provided by Madrone Environmental Services Ltd. includes cleaning and deepening the existing eastern ditch to allow drainage to the south into the main Westminster Highway ditch. It also proposes new ditches along the western and southern side of the property that will drain east and connect with the existing ditch that drains south to the Westminster Highway ditch.

The applicant has advised that the filling will take place in three phases. The total duration of the project will be up to three years. The applicant has confirmed that the monitoring, inspection and reporting of the fill activities will be overseen and conducted by a professional Agrologist.

This response was brought forward to the AAC for final review on April 26, 2016. There was no AAC quorum, but to help the applicant, the AAC offered the following comments: The AAC supported the filling of the land for a nursery tree farm providing that sufficient fill management and monitoring mechanisms were put in place. The Chair introduced the following motion:

That the ALR non-farm use application for soil fill at 14791 Westminster Highway be supported subject to the following conditions:

A. *The applicant ensures that there is no drainage impact on neighbouring properties;*
B. *The applicant commits to using only non-contaminated soil supported by a Phase 1 Environmental Site Assessment report and not to bring in construction materials and/or non-excavated soil;*
C. *No soil sub-contractor, other than the designated soil provider, to be used to ensure the soil quality;*
D. *A performance bond to be provided; and*
E. *The property must be left to a condition that it can still be viable for agriculture once the tree nursery operation ceases.*

Due to the absence of quorum, the motion could not be considered, but the applicant has the benefit of the AAC consideration.

The notes of the meeting are included in (Attachment 4).

Staff Comments

The watercourse (Westminster Highway road ditch) bordering the property on the south has a five metre wide Riparian Management Area (RMA). As the proposed fill activity is for a farm use, it is exempt from the Provincial Riparian Area Regulations. However, the applicant is subject to the provisions under the City's Water Course Protection and Crossing Bylaw No. 8441and Pollution Prevention and Clean Up Bylaw No. 8475 that prohibits the introduction of pollution (such as sediment laden water) to the water course. The Agrologist report indicates that all fill activities and new drainage ditches will be a five meter distance from the top of the bank to mitigate erosion and sediment transfer to the adjacent watercourse.
The majority of the subject property is designated in the Official Community Plan as an Environmentally Sensitive Area (ESA) and is classified as "old field and shrub land" habitat (i.e. abandoned agricultural or cleared lands that support mixed grass, forb and shrub vegetation that typically provide habitat for small mammals and birds.

In recognition of the importance of bringing agricultural land back into production, the Official Community Plan provides an Environmentally Sensitive Area Development Permit exemption under section 14.1.6.2 of the Development Permit Guidelines for established farmers who will be legitimately farming the lands. The proposed land fill application and commitments made by the applicant as an established farmer to farm the site qualify for the ESA Development Permit exemption.

The City will inform the applicant to install sediment and erosion control measures to protect the adjacent watercourse.
The applicant has submitted a traffic control plan and the proposed route(s) is acceptable to staff. However, the scope of the operation requires strict adherence to operating between the hours of 9:00 AM and 4:00 PM. Traffic control personnel are not anticipated to be required based on the traffic management plan.

The applicant also submitted a geotechnical impact assessment conducted by Horizon Engineering Inc. on October 10, 2014 (Attachment 5) that states no fill should be placed within 10 metres of any settlement sensitive structures, and given a setback from the property boundary is included in the fill plan, we envisage that there would be no adverse impact to the structures in the neighbouring properties due to potential ground settlement.

If the ALC approves the fill application for the subject site, the City will issue a soil deposit permit to the applicant and require the applicant to provide the following security to the City:

- $5,000 pursuant to section 8 (d) of the Boulevard and Roadway Protection Regulation Bylaw No. 6366 to ensure that roadways and drainage systems are kept clear of materials, dirt or mud during or resulting from the fill activity.

- $10,000 pursuant to section 4.2 of the Soil Removal and Fill Deposit Regulation Bylaw No. 8094 to ensure the full and proper compliance with the provisions of this bylaw and all terms and conditions of the soil deposit permit.

Furthermore it is customary that the ALC will most likely request monthly or quarterly inspections and monitoring by a professional Agrologist as well as submission of monthly or quarterly reports to the ALC with a copy to the City.

In addition the ALC may request that semi-annual volume surveys take place during the life of the fill project to determine the volume of fill on the site and volume of fill left to complete the project. The results of the volume surveys should be submitted as part of the Agrologist report.

Financial Impact

None

Conclusion

Staff supports the comments of the Agricultural Advisory Committee and recommends Council endorse the non-farm use application submitted by Sixwest Holding Ltd. to deposit fill on the property located at 14791 Westminster Highway to an agricultural standard suitable for the purpose of nursery tree farming.

Ben Dias
Manager, Communty Bylaws
(604 247-4601)

BD:bd

Att. 1: Copy of Non-Farm Use application by Sixwest Holdings Ltd.
2: Excerpt of Agricultural Advisory Committee Meeting Minutes dated Sept 24, 2015
3: Copy of Agrologist Report (Madrone) dated February 2, 2016
4: Excerpt of Agricultural Advisory Committee Meeting Discussion Notes dated April 26, 2016
5: Copy of Geotechnical Investigation Report (Horizon) dated October 10, 2014

SCHEDULE C to BYLAW NO. 8094

Application for Soil Removal / Fill Deposit
Proposed Farm or Non-Farm Operations - Agricultural Land Reserve

☐ Application to remove soil ☑ Application to deposit fill

Owner: SIXWEST Holdings LTD
Address: 16060 Westminster Hwy. RICHMOND BC V6V 1A8
Telephone: (B) (C) 604 618 1721 (F)
Email: dougie Kavanagh @ me. Com

Owner or Agent: Douglas Kavanagh
Address: 16060 Westminster Hwy RICHMOND BC V6V 1A8
Telephone: (B) (C) 604 618 1721 (F)
Email:

Address of Property or Legal Description 14791 Westminster Hwy. LOT 1 PID 011-305-231
Size of Property / Parcel: 14.483 hectares
Current Use of Property: In Fallow

Adjacent Uses: North: Golf; East: Farm; South: Westminster Hwy.; West: Commercial

Total Project Area: 14.4 hectares
Volume of Soil or Fill: 172,800 cubic metres
Depth of Soil or Fill: 1.2 metres
Duration of Project: 24-36 weeks / months

Type of Soil / Fill Material (reference *Guidelines for Farm Practices Involving Fill (BC Ministry of Agriculture and Lands)*
SILTY CLAY LOAM, SAMOY LOAM, COARSE TEXTURED - all local native soil

Purpose of Project (reference *Guidelines for Farm Practices Involving Fill (BC Ministry of Agriculture and Lands)*
Improve this land from existing 4W/3W to a consistent CLASS 2W

Proposed Reclamation Measures (for soil removal projects)

SCHEDULE C to BYLAW NO. 8094

Application for Soil Removal / Fill Deposit
Proposed Farm or Non-Farm Operations - Agricultural Land Reserve

Has a Professional Agrologist reviewed the project and provided a written report? ☑ Yes ☐ No

(If yes, please attach a copy of the report)
(If no, please explain why) _____

Has a Professional Engineer reviewed the project and provided a written report? ☑ Yes ☐ No

(If yes, please attach a copy of the report)
(If no, please explain why) _____

Are you hereby undertaking to provide a security deposit as outlined in Section 4.2.1 of the City's Soil Removal and Fill Deposit Regulation Bylaw No 8094 (deposit is required to be in place before any permit is issued) ☑ Yes ☐ No

Have all requirements been met under the following City Bylaws:

Boulevard and Roadway Protection and Regulation Bylaw No. 6366	☐ Yes	☑ No
Tree Protection Bylaw No. 8057	☐ Yes	☑ No n/a
Public Health Protection Bylaw No. 6989	☐ Yes	☑ No

(If yes for any, please attach confirmation)
(If no for any, please explain why) _____

Please attach the following documents:

- ☑ Copy of Submission to Agricultural Land Commission
- ☑ Certificate of Title or Title Search Print
- ☑ Map or sketch of parcel showing the proposed project
- ☐ Map of Routing and Schedule for Vehicular Traffic
- ☑ Any photographs
- ☐ Other Documents as Required under Section 4.1

Declaration: I/We declare that:

- the information provided in this document is true and correct, to the best of my/our knowledge, and
- that any fictitious or misleading information that I/we provide may be a violation of the City of Richmond Soil Removal and Fill Deposit Regulation Bylaw No 8094 and punishable by a fine of up to $10,000.

March 16/15
Date

Signature of Owner

Douglas Kavanagh
Print name

APPLICATION TO PLACE FILL OR REMOVE SOIL
UNDER SECTION 20(3) OF THE AGRICULTURAL LAND COMMISSION ACT

NOTE: The information required by this form and the documents you provide with it are collected to process your application under the Agricultural Land Commission Act and regulation. This information will be available for review by any member of the public. If you have any questions about the collection or use of this information, contact the Agricultural Land Commission and ask for the staff member who will be handling your application.

APPLICANT

Registered Owner: SIXWEST HOLDINGS LTD.	~~Agent:~~ owner Douglas Kavanagh.
Address: 16060 WESTMINSTER HWY RICHMOND BC.	Address: 16060 Westminster Hwy Richmond BC
Postal Code V6V 1A8.	Postal Code V6V 1A8
Tel. (home) (work) 604.618 1721 Fax	Tel. 604 618 1721 Fax
E-mail Dougle Kavanaghe me.com	E-mail

LOCAL GOVERNMENT JURISDICTION *(Indicate Regional District or Municipality)*

CITY OF RICHMOND.

LAND UNDER APPLICATION *(Show land on plan or sketch)*

Title Number	Size of Parcel (Ha.)
LOT 1 PID 011-305-231	35.79 acres / 14.483 hectares

CURRENT USE OF LAND UNDER APPLICATION *(Show information on plan or sketch)*

List all existing uses on the parcel(s) and describe all buildings

THERE ARE NO BUILDINGS, Property Currently in fallow
SOME Agriculture Beds in the WestSIDE of Property.
-tenant. Arts Nursery

PROPOSAL *(Show on plan or sketch)*

☑ To Place Fill ☐ To Remove Soil ☐ To Remove Soil and Place Fill

Type of Material: SILTY CLAY LOAM, SANDY LOAM, COARSE TEXTURED

Volume: 173,520 m³ cubic metres Depth: 1.2 metres

Total Project Area: 14.46. (hectares) Duration of Project: 2-3 years

Type of Equipment to be Used: *(i.e. screening plants, washers, portable asphalt and concrete plants)*
BULL DOZER · EXCAVATOR

Proposed Reclamation Measures: ⊛ PLEASE SEE ATTACHED REPORT ·

Reclamation plan prepared by Professional Agrologist ☐ Yes *(If yes, attach plan)* ☐ No

Purpose of Project:
Improve this property to allow for a · tree farm ·

⊛ please see ~~Attached~~ report ·

Explain how the proposal will benefit the agricultural use of the property:
Improve this land from existing CLASS 3W to 4W to a consistent CLASS 2W

USES ON ADJACENT LOTS *(Show information on plan or sketch)*

North — Golf
East — Farm
South — Westminster Hwy / some residential
West — Commercial

Are there any farm activities such as livestock operations, greenhouses or horticultural activities in proximity to the proposal?

☑ Yes *(If yes, please specify farm activity and location)* ☐ No
Surface vegtables to the east of subject property & some green houses

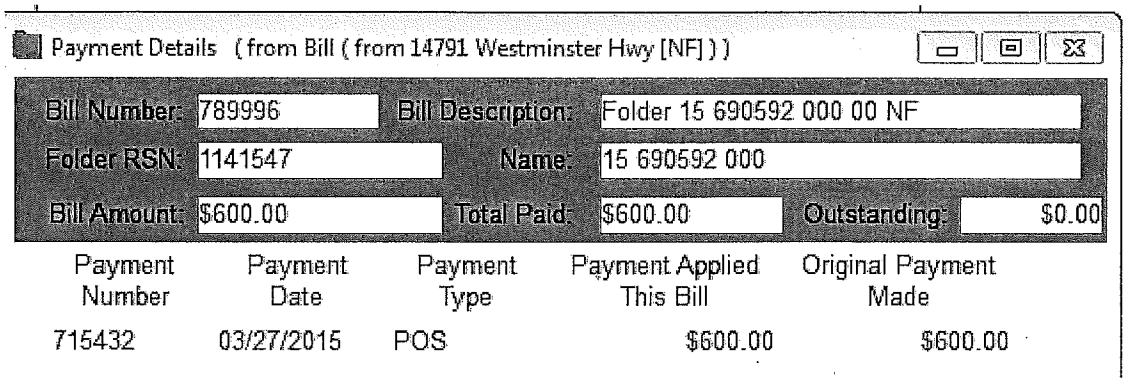
DECLARATION

I/we consent to the use of the information provided in the application and all supporting documents to process the application in accordance with the *Agricultural Land Commission Act* and regulation. Furthermore, I/we declare that the information provided in the application and all the supporting documents are, to the best of my/our knowledge, true and correct. I/we understand that the Agricultural Land Commission will take the steps necessary to confirm the accuracy of the information and documents provided.

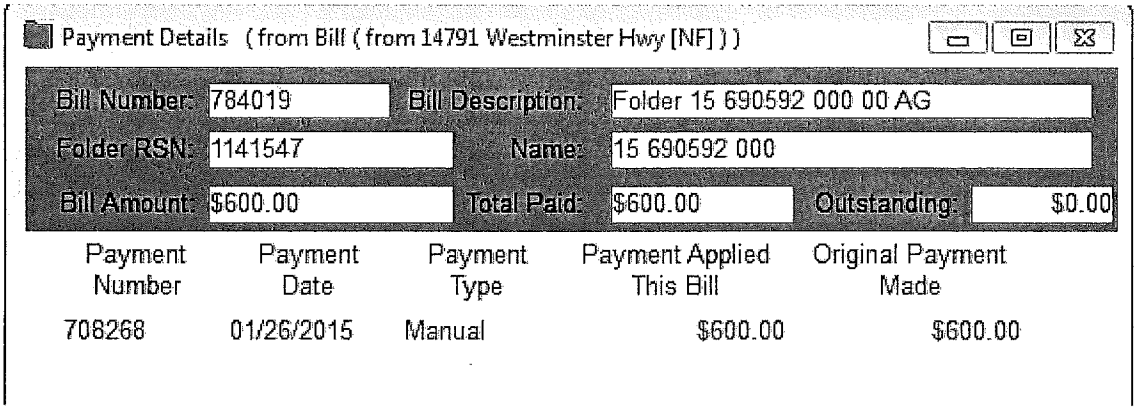
Date	Signature of Owner or Agent	Print Name
March 16/15	Owner	Douglas Kavanagh ·

Total Fees Paid: $1,200.00

$600 ALC Act Fees



$600.00 City Fees



Attachment 2

Excerpt from the Minutes from

The Agricultrural Advisory Committee Meeting

Thursday, September 24, 2015 – 7:00 p.m.
M.2.002
Richmond City Hall

2. Development Proposal - Non-Farm Use Application (Soil Fill) 14791 Westminster Highway

Community Bylaw Staff (Michelle Orsetti) provided an overview of the Agricultural Land Reserve (ALR) soil fill application to establish a tree nursery at 14791 Westminster Highway. The Chair invited the applicant and the project Agrologist to the table.

The Chair introduced the following motion:

That the non-farm use application for 14791 Westminster Highway be returned to the AAC for further review once the missing information previously requested by staff as well as the following additional information is provided to the satisfaction of staff:

1. *A detailed topographic survey (a minimum of 10 m xy and a minimum of 0.01m z) referenced to geodetic datum;*
2. *Elevations and cross sections showing the finished grades with topographic reference to geodetic elevations;*
3. *Site phasing details referenced to every 2 to 3 years with the finished grade of each phase indicated;*
4. *A survey of any drainage courses on the subject site;*
5. *A detailed drainage plan including the invert levels of all drainage pipes;*
6. *A percolation test for soil hydrology;*
7. *Details of the agricultural history of the site;*
8. *A detailed proposed farm plan including details of the proposed farm access;*
9. *A detailed analysis of the long-term agricultural viability of the site (i.e., what other crops or agricultural operations will be viable on the site in the future);*
10. *Agricultural experience of the owner and/or operator to successfully implement the proposed farm plan;*
11. *Detailed explanation/justification as to how the subject site is different from the neighbouring sites to the west and east and why the proposed soil fill is necessary for the subject site while it was not necessary for viable agricultural operations on the neighbouring sites (to the west has been a successful tree nursery without soil fill and immediately to the east is one of the most productive farms in Richmond with mixed farming operations);*
12. *Geodetic comparisons to the site at 18431 Westminster Highway where East Richmond Nurseries Inc. is located;*
13. *Details of the proposed retaining wall and how it will interact with neighbouring sites;*
14. *Impacts of the raised elevations on the neighbouring properties;*

15. *Details of a range of crops and agricultural operations that can be implemented on the site without soil fill, and;*
16. *Reference to the City's 2006 East Richmond Agricultural Water Supply Study, which was recently updated.*

Carried unanimously

MADRONE
environmental services ltd.

F: 604. 504-1912
www.madrone.ca
info@madrone.ca

February 2, 2016

Ms. Michelle Orsetti
City of Richmond
6911 No. 3 Road,
Richmond, BC V6Y2C1

RE: Response to McTavish Resource & Management Consultants Ltd. Assessment of 'Non-Farm use fill application' at 14791 Westminster Hwy, Richmond

Application for fill placement on Mr. Doug Kavanagh's A1 agricultural land parcel within the ALR was made to ameliorate excess moisture conditions, which limit the land capability for agriculture.

McTavish Resource & Management Consultant Ltd (McTavish) was contracted by the City of Richmond to review the fill placement application. A summary of the McTavish points is provided in italics.

A substantial effort was required to respond to these questions. A detailed land survey was carried out to determine ground elevations throughout the property as well as in ditch and culvert invert elevations. The results of this survey were:

1) Ground elevations are indeed low even for this area of Richmond, and
2) Ground levels were more uneven than we thought after our original soil survey in December 2014.

Confirmation of the low elevations strengthens our position that fill importation is a reasonable and justifiable method to improve the land.

The new information on surface variability has resulted in our adjusting the estimated volume downwards from the original 173,520 m^3 to 140,000 m^3. In addition, we tweaked the plan to increase slopes to 2% (from 1%) to improve drainage. The average depth remains at 1.2 m.

Response to Questions

Below is a point-by-point response to McTavish's commentary on the fill application.

1 A detailed topographic survey referenced to geodetic datum.
This has been completed. See Figure 1.

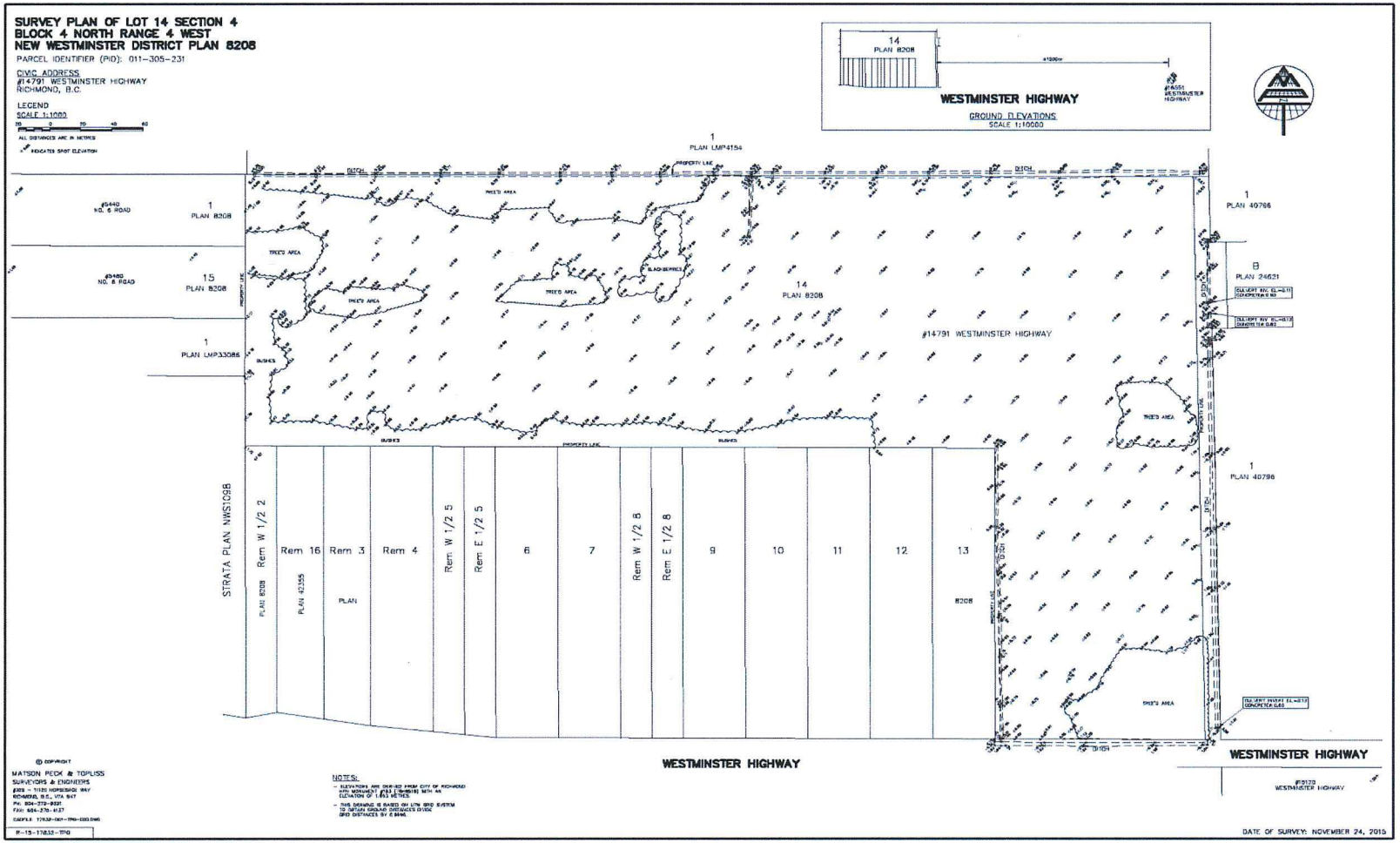

SURVEY PLAN OF LOT 14 SECTION 4
BLOCK 4 NORTH RANGE 4 WEST
NEW WESTMINSTER DISTRICT PLAN 8208
PARCEL IDENTIFIER (PID): 011-305-231
CIVIC ADDRESS
#14791 WESTMINSTER HIGHWAY
RICHMOND, B.C.
LEGEND
SCALE 1:1000
ALL DISTANCES ARE IN METRES
INDICATES SPOT ELEVATION
WESTMINSTER HIGHWAY
GROUND ELEVATIONS
SCALE 1:10000
#14791 WESTMINSTER HIGHWAY
STRATA PLAN NWS1098
Rem W 1/2 2
Rem 16
Rem 3
Rem 4
Rem W 1/2 5
Rem E 1/2 5
6
7
Rem W 1/2 8
Rem E 1/2 8
9
10
11
12
13
WESTMINSTER HIGHWAY
MATSON PECK & TOPLISS
SURVEYORS & ENGINEERS
DATE OF SURVEY: NOVEMBER 24, 2015

FIGURE 1

The survey confirms that the ground is at a low elevation, relative to adjacent properties. The BCLS surveyor confirms that the average elevation of the property is 0.6 m, which is low for Richmond. Other off-site elevations were measured, as follows:

#5440/#5480 No 6. Road: 1.2 to 1.4m
#15120 Westminster Highway: 1.35 m
#16551 Westminster Highway: 1.9 m.

Figure 1 shows that about 70% of the land area lies between 0.5 and 0.7 m elevation. The remaining 30% - mainly in the western portion – lies below 0.5 m.

2 Elevations and cross-sections showing the finished grades with topographic reference to geodetic elevations.

See Figure 2a, b, c and d. These cross-sections are a more detailed version of a similar diagram that was included in the original submission. It shows the topographic variation in the ground surface, as provided by the detailed geodetic survey. The slope away from the centre has been increased to 2% to allow better drainage towards the periphery.

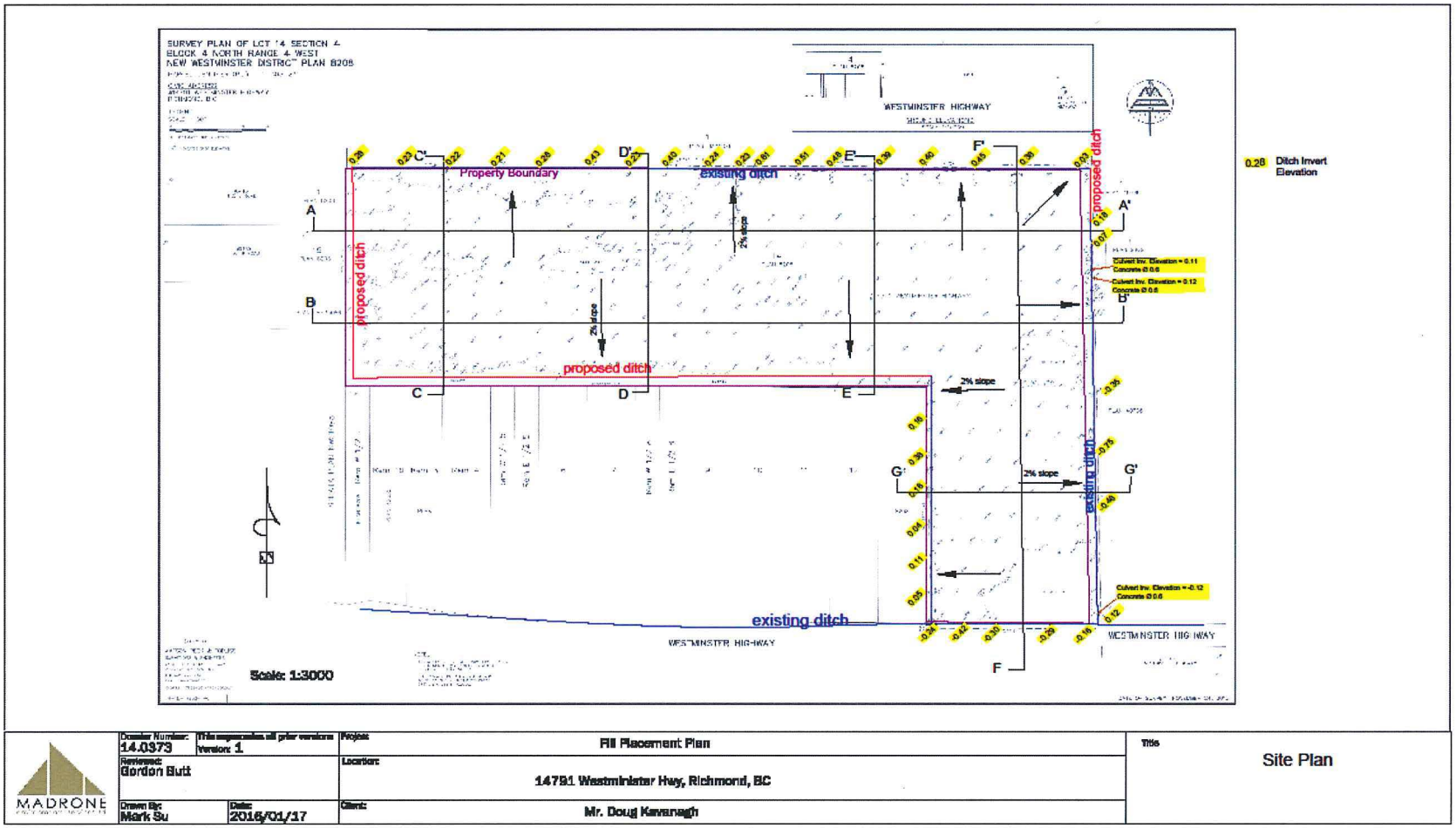

SURVEY PLAN OF LOT 14 SECTION 4
BLOCK 4 NORTH RANGE 4 WEST
NEW WESTMINSTER DISTRICT PLAN 8208
WESTMINSTER HIGHWAY
Property Boundary
existing ditch
proposed ditch
2% slope
existing ditch
WESTMINSTER HIGHWAY
Scale: 1:3000
0.28 Ditch Invert Elevation
Culvert Inv. Elevation = 0.11
Concrete Ø 0.6
Culvert Inv. Elevation = 0.12
Concrete Ø 0.6
Culvert Inv. Elevation = -0.12
Concrete Ø 0.6
Dossier Number: 14.0373
This supersedes all prior versions
Version: 1
Reviewed: Gordon Butt
Drawn By: Mark Su
Date: 2016/01/17
Project: Fill Placement Plan
Location: 14791 Westminster Hwy, Richmond, BC
Client: Mr. Doug Kavanagh
Title: Site Plan
MADRONE

FIGURE 2A


A
A'
3:1 slope (H:V)
3
1
(w.o vertical exaggeration)
Elevation (meters above sea level)
20x Vertical Exaggeration
4 m
3 m
2 m
1 m
0 m
-1 m
Property Boundary
Proposed ditch
5m buffer
3:1 slope (H:V)
5m buffer
Property Boundary
Existing ditch
Cross-Section A-A'
B
B'
Property Boundary
Proposed ditch
5m buffer
3:1 slope (H:V)
5m buffer
Property Boundary
Existing ditch
Cross-Section B-B'
Scale: 1:2000
MADRONE
Dossier Number: 14.0373
This supersedes all prior versions
Version: 1
Reviewed: Gordon Butt
Drawn By: Mark Su
Date: 2016/01/17
Project: Fill Placement Plan
Location: 14791 Westminster Hwy, Richmond, BC
Client: Mr. Doug Kavanagh
Title
Cross-sections A and B

FIGURE 2B

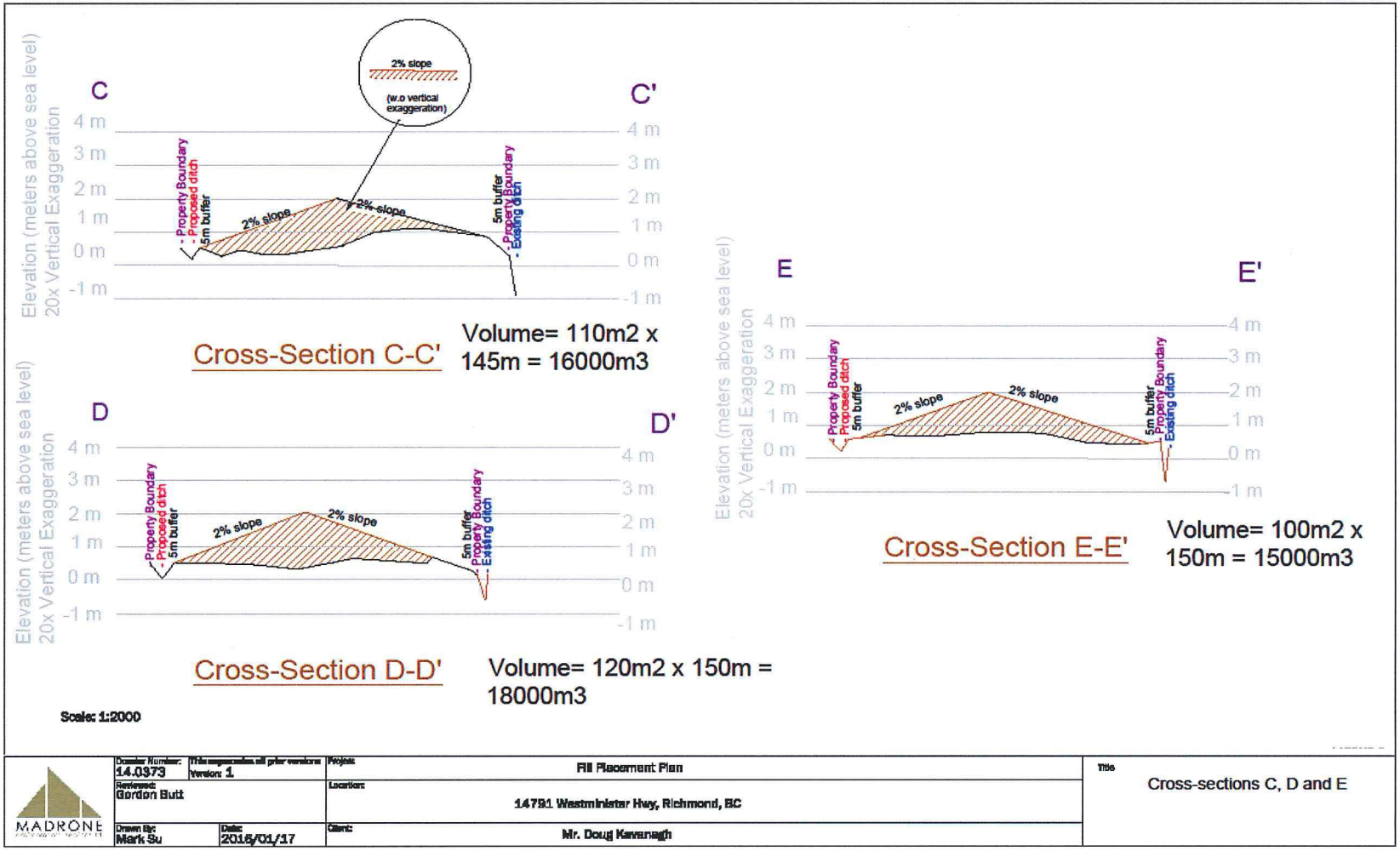

C
C'
2% slope
(w.o vertical exaggeration)
Elevation (meters above sea level)
20x Vertical Exaggeration
4 m
3 m
2 m
1 m
0 m
-1 m
Property Boundary
Proposed ditch
5m buffer
2% slope
2% slope
5m buffer
Property Boundary
Existing ditch
Cross-Section C-C'
Volume= 110m2 x 145m = 16000m3
D
D'
Cross-Section D-D'
Volume= 120m2 x 150m = 18000m3
E
E'
Cross-Section E-E'
Volume= 100m2 x 150m = 15000m3
Scale: 1:2000
MADRONE
Dossier Number: 14.0373
Version: 1
Reviewed: Gordon Butt
Drawn By: Mark Su
Date: 2016/01/17
Project: Fill Placement Plan
Location: 14791 Westminister Hwy, Richmond, BC
Client: Mr. Doug Kavanagh
Title: Cross-sections C, D and E

FIGURE 2C

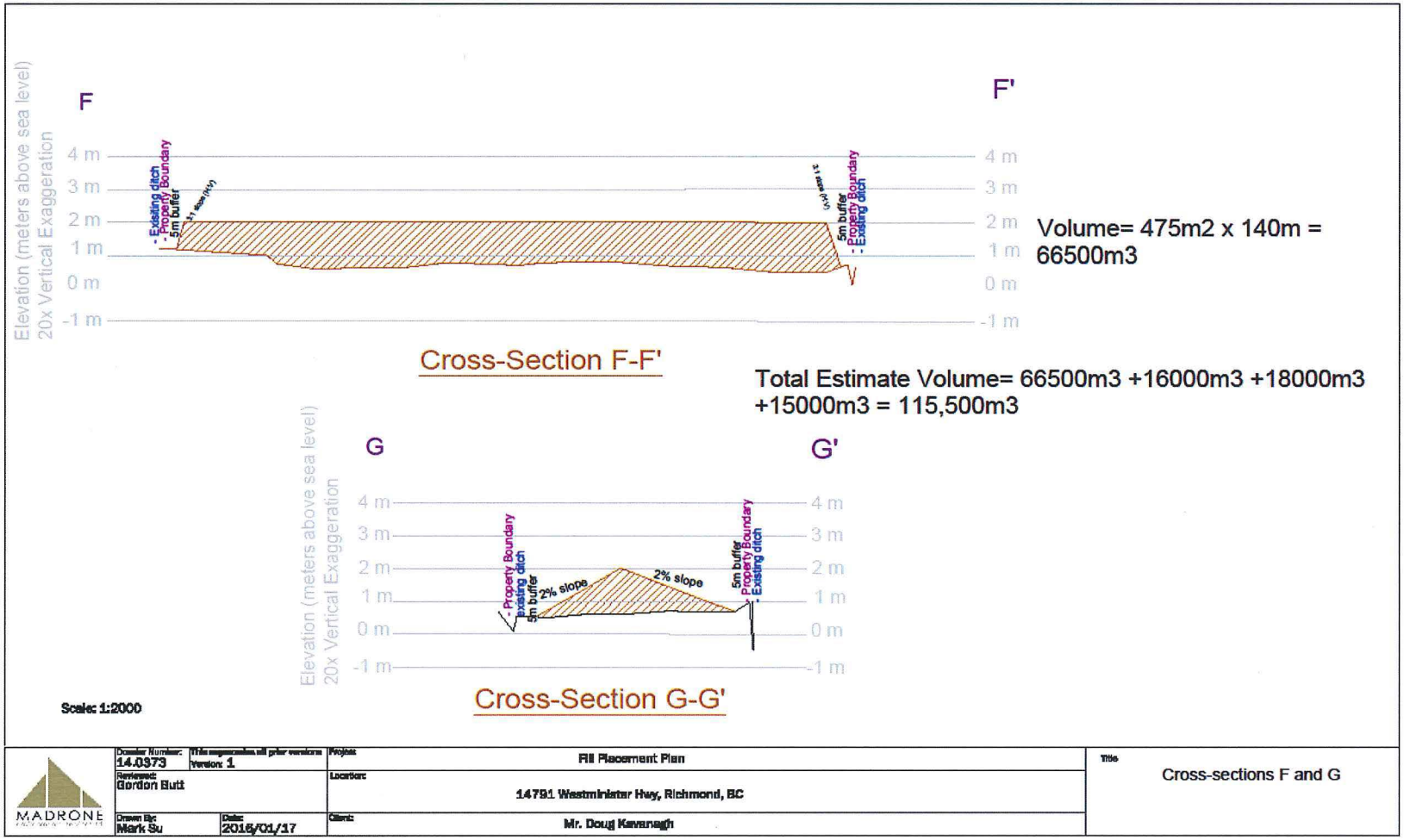

F
F'
Elevation (meters above sea level)
20x Vertical Exaggeration
4 m
3 m
2 m
1 m
0 m
-1 m
Existing ditch
Property Boundary
5m buffer
3:1 slope (typ)
Volume= 475m2 x 140m = 66500m3
Cross-Section F-F'
Total Estimate Volume= 66500m3 +16000m3 +18000m3 +15000m3 = 115,500m3
G
G'
2% slope
Cross-Section G-G'
Scale: 1:2000
Dossier Number: 14.0373
Version: 1
Reviewed: Gordon Butt
Drawn By: Mark Su
Date: 2016/01/17
Project: Fill Placement Plan
Location: 14791 Westminster Hwy, Richmond, BC
Client: Mr. Doug Kavanagh
Title: Cross-sections F and G
MADRONE

FIGURE 2D

3 Site Phasing details referenced to every 2 to 3 years with the finished grade of each phase indicated.

Figure 3 shows the phasing plan along with final grades and depths of fill at selected locations.

Access to the site will be from No. 6 Road, via 5440 # 6 Road, an adjacent property also owned by Doug Kavanagh. No new ditch crossing is envisaged and existing roads on the property will be used, but may require extra ballast to support haul trucks. A wheel-wash and inspection point will be installed near the entrance/exit. At this point, we envisage the main access to be from No. 6 Road, but later it may be necessary to shift to the access point in the southeast corner on Westminster Highway (to complete Phase 3). Any crossing upgrades will be done then. If this change is planed the City will of course be notified. A new wheel-wash facility and inspection point will be installed there as well.

The fill operation will extend from west to east from this access point. Figure 3 shows the areas of three broad phases. The first operation will be construction of a road to allow machine access onto the property. The road would lead to as-yet undetermined points or nodes with sufficient area to allow machine operation (we prefer to leave these details to the contractor). All topsoil under the road footprint will be stripped and windrowed adjacent to initial road construction. From this point, stripping and stockpiling of topsoil would proceed systematically in a specific pattern developed by the contractor (Hexall Construction, a trusted City of Richmond Contractor).

Fill will be imported, dumped and temporarily stockpiled near each point or node and after adjacent areas are stripped, fill will be pushed out using dozers and excavators. The contractor will determine exact areas of topsoil stripping and fill placement, but it will be in a progressive fashion. The fill thickness will roughly conform to the elevations and depths shown in Figure 3.

When one area is completely filled, the next step is the grading, using laser-levelling technology to conform to the 2% slopes in the plan.

After satisfactory grading, topsoil will be respreads to a thickness of 30 cm.
At regular (3 week intervals) a qualified professional will inspect the site to ensure satisfactory stripping, stockpiling, import fill quality, and adherence to setbacks.

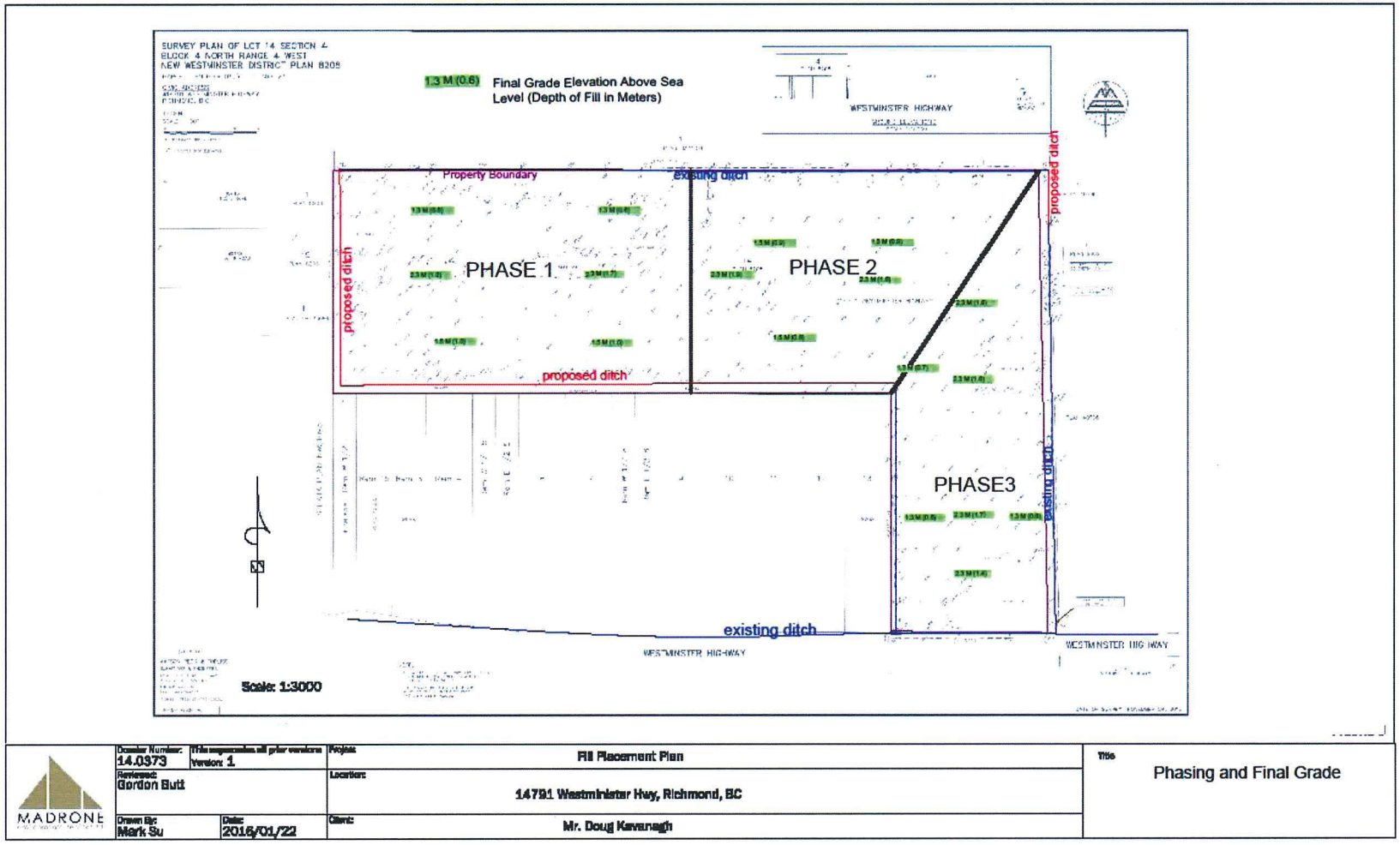

SURVEY PLAN OF LOT 14 SECTION 4
BLOCK 4 NORTH RANGE 4 WEST
NEW WESTMINSTER DISTRICT PLAN 8208
1.3 M (0.6) Final Grade Elevation Above Sea Level (Depth of Fill in Meters)
WESTMINSTER HIGHWAY
Property Boundary
existing ditch
proposed ditch
PHASE 1
PHASE 2
PHASE3
proposed ditch
existing ditch
existing ditch
WESTMINSTER HIGHWAY
WESTMINSTER HIGHWAY
Scale: 1:3000
MADRONE
Dossier Number: 14.0373
This supersedes all prior versions Version: 1
Reviewed: Gordon Buti
Drawn By: Mark Su
Date: 2016/01/22
Project: Fill Placement Plan
Location: 14791 Westminster Hwy, Richmond, BC
Client: Mr. Doug Kavanagh
Title: Phasing and Final Grade

FIGURE 3

Once Phase 1 is complete, the contractor will move onto phase 2, using dedicated road alignments constructed in Phase 2 (these roads will also be used for the first farming operations).

The amount of fill needed to complete Phase 1 is estimated at 45,000 m^3 and is expected to take 1 to 1.5 years. The exact duration will vary with fill availability, prices, weather and other factors. A rainfall shutdown protocol will be put in place to stop activity during wet conditions.

The objective in the phasing of the project is to complete a portion of the area as soon as possible to commence planting of trees and eventually earn revenue

4 A survey of the drainage courses on the subject site.

Figure 2a shows existing and proposed ditches on the subject site. An existing ditch runs the length of the northern boundary. Invert elevations range from 0.61 to 0.03 (in the northeastern corner).

At the time of our field assessment, this ditch was not effective in removing excess water. If the fill project is approved this ditch will be enlarged and deepened to allow water to drain east. In addition, a connector ditch will be excavated to connect this northern ditch to a larger ditch draining south along the eastern boundary.

The eastern ditch has invert elevations of 0.18 to -.75 m. There are two concrete culverts with invert elevations of 0.11 and 0.12 m. This ditch drains into the main ditch along the north side of the Westminster Highway, which has an invert elevation of -0.16 m at the junction. The eastern ditch will be deepened (slightly) and cleaned to allow drainage south.

A proposed ditch runs along the southern boundary in the central and western portion of the property. This will be excavated to an elevation that will allow drainage to the east, connecting with an existing ditch that drains south to the Westminster ditch. The existing ditch draining south has invert elevations of 0.06 to 0.38. This ditch will be cleaned and deepened as necessary to drain south.

5 A detailed drainage plan including the invert levels of all drainage pipes;

Figure 2a shows the location of existing and proposed ditches. Figures 2b through 2d show cross-sections of the proposed fill. No in-field drainage is planned; however, the fill will be graded to 2% grades from a central east-west ridge to allow for drainage to adjacent ditches.

6 A percolation test for soil hydrology;

This work was contracted to Cleartech Consulting Ltd. and is presented in Appendix 1. Four pits were excavated for a percolation test. This confirmed that the land is poorly drained. For two of the pits, Cleartech stated that the permeability of the soils tested was slow enough as to be essentially immeasurable utilizing the conventional percolation test method.

7 Details of the agricultural history of the site;

We obtained historic air photos dating back to the 1940s to the present. These are presented in Appendix 2. The early photos were of poor quality, but it is evident that some farming activity occurred. Table 1 shows our summary of evidence of land use in the last 60 years.

TABLE 1: SUMMARY OF LAND USE FROM HISTORIC AIR PHOTO S AND GOOGLE EARTH IMAGES

Photo Year & ID	On-Site Property Activities
Date Unknown (1949?) B.C.-782:34 (poor Site image resolution)	Property is divided into fields. Clearly cultivated (probably for hay) in eastern portion. Some evidence of land clearing in west. Farmstead in SE corner
Date Unknown (1953?) BC IC 1672:105 (poor Site image resolution)	Clear activity of farming use; Farmstead in SE has been enlarged with additional buildings (barns). The likely activity is hay and/or pasture. East west rows evident in western part of property.
1963 B.C.-5063 #282 (Moderate Site image resolution)	Continued farm activity. North south rows in east. The western portion appears to have been abandoned. Possibly hay or pasture in central portion. Farmstead continues to be present in SE corner

1969 B.C.-5320-#071 (good Site image resolution)	No farming activity; fields appear to be abandoned. Farmstead has disappeared; no buildings remain. Golf course to north under construction.
1974 B.C5581 #0227 (good Site image resolution)	Property divided into two main fields; western field is integrated with separate property on No. 6 road (now tree nursery); east-west rows are probably harvesting for hay. Eastern part has N-S rows. Some additional roads have been developed. Farmstead area appears to have been partly rebuilt.
1979 (no ID available)	Partial image only. Farmstead has no buildings; a small hayfield is present along eastern property boundary.
1984 B.C. 84013 #190 (Poor Site resolution)	No farming activity. Farmstead has been abandoned. Golf course to north has been completed; commercial development to SW also completed.
1991 FF 9131 #80 (good Site image resolution)	No farming activity. Site has been abandoned. No buildings in SE corner.
1997 FFC VRC9700 L-4 #109 (good Site image resolution)	Some activity detected. Property is divided into fields with cropping, mainly in eastern portion.
2000 Google Earth Image (good Site image resolution)	No farming. Site has been abandoned, except for small hayfield extending north from 8208 Westminster.
2003 Google Earth Image (good Site image resolution)	No farming activity. Small hayfield appears to be abandoned.
2004 SRS 7964-482 (good Site image resolution)	No farming, but some activity in western part of property extending from nursery at 5440 No. 6 road.
2005 Google Earth Image (good Site image resolution)	10-15% tree cover, remainder bare land, low shrubs. Less sign of activity, appears to be growing in
2009 SRS 6600-267 (good Site image resolution)	No farming activity, except for small hayfield extending north from 8208 Westminster. This appears to have been mowed in this year.
2013 Google Earth Image (poor Site image resolution)	No farming activity except for small hayfield mentioned earlier.
2015 Google Earth Image (good Site image resolution)	Eastern half of property has been cleared and cultivated for summer vegetables (leased out to local farmer). During our field visit in winter of 2014, much of this crop was left unharvested. Remainder of property to west is uncultivated.

Some low-intensity farming was carried out prior to 1949 to sometime between 1963 and 1969. During that time a farmstead with residential and farm buildings (and landscaping)

was present in the SE corner on Westminster Highway. By 1969, the farmstead had disappeared.

By 1974, some farming activity had been started again, with a few roads. The most probable crop is hay. It appears that some buildings had been built in the old farmstead area.

By 1979, farming appears to have been discontinued except for a small hayfield along the eastern boundary. Between 1979 and sometime between 1991 and 1997, additional activity started up again; the 1997 photo shows the property divided into fields and there is evidence of row cropping. However, by 2000 the property had again been abandoned, with the exception of a small hayfield extending north from 8208 Westminster Highway. This condition continues until sometime between 2013 and 2015 when the eastern portion of the property was cultivated for summer vegetables.

The previous owner – Coast Land Corp – Mr. Darly Fox indicated that his grandfather purchased the subject land in 1949 and that he thought the land had never been farmed [although we found through air photo analysis that it has been discontinuously farmed since then].

In 2014, the neighbor to the east was granted the right to grow surface vegetables on part of the property at no charge to him. Most of the last crop (Chinese Turnip or Radish) has been tilled into the land.

Overall, the history shows a pattern of on-again, off-again farming activity. We estimate that the property has been actively farmed for less than 20 of the previous 60 years.

8 A detailed proposed farm plan including details of the proposed farm access;

Mr. Kavanagh plans to establish a commercial tree nursery to meet the growing demand for trees for landscaping in the Lower Mainland. The nursery will focus on different species and cultivars of ornamental maples, including Japanese, red and paperbark. Stock will be bare-root. Further details are provided in Appendix 3.

9 A detailed analysis of the long-term agricultural viability of the site (ie: what other crops of agricultural operations will be viable on the site in the future);

In our soil survey, we classed the soils as mainly 4W with lesser areas of 3W. Soils were classed as being members of the Allouette and Blundell Soil Management Group, according to the Soil management handbook for the Lower Fraser Valley[1]. This soil group is characterized as being:

"moderately to slowly pervious and poorly to very poorly drained. Nutrient and water-holding capacity is high."

Limitations are listed as:

- The shallowness of the organic layer, over mineral subsoil, limits the rooting zone and water movement;
- Variable depth to underlying mineral soil results in some uneven crop growth and makes these soils difficult to drain;
- If left in a bare and pulverized condition, soils are subject to water erosion during periods of heavy precipitation and to wind erosion when the surface dries.
- According to the Soil Management Handbook, this soil group is well suited to no crop.

Suited crops include:

Annual legumes, blueberries, cereals, cole crops, corn, perennial forage crops, root crops (except carrots) and shallow-rooted annual vegetables.

Unsuited crops include:

Nursery and Christmas trees, raspberries and tree fruits. The handbook further states: "even with a drainage system, soils will have excess water for successful production of these crops".

Although the handbook states that blueberries are 'suited' the poor drainage in the property makes it – in my opinion – sub-optimal for production.

The Handbook does not mention cranberries, which were not an important crop at the time it was written (1991). Cranberries are the most extensively planted crop in Richmond, according to the Profile Report for the City of Richmond. However,

[1] Bertrand, R.A., G.A. Hughes-Games, D.C. Nikkel. BC min of Agriculture, fisheres and Food. 1991.

cranberries are also not well suited to this site unless substantial amounts of soil are imported to allow a well-drained, aerated root zone, preferably with a layer of sand (in the order of 20000 m^3) not to mention a larger amount for the creation of dykes around the bogs and associated water ponds.

An important consideration in the selection of suitable crops is the experience and preferences of the owner. Mr. Kavanagh has experience in tree nursery production and none in summer vegetables or berries. His stated desire for this land is to develop a specimen and specialized tree farm and our target market will include municipalities, commercial developments, retail nurseries and landscapers. Once the land has been slightly raised, a wide variety of crops could be planted but none as commercially viable as trees.

10 Agricultural experience of the owner and/or operator to successfully implement the proposed farm plan.

The owner Douglas Kavanagh started his career in the Banking industry as an Administration manager for the Bank of Montreal; he later started Able Bailiffs Ltd and Able Auctions – two very successful companies. He became interested in building and landscaping over 30 years ago and that's when he first started dealing with Jones Nurseries – Instant gratification was required for his projects and was provided by his favorite nursery – many years later he purchased Jones Nurseries Ltd. – a 34 acre Retail and Wholesale Nursery. More recently he has successfully planted two vineyards – one at 16200 Westminster Hwy (9 acres) (2010), and one at 16060 Westminster Hwy. (8 acres)(2015). (Doug Kavanagh lives at 6188 #7 Road). Sixwest Holdings Ltd. will enter into a contract with Mr. Kal Mahal from Mahal Farms Ltd. Richmond and Mr. Ranjit Sandhu from Green Guys Trees and Nursery, Abbottsford, B.C. who will be responsible for sourcing, planting, irrigation, pruning, fertilizing and general tree wellness. Permanent staff will be eventually hired to market, harvest and sell the subject trees.

11 Detailed explanation/justification

The subject site is different from the neighbouring sites to the west and east and why the proposed soil fill is necessary for the subject site, while it was not necessary for viable agricultural operations on the neighbouring sites (to the west has been a successful tree nursery without soil fill and immediately to the east is one of the most productive farms in Richmond with mixed farming operations);

Arts Tree Farms average elevation is substantially higher in elevation (1.2 to 1.4 m, compared to 0.3 to 0.9 in the subject property). The property has been the subject of

substantial peat fill over the years. During our fieldwork in December 2014, we noted numerous trees in a state of decline that we attribute to excess water in the root zone.

The property to the east is a large property with a discontinuous farming history – similar to that in the subject property. Since about 2005 the property has been intensively farmed for a combination of summer vegetables (eg: Chinese cabbage) as well as bedding plants for hanging baskets and other ornamentals. The soils appear to be similar to that in the subject property and the farm appears to be successful, with above-average revenue for the size. However, this farm is intensively managed to a level that is beyond the capability and expertise of the owner. **Importantly, he has no desire or intension to grow vegetables or bedding plants.**

The property to the South – Grootendorst Flowerland Nursery Ltd. 15120 Westminster Hwy., Richmond specialize in bedding plants, nursery stock and ornamentals (eg: hydrangeas and poinsettias in addition to other nursery stock). These plants are grown in pots and are not therefore subject to the problem of high water tables. The elevation is also substantially higher (1.35 m) than the elevation of the subject applicant's property, according to the survey plan.

Due to the very high water table, it is currently impossible to grow harvestable trees – by this; we mean a tree with good root system. Under current conditions, the roots would 'pancake'; the watertable would cause the roots to be confirmed to a shallow aerated surface layer. This problem occurred on land leased to Jones Nursery's by Mahal Farms many years ago The trees had to be destroyed because the water table was too high and the roots progressed along the top 30 cm (12") of soil – it was impossible to get a good root ball. The Mahal property (to the East border) has since been raised and a new inventory of large caliper trees is growing well.

12 Geodetic comparisons to the site at 18431 Westminster Highway where East Richmond Nurseries Inc. is located;

East Richmond Nurseries Inc. is located 4 km east on Westminster on different soils and different elevations (which increase marginally from west to east). This is a large supplier to the landscape trade, garden centres and wholesale nurseries. They have a greenhouse container operation and import trees from other growers and hopefully will purchase trees from our new tree farm The operation does grow stock in bare soil but most shrubs and trees are stored and sold in containers.

We did not obtain geodetic data, but Google Maps shows elevations of 6 to 7 m at East Richmond Nurseries compared to 0 to 1 m at the subject property. We understand that this is not an accurate depiction of elevation, but the difference is substantially larger than the expected error.

Elevations provided for Mahal Farms Ltd. at 16551 Westminster Highway is substantially higher (1.9 m) than the subject property. This site appears to have been raised and they are successfully growing a good variety of caliper trees.

13 Details of the proposed retaining wall and how it will interact with neighbouring sites.

We do not plan to install a retaining wall.

14 Impacts of the raised elevations on the neighbouring properties.

The imported fill will have negligible effects on neighbouring properties and water tables. The geotechnical assessment indicated that settlement of native (mineral) soils under the fill would be in the range of 1-6 cm. The reduction in pore space would result in an estimated 20% reduction from 50% under current conditions to 30% when compressed. The loss of pore space would be felt primarily in the upper 6 cm of the soil profile (taking the worst case for settlement). Reduction in pore space would rapidly diminish below this depth, especially under saturated conditions. The volume of compressed soil would therefore be approximately 8640 m^3 (14.4 ha x 0.06 m) and the loss of pore space would result in the displacement of approximately 2000 m^3 of water. This volume, divided by the area of fill, would result in localized increases of about 1.2 cm in the water table. Since ditches will be present over much of the perimeter, connected to larger ditches along No. 6 road and the Westminster Highway, this increase would be rapidly attenuated.

15 Details of a range of crops and agricultural operations that can be implemented on the site without soil fill.

This question has largely been addressed in the answer to Question 9.

The soil management handbook for the Lower Fraser Valley lists no crops as 'well-suited' due to severe limitations due to excess wetness. The list of 'suited' plants (implying sub-optimal production and/or elevated management inputs) is as follows:

"Annual legumes, blueberries, cereals, cole crops, corn, perennial forage crops, root crops (except carrots) and shallow-rooted annual vegetables".

Crops not mentioned here but could be suited are potatoes and cranberries.

Potatoes as a commodity are a low-return crop; many farmers who were formerly growing potatoes have shifted to other crops. This does not include seed potatoes however. Again, the owner does not have the desire, intention or expertise to grow potatoes.

The problem with cranberries requires a very large investment to establish and requires specialist expertise. In addition, the market is oligopolistic; it is controlled by one buyer, namely Ocean Spray. Due to saturation of the market, there is little opportunity now to secure new purchase agreements. Finally as noted earlier, the establishment of a cranberry farm will involve substantial amounts of fill: earth for dykes around bogs and for on-site water storage, as well as sand for bedding.

16 Reference to the City's 2006 East Richmond Agricultural Water Supply Study, which was recently updated.

We are aware of this publication, having consulted it, for this and other projects in Richmond. It identifies priorities for drainage improvements. The original study was completed in 2006 and an update was submitted to the City in 2013. The majority of recommendations pertain to irrigation and flood protection problems south of Highway 91. The main thrust is to increase water supply to this area from the North arm of the Fraser. The 2013 update also recommends a number of measures to improve drainage. One recommendation is to improve drainage along Westminster Highway

The model shows flooding in the low lying areas East of No.6 Rd. Two homeowners in this area have reported drainage problems during the open house.
To reduce flooding in this area the following improvements are recommended:

- • Re-grade the existing ditch for 1400m
- • Upgrade all existing culverts (ranging from 600 to 900mm) to a minimum 900mm diameter (total length of 153m of pipe)
- • Install a new 16m long 900mm diameter cross culvert connecting the North side ditch with the existing 900mm storm sewer in street.

The improvements start at the east end of the subject property and continue eastwards towards No. 7 road. The cross-culvert noted is located about 1 km east of the subject property.

Once these improvements were incorporated into the model, the peak HGL was lowered. According to diagrams in the report, the reduced water elevation (for a 10 year, 5 day storm) was lowered from 1.0 m to 0.61 m. Note that most of the elevations in the southeast corner are between 0.5 and 0.9 m so that during these storm events there will be limited freeboard.

These data are useful, but the main problem with drainage in the subject property is not the 10 years 5 day storm, but persistent high water levels throughout the winter. It is not clear that the improvements will substantially change this pattern. In addition, while we recognize that these improvements may improve the drainage situation in the extreme southeast of the property, we expect the improvement to be minor and localized. They are unlikely to make a discernible difference to drainage in the entire property.

Yours sincerely,
MADRONE ENVIRONMENTAL SERVICES LTD.

**This is a digitally signed duplicate of the official manually signed and sealed document.*

Gordon Butt, M.Sc., P.Ag.,
P.Geo.
Professional Agrologist,

On behalf of:
Mr. Doug Kavanagh
Sixwest Holdings Ltd.
16060 Westminster Highway
Richmond, BC V6V 1A8

MADRONE
environmental services ltd.

APPENDIX 1

BACKGROUND INFORMATION

January 19, 2016

File: 316-0004

CLEARTECH CONSULTING LTD.
1345 Salsbury Drive ph. 604-329-8324
Vancouver, BC V5L 4B4 fax. 604-893-8323
email. info@cleartechconsultingltd.com

Doug Kavanagh
dougiekavanagh@me.com

Re: 14791 Westminster Highway, Richmond, BC
Percolation and Permeameter Test Report

As requested, Cleartech Consulting Ltd. has completed percolation testing and permeameter testing at the above referenced site in Richmond, BC. The testing was completed on January 11, 2016. At the time of the site assessment, there was a thin layer of surficial frost across the site, enabling some access to areas remote from the access road. However, not all of the site was accessible due to standing water (iced over), very muddy conditions, etc.

A total of four percolation tests were completed across the site. The approximate locations of the tests are shown on the attached site plan. The percolation test holes were pre-soaked as required. The results of the percolation testing are shown in Table 1 below:

Table 1 – Percolation Test Results

Test #	depth of hole [cm]	result [min./2.54cm]	Test #	depth of hole [cm]	result [min./2.54cm]
PH1	40	288	PH3	50	>360*
PH2	49	>360*	PH4	55	52

The results for PH2 and PH3 indicate that the permeability of the soils tested was slow enough as to be essentially immeasurable utilizing the conventional percolation test method.

In addition a total of two permeameter tests were completed at the site. The approximate locations of the tests are shown on the attached site plan. The results of the permeameter testing (field saturated hydraulic conductivity) are shown in Table 2 below:

Table 2 – Permeameter Results

Test #	depth of hole [cm]	result [mm/day]
PM1	46	0
PM2	48	12.5

The results for PM1 could indicate one of two things: 1) the test hole was smeared due to the high moist silt and clay content of the soils and/or 2) the field saturated hydraulic conductivity of the soils tested was slow enough as to be essentially immeasurable utilizing the conventional permeameter test method.

As a general comment, the measured percolation rates and permeameter results indicate that the soils tested at the subject site would be considered poorly draining soils. Although access to a large portion of the site was not possible, it is our opinion that similar results would be seen in the soils across the property.

We trust this meets with your immediate requirements. This report has been prepared by Cleartech Consulting Ltd. exclusively for Mr. Doug Kavanagh and appointed agents, for the purposes of evaluating the general drainage properties of the site soils. The report has been completed by Cleartech based on the reported development plans and observed site conditions. Any damages suffered by third parties as a result of use of this report would be the responsibility of said parties.

The investigation was conducted in accordance with standard engineering practices. The information gathered and used to derive the conclusions in this report was in part provided by others. Further, percolation and permeability testing was completed at discrete test locations at discrete times across the site. Soil and groundwater conditions may vary at different times or in areas remote from the reported test locations. If new and more accurate information comes to light, Cleartech should be given the opportunity to review the new information and update the findings of this report as may be required.

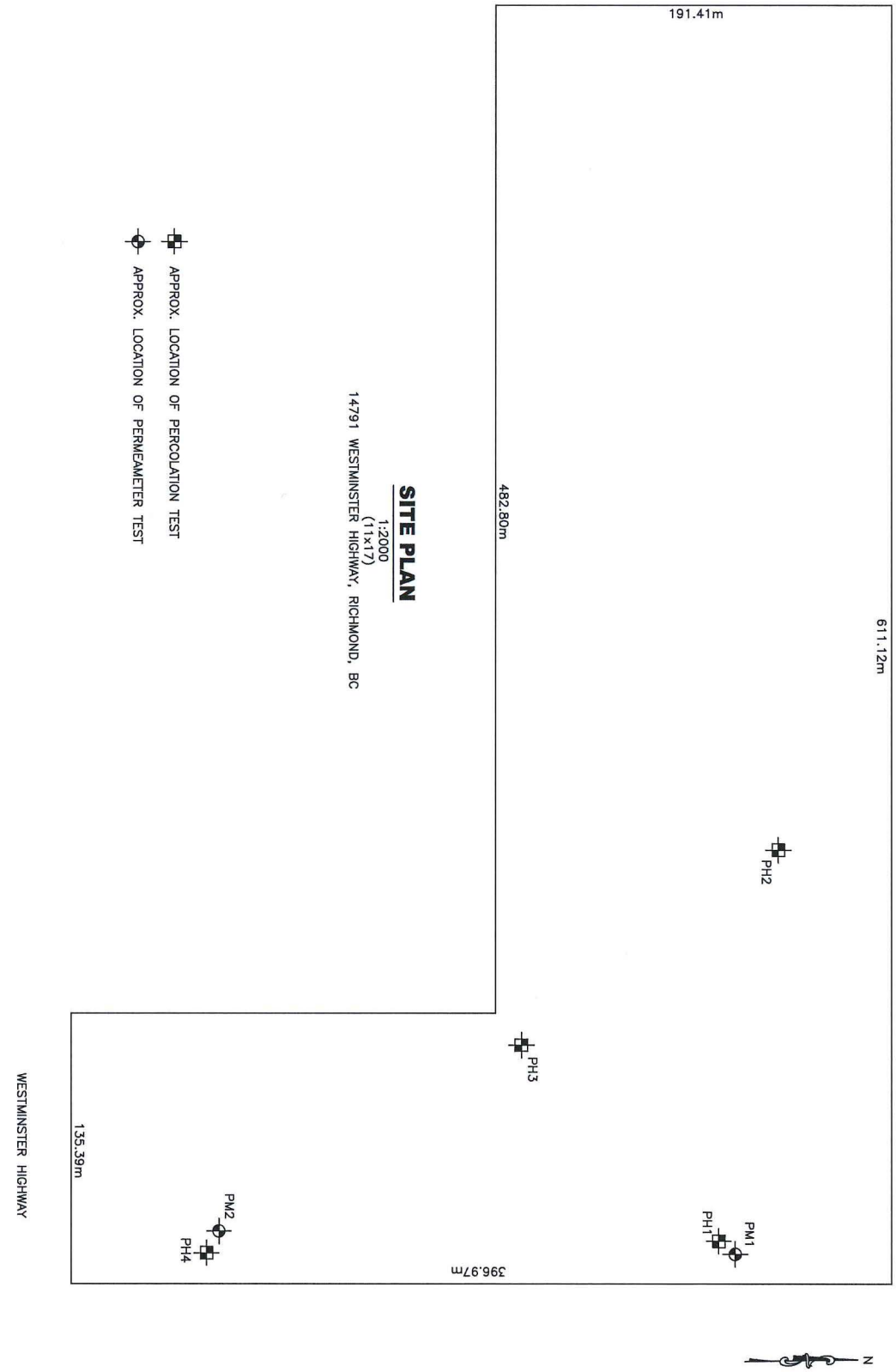
If you have any questions or require further information, please do not hesitate to contact the undersigned at 604-329-8324.

Yours truly,

CLEARTECH CONSULTING LTD.
per: Craig Regier, P.Eng., ROWP

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
C. L. REGIER
#25198
JAN 19 2016

Encl. Appendix A – Site Plan



SITE PLAN

1:2000
(11x17)

14791 WESTMINSTER HIGHWAY, RICHMOND, BC

CLEARTECH CONSULTING LTD. 1345 SALSBURY DRIVE, VANCOUVER, BC V5L 4B4 PH. 604-329-6324 FX. 604-893-6323 EMAIL: info@cleartechconsultingltd.com WEB: www.cleartechconsultingltd.com		PROJECT: 14791 WESTMINSTER HIGHWAY, RICHMOND, BC					
		TITLE: SITE PLAN SHOWING TEST LOCATIONS (TESTING JAN 11, 2016)					
CLIENT: **KAVANAGH**		SCALE: SHOWN	DESIGN: CLR	DATE OF ISSUE: JAN. 2016	PROJECT No.: 316-0004	DWG. No.: 1 OF 1	REV.: A
		DRAWN: CLR	REVIEWED:				
SEAL							
REVISION		**GP - 64**		INITIAL	DATE	NOTE: THIS DRAWING IS THE SOLE PROPERTY OF CLEARTECH CONSULTING LTD. AND CANNOT BE USED OR DUPLICATED IN ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION	

MADRONE
environmental services ltd.

APPENDIX 2

PHOTOS


1/15/2016
2000
2015
2015
14791 Westminster Hwy
© 2015 Google
Image © 2016 DigitalGlobe
Google earth
Imagery Date: 6/15/2015
49°10'12.13" N 123°03'31.57" W elev 2 m
Eye alt 3.07 km


3/19/2013
2000
2015
2013
14791 Westminster Hwy
© 2015 Google
Image © 2016 DigitalGlobe
Google earth
Imagery Date: 3/19/2013
49°10'12.13" N 123°03'31.57" W elev 2 m
Eye alt 3.07 km


2009


9/22/2005
2005
14791 Westminster Hwy
© 2015 Google
Image © 2016 DigitalGlobe
Google earth
Imagery Date: 9/22/2005
49°10'12.13" N 123°03'31.57" W elev 2 m
Eye alt 3.07 km


2004
SRS 7964 - 482
1: 7,000 nom
04 APR 09


8/24/2003
2003
14791 Westminster Hwy
© 2015 Google
Image © 2016 DigitalGlobe
Google earth
Imagery Date: 8/24/2003
49°10'12.13" N 123°03'31.57" W elev 2 m
Eye alt 3.07 km


12/11/2000
2000
14791 Westminster Hwy
© 2015 Google
Image © 2016 DigitalGlobe
Google earth
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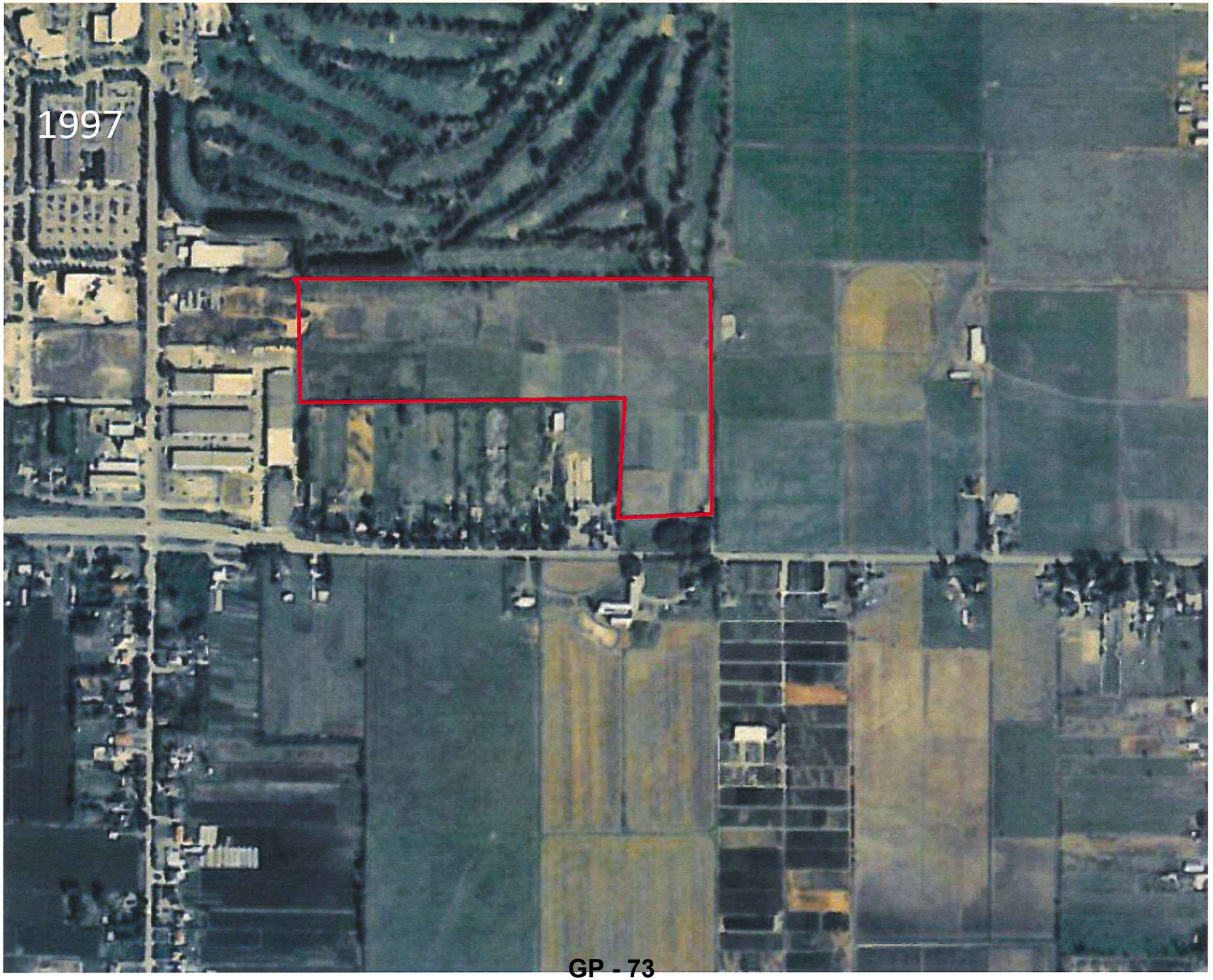
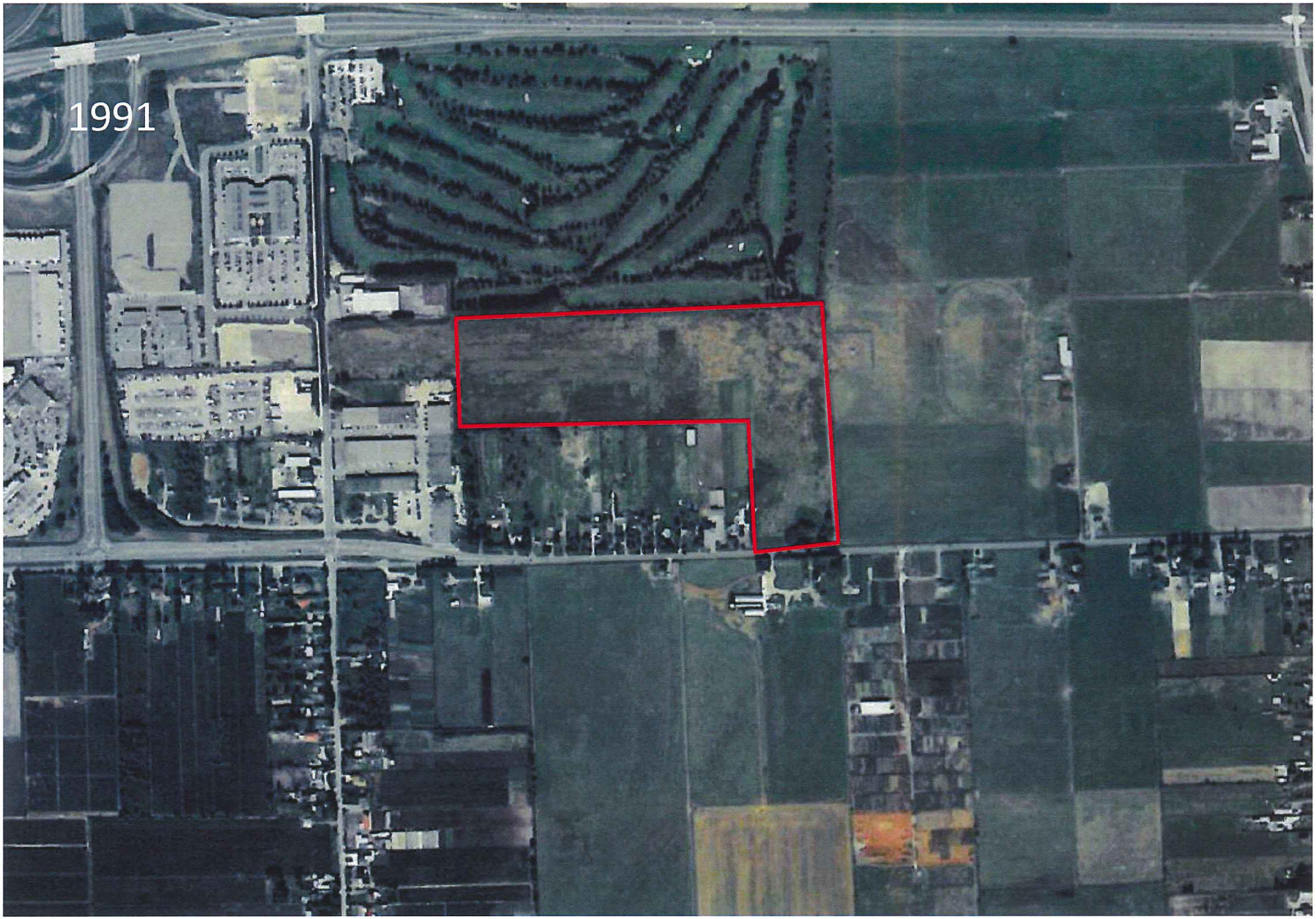
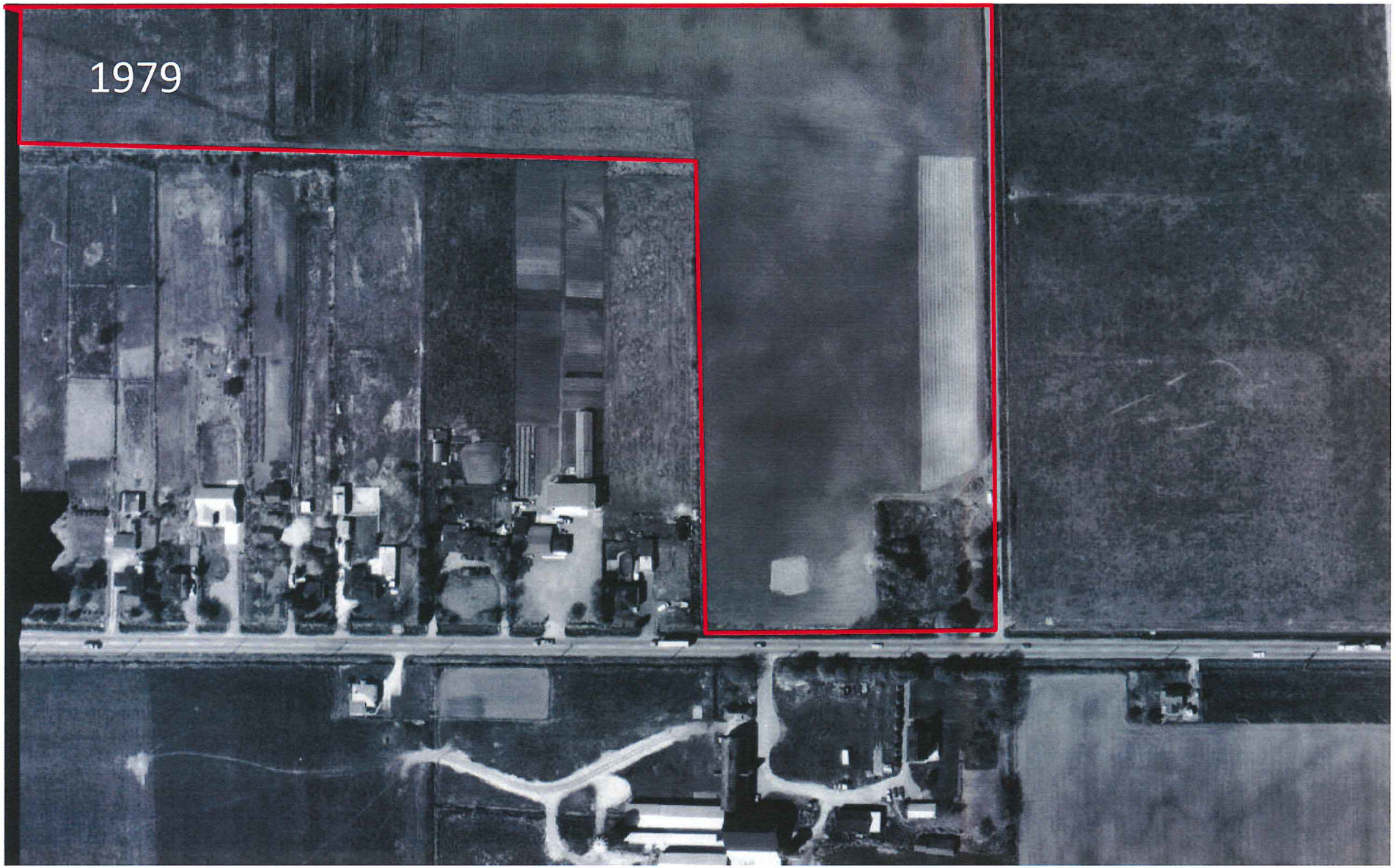
49°10'12.13" N 123°03'31.57" W elev 2 m
Eye alt 3.07 km

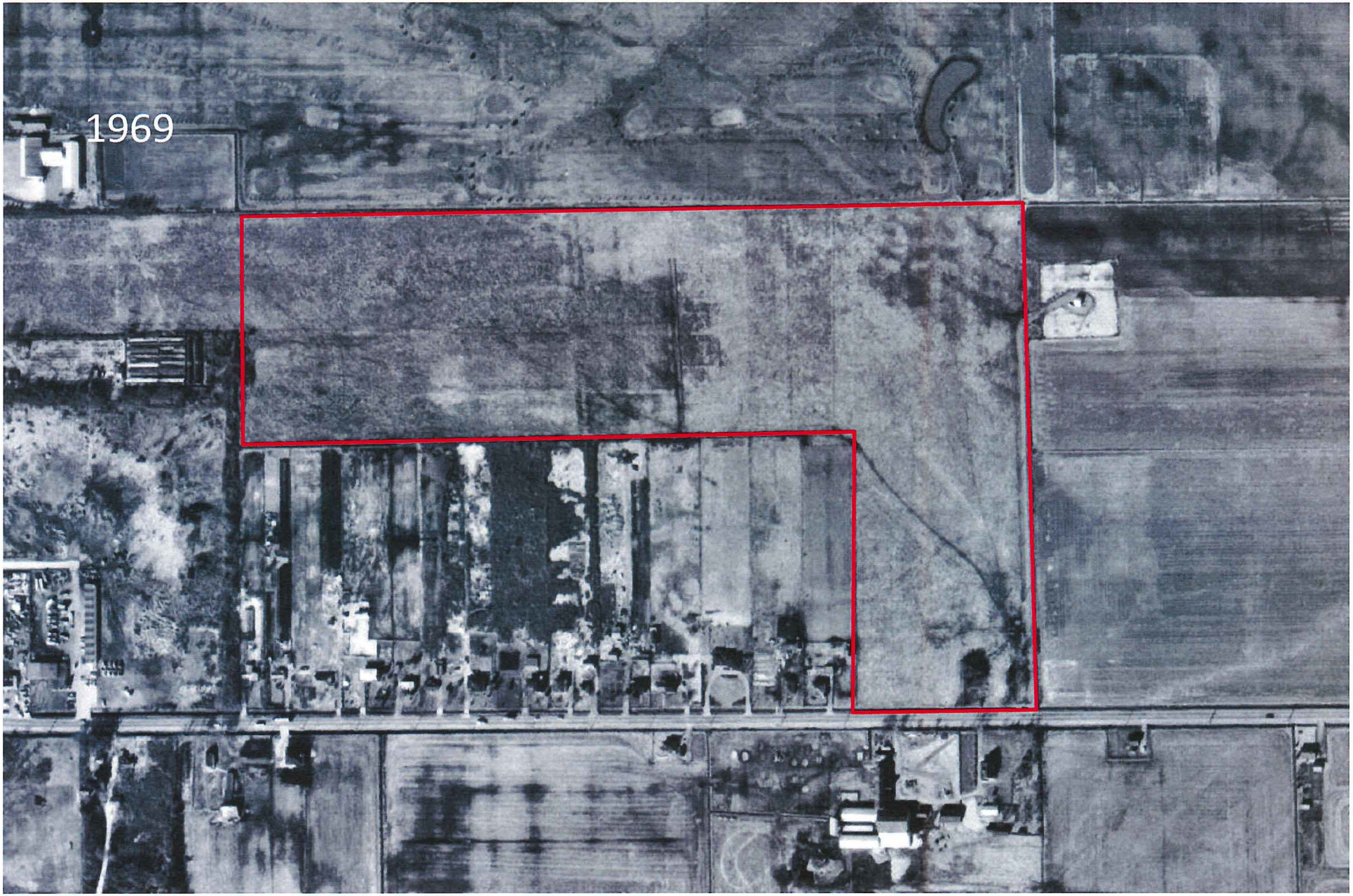

1997

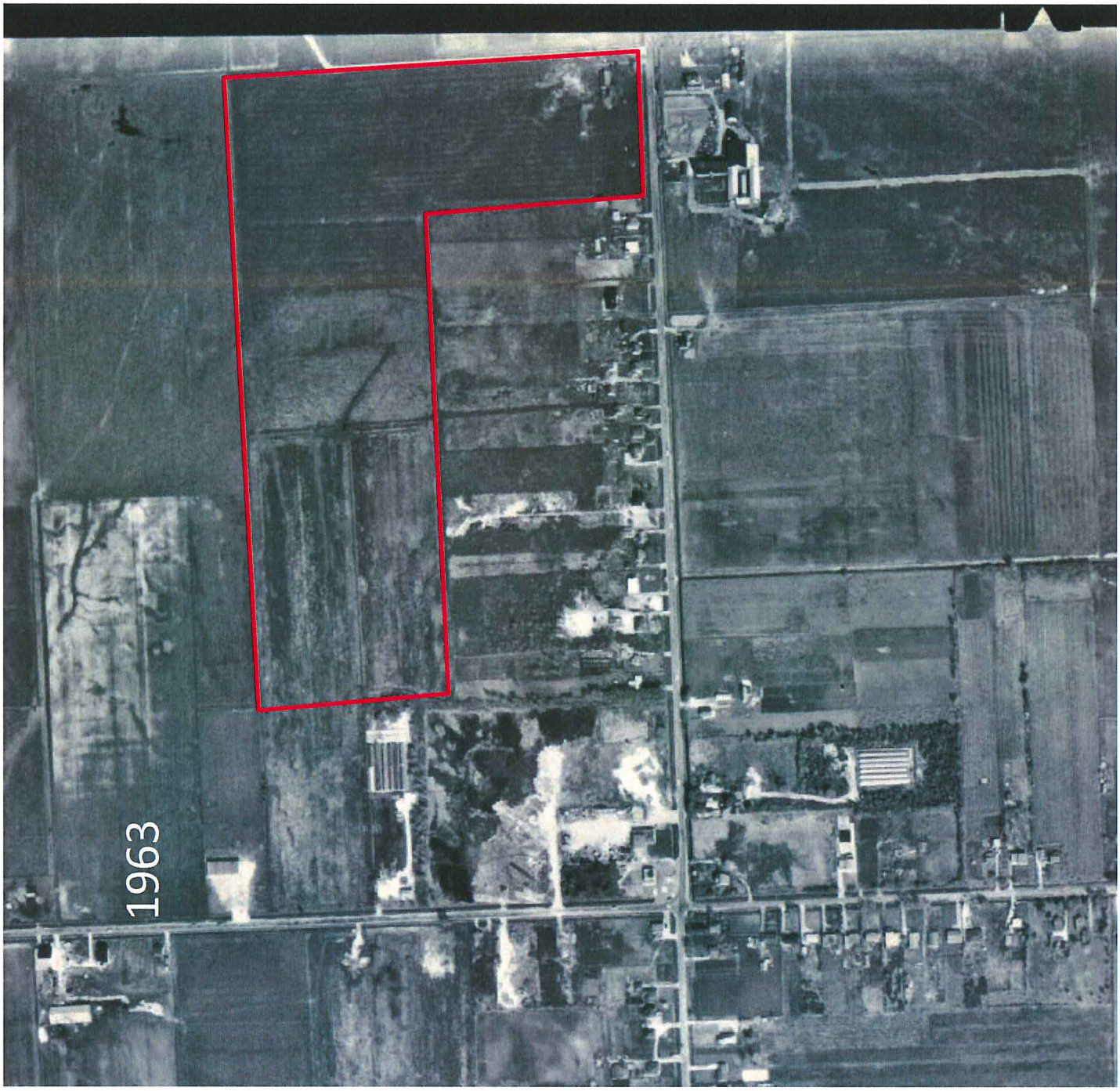

1991


1984

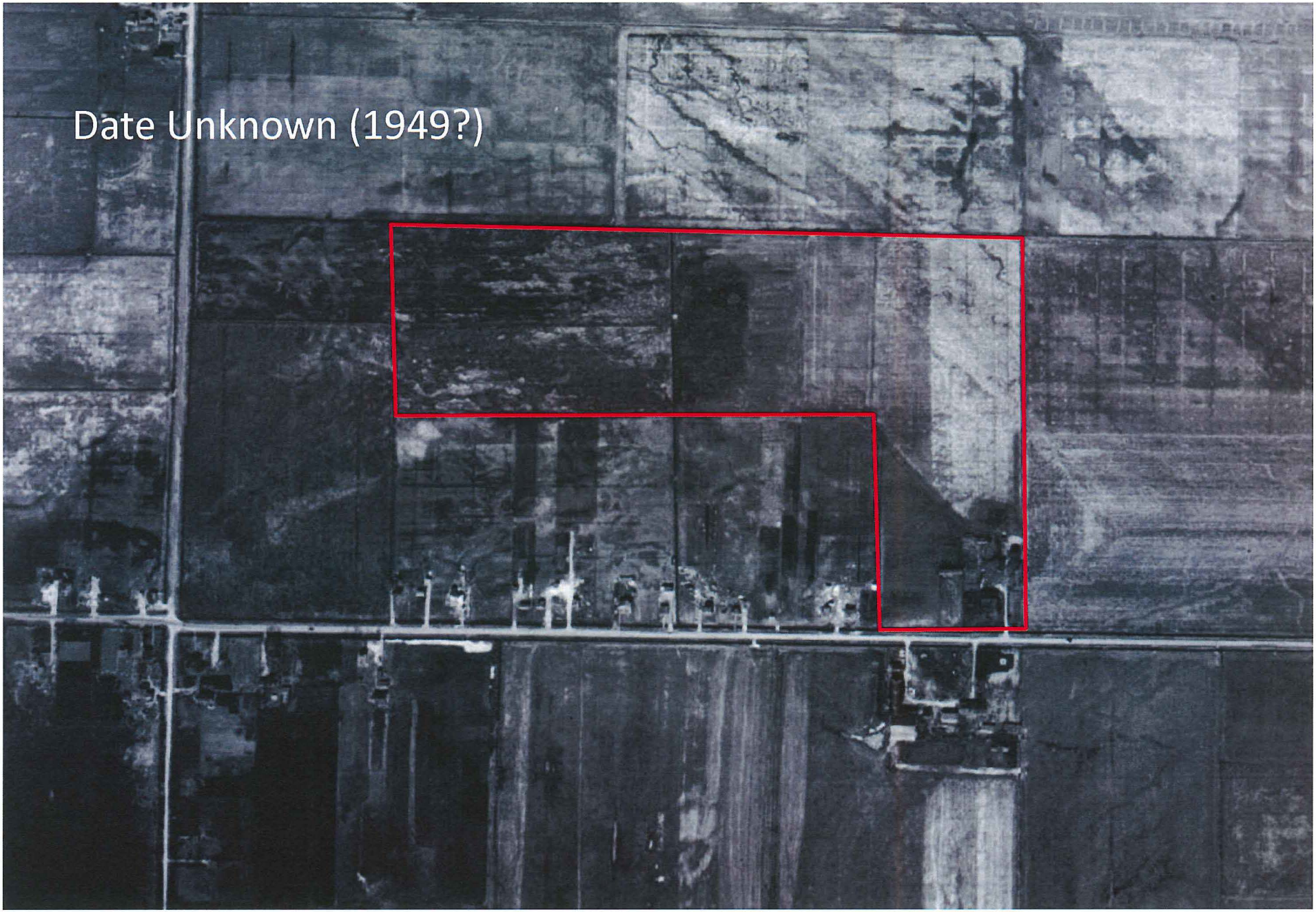

1979


1974


1969


1963


Date Unknown (1953?)


Date Unknown (1949?)

MADRONE
environmental services ltd.

APPENDIX 3

FARM PLAN

Farm Plan

Objective

The objective is to establish a commercially successful tree nursery supplying different species and varieties of maple trees to the landscaping and nursery industries. The trees will be supplied wholesale to other distributors or landscapers. This objective is consistent with the owner's experience being a past owner of a commercial nursery.

The total area of the property is 14 ha or 31.xx acres. Some area will be required for access, equipment storage, farm buildings, and lay down areas. In this plan we envisage about 30 acres will be available for planting. Assuming a density of 2000 trees per acre, the total number of trees at maximum production will be 60,000.

Land Preparation

Tillage and furrowing

If the fill project is approved the land will be close to ready, with topsoil respread over the graded surface. Conventional farm equipment will be used to prepare the land for planting of trees. The last step prior to planting will be to create furrows for planting bare-root stock.

Drainage. Since the land will be sloped at 2% we anticipate that the soils should be well drained and will not require sub-surface drainage. This is consistent with our observations of other tree nurseries.

Irrigation. This will be essential to counter the significant moisture deficit experienced in the summer. Drip irrigation delivered by surface-laid PVC pipes is planned. This is the most efficient method of supplying water. Spraying during hot summer days could damage certain sensitive species (eg: Japanese maples).

Tree species/variety Selection

The owner wishes to plant several species of ornamental maples, for example, red (Acer rubrum), Japanese (Acer japonica) and paperbark (A.). He has experience with these species. The final selection of species, varieties and cultivars will be made after survey of demand from commercial nurseries and landscapers. The owner plans to buy young saplings ('whips') on the commercial market and grow bare-root (not container) stock. This involves manual planting and later manual harvesting.

Planting

Whips will be planted at a density of approximately 2000 units per acre or about 5000 per ha. This amounts to a spacing of 2.4 m x 0.8 m. Rows will be spaced to allow machine access for planting and maintenance. Some species/cultivars may require staking. The wide spacing is also designed to allow air circulation and light penetration. This will minimize tree health problems. The whips will be placed in the furrows and then back-filled with organically enriched soil.

Fertilization

Fertilization will be done at or immediately following planting. A low P fertilizer is planned. The final selection will be made at the time; either a quick-acting fertilizer will be spread on the adjacent soil or slow-release fertilizer in the backfill. Fertilization will then be applied once or twice a year as needed. Since we anticipate that the final soil will be production (with the application of topsoil) and that fertilizer needs will be relatively low.

Maintenance

Pruning may be required for certain trees, depending on species, variety, age and size. Pruning is sometimes required to obtain a particular crown shape or size. It may also be necessary to remove dead, dying or infected branches.

Regular monitoring for health problems is planned. Common fungal diseases in maples include *Phytophthora*, anthracnose and mildew. These problems can be minimized by ensuring good air circulation and maintenance of well drained soils.

Dead, dying or infected trees will be promptly removed and destroyed before any opportunity for the pathogen or pest to spread.

Harvesting

Harvesting will be done manually. The first harvest will probably start approximately one year after the first planting and will consist of those specimens that are marketable. The trees will be excavated, roots wrapped in burlap in concordance with BC Landscaping Standard. After removal from the soil, the trees will be temporarily heeled in and kept moist before sale. Harvesting will be done in response to specific orders, so storage will be limited. We estimate 5000 trees in year 1, 10,000 in year two and 15000 in year three.

Sales and Marketing

The owner is an experienced nursery owner and has numerous contacts throughout Richmond and neighbouring cities. Sixwest Holdings Ltd. will enter into a contract with Mr. Kal Mahal from Mahal Farms Ltd. Richmond and Mr. Ranjit Sandhu from Green Guys Trees and Nursery, Abbottsford, B.C. who will be responsible for sourcing, planting, irrigating, pruning, fertilizing and general tree wellness. Permanent staff will be eventually hired to market, harvest and sell the subject trees.

Costs and Revenues

Table 1 summarizes the projected costs for the first three years. These of course may change but for the purposes of demonstrating the financial viability these assumptions were made:
The owner and his contractors are experienced in nursery establishment and management;
Labour costs are $15 per hour. This is inclusive of non-wage costs.

Planting stock will cost an average of $20 per unit. The actual cost varies of course with species, cultivar, size, age and condition. Actual prices in the Lower Mainland for small trees are in the range from $15 to $30.

The wholesale price for trees is obviously highly variable and fluctuates with the market. The upper range for prices for smaller (eg: one year out-planted) is $50 and $100 for large trees. However, we have assumed lower prices.

Trees can be manually planted at the rate of 12 trees per ha. At $15 per hour this works out to $1500 per ha or $600 per acre.

General Task	Specific Task	Unit Cost	acres or trees	total cost over 3 years	on-going/ per year
	Disking and bedmaking.	6 hours/acre x 30 acres	132	$23,760	$5,000
Site Preparation					
Planting	Purchase plants	60,000 trees	20	$1,200,000	$600,000
	Plant	15 trees per hour $15/hr	$1875/acre	$56,250	
Fertilizer	Purchase	200 kg/acre x $0.75	$150/acre	$4,500	
	Application	0.5 hours/acre	$11/acre	$330	
Fungicide	Purchase	4 kg/ha copper spray	$30/kg	$900	
	Application	0.3 hours/acre	$18/acref	$540	
Irrigation (Drip)	Installation – Parts	$1500/acre	1000	$5,480	
	Installation - Labour	6 hours/acre	$90/acre	$2,700	
Harvest	Labour (15$/hour)	2 trees per hour	as needed		$8 per tree
				$1,294,460	

Revenues	Year 1	Year 2	Year 3	Year 4	Year 5
Number of trees	0	$10,000	$20,000	$30,000	$40,000
average sale $/tree	na	$35	$50	$60	$75
		$350,000	$1,000,000	$1,800,000	$3,000,000
cost of new stock	na	$200,000	$400,000	$600,000	$800,000
planting	na	$12,500	$25,000	$37,000	$50,000
additional	na	$5,500	$5,500	$6,000	$,000
		$218,000	$430,500	$643,000	$856,000
net revenue	0	**$132,000**	**$ 69,500**	**$1,157,000**	**$2,144,000**

Attachment 4

Excerpt from the Discussion Notes from

The Agricultrural Advisory Committee Meeting

Tuesday April 26, 2015 – 7:00 p.m.
M.2.002
Richmond City Hall

3. Development Proposal - Non-Farm Use Application (Soil Fill) 14791 Westminster Highway

Community Bylaw Staff (Michelle Orsetti) provided an overview of the Agricultural Land Reserve (ALR) soil fill application to establish a tree nursery at 14791 Westminster Highway. The application was initially considered by the Committee on September 24, 2015. Staff noted that the applicant had provided all the information previously requested by the Committee. The Chair invited the applicant and the project Agrologist to the table.

The Committee had the following questions and comments:

- Committee asked about the source of subsoil. The applicant noted that it will be sourced from a single local provider.

- Committee asked whether the owner plans to grow only local trees. The applicant noted that, unless there is a request for exotic trees, they will grow mostly local trees.

- Discussion ensued regarding suitability of the site for the proposed use and proposed improvement. The Agrologist noted that the site can be used for a tree nursery with some improvement.

- Committee noted that it wants to see a long term business plan when reviewing a development application in the ALR to ensure that the proposed proposal makes sense. Committee also would like to see a long term commitment from the applicant and ensure the site will still be agriculturally productive after fill activities are completed in case the nursery operation ceases in the future.

- The soil contractor from Hexcel Construction Ltd. was invited to the table and provided details of the operation and soil quality. He noted that soil will be tested and certified, and it will mostly be from Richmond.

- A Committee member noted that the site has been fallow for 40-50 years, and there must be a reason for it. Another member also noted that the plan makes sense, and Committee's role is to provide comments on the plan, not to enforce it.

- The chair introduced the following motion:

That the ALR non-farm use application for soil fill at 14791 Westminster Highway be supported subject to the following conditions:

1. *The applicant ensures that there is no drainage impact on neighbouring properties;*
2. *The applicant commits to using only non-contaminated soil supported by a Phase 1 Environmental Site Assessment report and not to bring in construction materials and/or non-excavated soil;*
3. *No soil sub-contractor, other than the designated soil provider, to be used to ensure the soil quality;*
4. *A performance bond to be provided, and;*
5. *The property must be left to a condition that it can still be viable for agriculture once the tree nursery operation ceases.*

Due to the absence of quorum, the motion could not be considered.

HORIZON ENGINEERING INC

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North Vancouver, BC
Canada V7H 0A1

Pho
Fax 604-990-0583
www.horizonengineering.net

October 10, 2014

Our File: 114-3648

DOUGLAS KAVANAGH
16060 Westminster Hwy,
Richmond, BC, V6V 1A8

Re: Proposed Development
14791 Westminster Hwy, Richmond, BC
Geotechnical Investigation Report

1.0 INTRODUCTION

This document provides geotechnical design and construction recommendations for the proposed development at 14791 Westminster Hwy, Richmond, BC. The recommendations presented herein are based on the geotechnical investigation carried out on September 19, 2014 and information available to us with regards to the proposed development at the time of preparing this report. Th e site investigation and report preparation were carried out in conformance with the scope of services dated September 12,2014.

2.0 SITE DESCRIPTION

The subject property is located on the north side of Westminster Hwy with a civic address of 14791 Westminster Hwy. Currently, the subject property is bounded by agricultural properties on the east and south, a commercial property and a farm (Art's Green Acre Tree Farm) to the west and a golf course to the north. The subject property is fronting to Westminster Hwy, however, access to the property is currently provided through the neighbouring property with a civic address of 5440 No.6 Road, where Art's Green Acre Tree Farm is located. At the time of our geotechnical investigation, the subject site was vacant and ground surface was covered with vegetation with various heights. It should be noted that the subject property was separated with a couple of ditches, which limited the access to the east part of the subject site. Based on Geographic Information System provided by the City of Richmond (Richmond Interactive Map: RIM), the size of the subject property is 14.46 hectares.

The topography within and in the general vicinity of the site is essentially flat. At the time of preparing this document, no topographic survey of the subject site was available to us. The approximate location of the subject site is shown in Figure 1, attached to this document.

3.0 PROPOSED DEVELOPMENT

Based on information provided by our client, we understand that the existing grades will be raised for farming purposes. Thus, geotechnical comments and recommendations presented herein are

solely for the proposed grade increase and not applicable to design and construction of any settlement-sensitive structures including hard landscaping features. At the time of preparing this report, the final grade elevations were unknown, however, we envisage that the proposed fill thickness be placed at the subject site would be up to 3 metres.

In the event that the above assumptions differ from the actual development be constructed at the subject site, our geotechnical investigation report should be reviewed and revised accordingly to suite the final proposed development.

4.0 BACKGROUND INFORMATION

4.1 Surficial Geology

Based on published information from the Geological Survey of Canada, the expected subgrade material at the subject site is Bog, swamp and shallow lake deposits which can be described as a organic-rich sandy loam to clay loam 15 to 45 centimetres overlying Fraser River Sediments, which is a deltaic and distributary channel fill (includes tidal flat deposits), up to 10 to 25 metres interbedded fine to medium sand and minor silt bed.

4.2 Land Use and Flood Construction Level

Based on Geographic Information System provided by the City of Richmond (Richmond Interactive Map: RIM), the land use of the subject site is categorized as an agricultural (AGR), Old Fields and Shrubland (OLSH) and FCL is 3.0 metres Geodetic at the subject property.

5.0 FIELD INVESTIGATION

The subsurface investigation was carried out on September 14, 2014. The investigation program consisted of two, continuous flight, solid stem, auger test holes, (AH14-1 and -2) advanced to depths of 12.2 metres and 9.1 metres, respectively. Two dynamic cone penetration tests (DCPT, hereafter) were advanced to depths of 11.5 metres at AH14-1 and -2 locations. In addition to above, two piezometric cone penetration test (CPT, hereafter) soundings were advanced at both test hole locations. CPT soundings were advanced to a depth of 23 metres at the location adjacent to AH14-1 test hole location and 22 metres at the location adjacent to AH14-2 test hole location.

Select soil samples were retrieved from the auger flights for further soil characterization. This subsurface investigation was directed by an engineer from our office who also documented the soil data and stratigraphy encountered at the test holes. The investigation was carried out using a truck mounted drill rig supplied and operated by On-Track Drilling Inc. of Coquitlam.

As per the British Columbia Groundwater Protection regulations, test holes were backfilled with drill cuttings and sealed with bentonite chips since the test holes were deeper than 4.5.

6.0 SOIL and GROUNDWATER CONDITIONS

A summary of the soil and groundwater conditions encountered at the test hole locations is provided in the following sections. Detailed descriptions of the subsurface materials encountered at the test hole locations are provided in the test hole logs attached to this report.

6.1 Subsurface Soil Conditions

The soil stratigraphy encountered at both test holes is briefly described as follows (from top to bottom);

Auger Holes to a depth of 12.2 metres

- SAWDUST (AH14-1 only) approximately 0.3 metre thick;
- TOPSOIL - dark brown, silt, soft to firm approximately 0.9 metre thick;
- SILTY CLAY - grey, very soft to firm, trace to no sand, wet with 1.8 to 2.4 metres thick, and;
- SAND - grey, fine grained, trace silt, wet, compact to dense to the bottom of the test holes.

CPT to a depth of 22 and 23 metres

- Sensitive fine grained to Clay with Sandy silt layers - to a depth of 3.5 metres, estimated average undrained shear strength of approximately 50kPa, blow count average to be 6 per 0.3 metre, and
- Sand to Silty Sand - to the bottom of the CPT soundings, estimated average blow counts to be 20 per 0.3 metre.
- Clay to Silty Clay - approximately one metre thick interbedded layer

Auger test holes 14-1 and 14-2 were terminated at a depth of 12.2 and 9.1 metres, respectively within grey sand material. CPT1 and CPT2 soundings were terminated at depths of 23 and 22 metres, respectively within a grey sand material.

6.2 Groundwater Condition

Local groundwater table was encountered at 1.7 and 1.8 metres deep below existing grades at AH14-1 and 14.2 locations, respectively. CPT1 and CPT 2 soundings indicated that a local groundwater table was located at 1.0 and 0.5 metre, respectively. We envisage that this is considered to be a typical local groundwater table depth for the region with relatively flat topography surrounded by rivers and coast line.

7.0 CPT/DCPT INTERPRETATIONS AND ANALYSES

Two piezometric cone penetration tests (CPT) were carried out adjacent to both auger test hole locations during the investigation. The CPT soundings were advanced to a depth of approximately 32 metres and 24 metres at CPT13-1 and CPT13-2 locations, respectively.

7.1 General

7.1.1 CPT

A "standard" piezometric cone system was used to carry out the cone penetration testing. The electronic cone system used employs a 35.7 mm diameter cone which records tip resistance, sleeve friction, dynamic pore pressure and inclination at 0.05 metre intervals. Each reading is automatically recorded by a computer acquisition system wired to the cone. The results are plotted on the CPT series of figures attached to this document.

7.1.2 DCPT

Dynamic Cone Penetration Test (DCPT) provides subgrade soils' characteristic by measuring the resistence in an in-situ state, similar to the Standard Penetration Test (SPT). Resistance is measured by the number of blows required to advance a metal cone tip 0.3 metre into the ground. The metal cone tip is driven by striking it with a 63.4kgf weight hammer dropped from a distance of 762 millimetres. Unlike the SPT, the DCPT provides continuous data throughout the investigation depth of interest. The DCPT blow count results can be correlated to various soil properties using available methods.

7.2 Water Levels

CPT soundings provide a hydrostatic pressure reading while the piezometric cone probe is passing through layers of relatively coarse grained materials such as sand or sandy silt, allowing an estimation of the local water table elevation (or depth). As the CPT equipment passes through granular soils, its temperature increases and the readings used to estimate groundwater level can become distorted. The deviation in pore pressure baseline between when the probe is inserted and when it is withdrawn gives an indication of the potential error in estimated water table depth. The DCPT is not considered capable of providing information with regards to a local groundwater table.

For the purpose of this report, the depth of water at the subject site has been taken to be 1.0 metre and 0.5 metre at the CPT14-1 and CPT14-2 locations, respectively.

7.3 Soil Behaviour Type

The Soil Behaviour Type has been interpreted and plotted on the CPT series figures . The method of determining Soil Behaviour Type is in accordance with the recommendations by Robertson et al, 1985 and involves inferring Soil Behaviour Type, depending upon the ratio of tip resistance to sleeve friction. For example, the resistance at the tip of the cone is very large when compared to the friction on the side of the cone in coarse-grained (sand) materials, and the tip resistance is low when compared to the sleeve friction in fine-grained (clay) materials.

A chart plotting the sleeve friction ratio versus tip resistance has been derived and assigns Soil Behaviour Types to particular zones within the chart. The zone numbers are plotted versus depth on the CPT series of figures attached to this report and the Soil Behaviour Type associated with each zone number is indicated on the right side of the figures.

It should be noted that "Soil Behaviour Type" may not exactly correspond to the descriptions by the Unified Soil Classification system. Soil Behaviour Type implies that the subsurface soils encountered by a piezometric cone may have similar inherent sounding values, and may behave similarly to the corresponding soil types.

Based on the CPT soundings, the subsurface stratigraphy generally consists of compressive organic material such as peat and fine grained material to a depth of 3 metres underlain by 2 to 4 metres thick sand layer. Beneath the sand layer, series of thin interbedded silty clay, clayey silt, silt, sandy silt and silty sand layers were encountered. This interbedded zone is underlain by a sand layer to a bottom of the CPT sounding. The Soil Behaviour Types encountered at test hole locations are plotted on Figure CPT-01 attached to this document.

7.4 Undrained Shear Strength

This parameter indicates the material's inherent strength for a fine-grained material in the short term, which represents the condition of "undrained". This parameter is usually applied for an estimation of bearing capacity, provided that the material is not likely to be weathered. The undrained shear strengths of the fine-grained materials have also been estimated using the CPT data.

A zone of compressible material was encountered at the CPT locations to a depth of less than 3 metres and at a depth of 20 metres. The compressible material at shallow depth was organic material such as topsoil underlain by Silty Clay, Over Consolidation Ratio of which were estimated to be more than 3. The compressible material encountered at a depth of 20 metres below grade was approximately one metre thick and consisted of Sandy Silt to Clayey Silt. Over Consolidation Ratio of this material was estimated to be ranging from 1.2 to 3.0.

The undrained shear strength (Su) values have been plotted versus depth on Figure 3648-SU1 and 3648-SU2 following the text of this report. For presentation purposes, any shear strengths over 100 kPa have not been shown.

The ratio of undrained shear strength, Su, to effective vertical pressure can be used to estimate the compressibility of soil. We have also presented the ratio of undrained shear strength to existing vertical pressure on the aforementioned figures.

7.5 Settlement Estimate

Due to the presence of compressible subgrade material encountered at all test hole locations, we carried out settlement analyses. To estimate the magnitude of the settlement, Schmertmann's equations were applied. In addition, we considered Over Consolidation ratio by applying the re-compression index (C_r). The re-compression index used for the analysis was set as 7.5% of its compression index (C_c). Based on "Correlations of Soil Property" by Michael Carter and Stephen

P. Bentley, typical values of C_r range from 0.015 to 0.35 (Roscoe et al, 1958) and are often assumed to be 5% to 10%.

As described in the Section 3, the existing grade will be raised. At the time of preparing this document, the thickness of the proposed fill is unknown. Thus, we carried out settlement estimates with some conditions for both CPT1 and 2 locations. For preliminary design, we have applied "area pressure" placed at the current grade, which may represent a thickness of fill be placed in the future.

It should be noted that unit weight of fill material was assumed to be 17.5 kN per cubic metre. It should be also noted that this settlement was estimated based on only the primary consolidation and does not include an amount which may be caused by the secondary consolidation nor decomposition of peat.

Settlement Estimate at each CPT location

Thickness of Fill Placement (m)	CPT 1 Location (centimetres)	CPT 2 Location (centimetres)
0.6	0.5 - 3.0	0.6 - 4.0
1.2	1.0 - 6.0	1.0 - 6.0
1.8	1.5 - 8.0	1.5 - 8.5
2.4	2.0 - 10.0	2.0 - 10.0
3	2.3 - 11.5	2.5 - 11.5

The results provided above should be considered order of magnitude rather accurate values. Actual results may vary 50% to 100% of the calculated amounts.

8.0 DISCUSSIONS and RECOMMENDATIONS

8.1 General

Our geotechnical investigation results indicated that two zones of compressible, fine grained materials were encountered at all test hole locations. The thickness of these compressible materials were approximately 3.0 metres at the surface and one metre at a depth of 21 metres, respectively.

Due to the presence of the compressible materials, settlement at ground surface could be induced when these materials are subject to new, surcharge loading, such as building loads or loads associated with raising grade. The thickness and composition of these strata are variable across the site and therefore the performance of buildings or features supported on these materials could also vary. For buildings or features, such as a paved road, with large footprints, this differential performance could be significant and affect serviceability.

The sections below present geotechnical recommendations for the proposed development. All recommendations presented herein are provided based on the available information and results of the geotechnical investigation. In the event that additional information is available, and / or proposed development will not consistent with our assumptions, and/or subsurface conditions

encountered during construction differ from the descriptions in our geotechnical investigation, the recommendations herein should be reviewed and revised, if necessary, by Horizon Engineering.

8.2 Site Preparation

8.2.1 Stripping

Based on our geotechnical investigation, topsoil was encountered at a shallow depth at all test hole locations. It is preferable that the underlying organic material be removed prior to placing a permanent fill material. The benefit of this organic material removal operation would;

- minimize a risk of post construction settlement due to a decomposition of organic materials.
- excavated organic-rich material could be utilized for the proposed farming area.

However, for developing the agricultural land and inner road, the stripping operation may not be required from the geotechnical viewpoint. After stripping and exposing the natural undisturbed material, the site may require filling to achieve design grades. The fill should be consisted of 'Engineered Fill' beneath any settlement sensitive structures, such as building, roads, utilities, etc.

8.2.2 Grade Increase

Based on the information provided to us, FCL at the subject property is 3.0 metres Geodetic. In order to achieve the FCL, it is required that the existing grade be increased. It is recommended that the grade increase should be carried out by placing either Engineered Fill or select, inorganic granular fill.

Side slopes for grade increase must be kept no steeper than 2 horizontal : 1 vertical slope (26.5 degrees). This requirement is based on use of suitable granular materials.

The proposed ground level increase may generate settlement in the neighbouring properties along the property lines. Based on the site condition at the time of our site investigation, no settlement sensitive structures are located along the property lines except at southwest corner where a warehouse buildings are located. At the time of preparing this report, the extend of the proposed grade increase was not provided from yourself. Thus, we envisage that the proposed grade increase will be carried out at the entire subject property. It is recommended that no fill placement is placed within 10 metres from any settlement sensitive structures (ie toe of the fill material for grade increase should be at least 10 metres away from the exterior of the building) including warehouses located at southwest corner of the subject property.

Provided the above recommended setback distance is present and fill height is less than 3 metres, we envisage that there would be no adverse impact to the structures in the neighbouring properties due to potential ground settlement.

However, it is recommended that the settlement monitoring program should be carried out adjacent to nearby buildings and or any structure that may be affected by the proposed grade change. Settlement data should be forwarded to Horizon Engineering Inc for further review.

In addition, it is recommended that no settlement sensitive structures be constructed along the property lines in the neighbouring properties unless the completion of the ground settlement due to placing fill on the subject property.

8.2.3 Surficial Run-off Management

We envisage that surficial run-off will be altered subsequent to increasing grades at the subject site. In order to minimize negative impact to the neighbouring properties, it is recommended that an interceptor trench/ditch should be installed at the toe of the fill slope along the property lines in order to minimize surficial run-off into the neighbouring properties. The interceptor trench/ditch should be extended to the north or south end of the subject property and direct to suitable disposal system (such as existing ditches).

8.2.4 Engineered Fill

Within the context of this report, Engineered Fill should consist of select, clean, well-graded granular material with less than 5% fines content and 100% passing a 150mm sieve. In general, Engineered Fill, within 2% of its optimum moisture content for compaction, should be placed in suitable lifts and compacted to the equivalent of at least 100% of its maximum dry density when determined in accordance with ASTM D698 (Standard Proctor).

9.0 CLOSURE

This report has been prepared for the sole use of our client and other consultants for this project, as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to call.

For:
HORIZON ENGINEERING INC

Karim Karimzadegan M.A.Sc., P.Eng
President

For:
HORIZON ENGINEERING INC

Hiro Shozen, M.A.Sc, P.Eng
Geotechnical Engineer

Attachments

Site Location Plan	Figure 1
Test Hole Location Plan	Figure 2
Soil Log	AH14-1 and 2
CPT Plots	CPT-1, CPT-2, 3648-SU1, 3648-SU2

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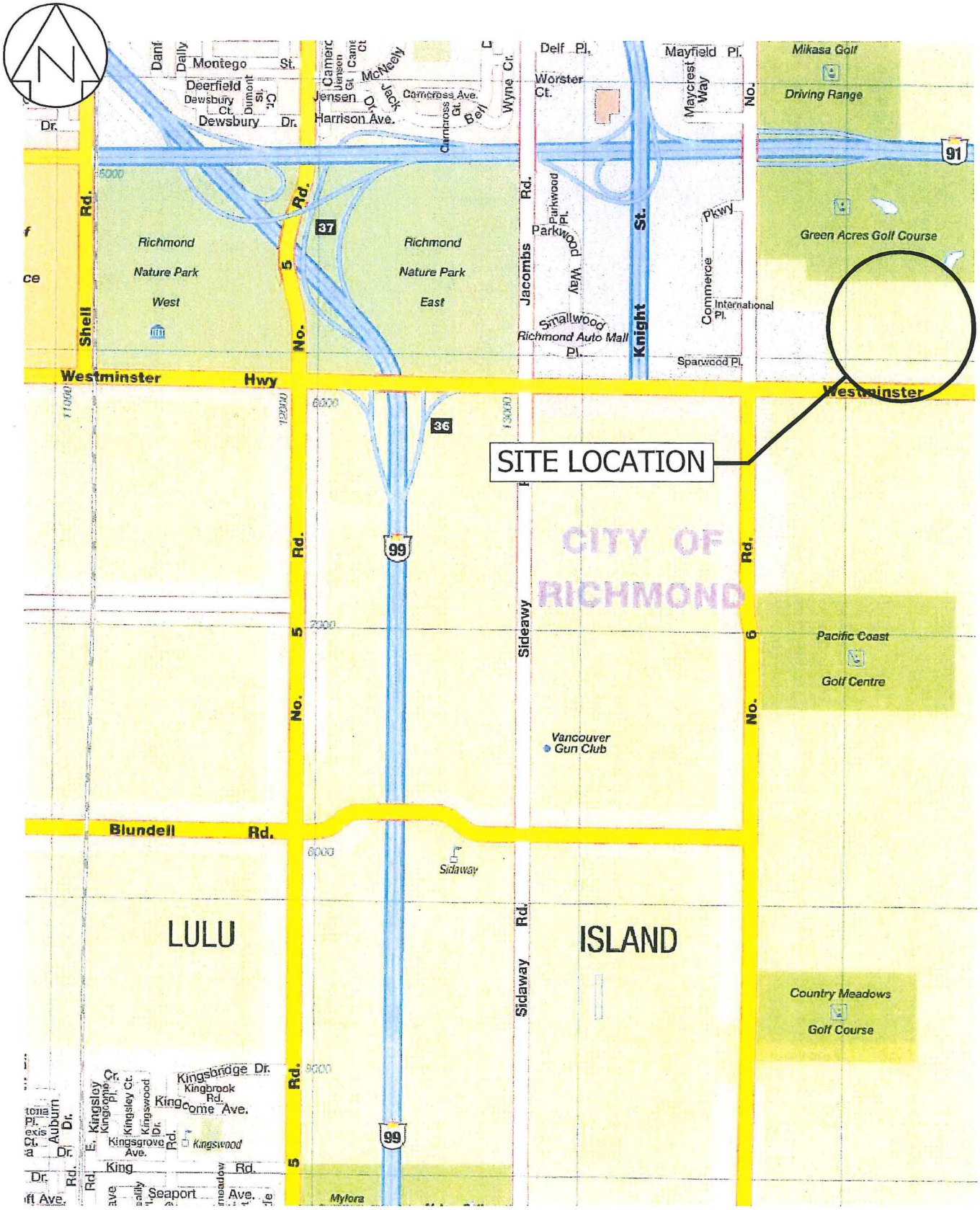

DOUGLAS KAVANAGH
16060 Westminster Hwy, Richmond, BC

PROPOSED DEVELOPMENT
14791 Westminster Hwy, Richmond, BC

SITE LOCATION PLAN
GP - 97

HORIZON ENGINEERING INC

Scale:	Job No:	Date:	FIGURE:
NTS	114-3648	OCT/2014	1

Des:	Dwn:	Chk:	Rev:
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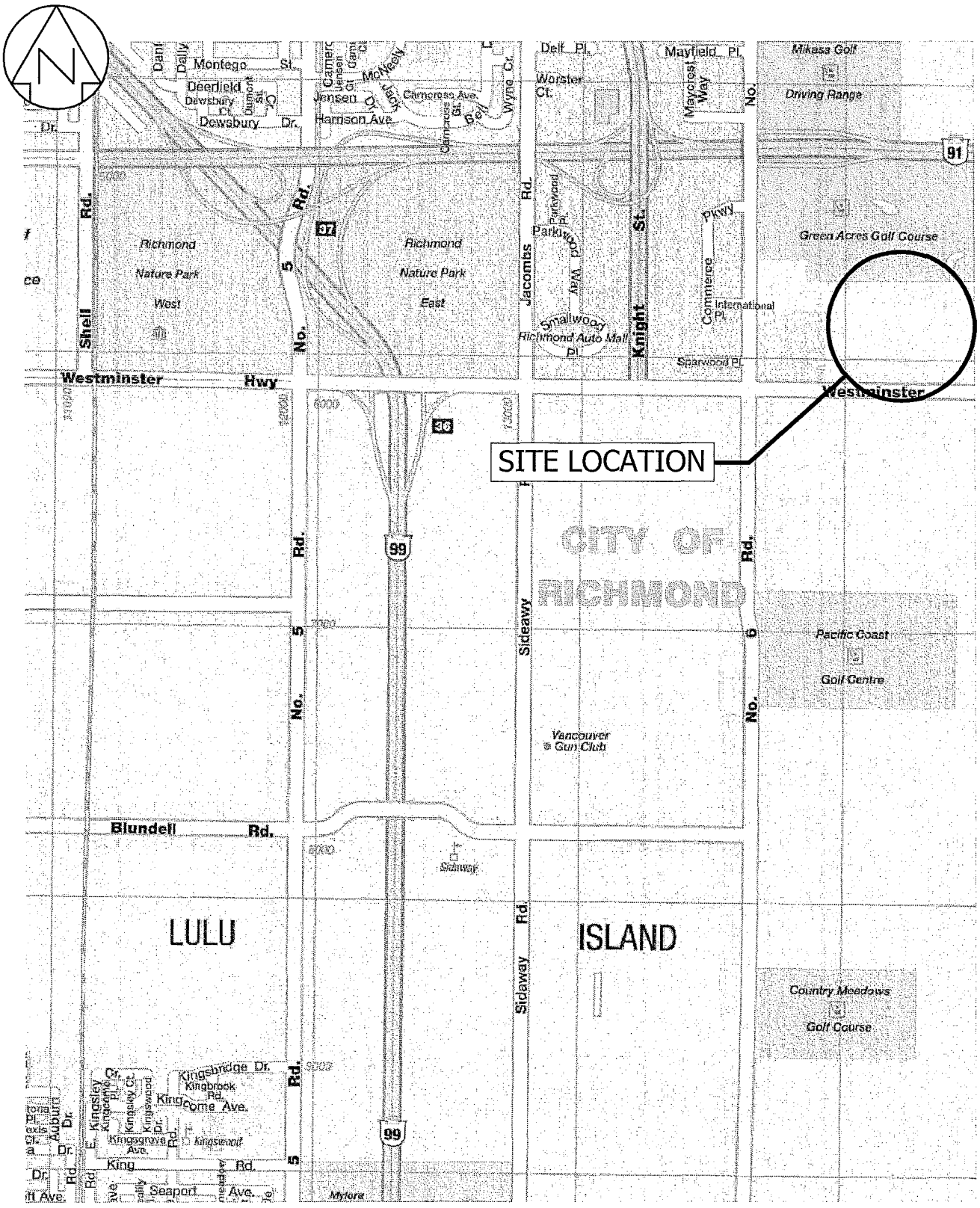

DOUGLAS KAVANAGH
16060 Westminster Hwy, Richmond, BC

PROPOSED DEVELOPMENT
14791 Westminster Hwy, Richmond, BC

SITE LOCATION PLAN

GP - 98

HORIZON ENGINEERING INC

Scale:	Job No:	Date:	FIGURE:
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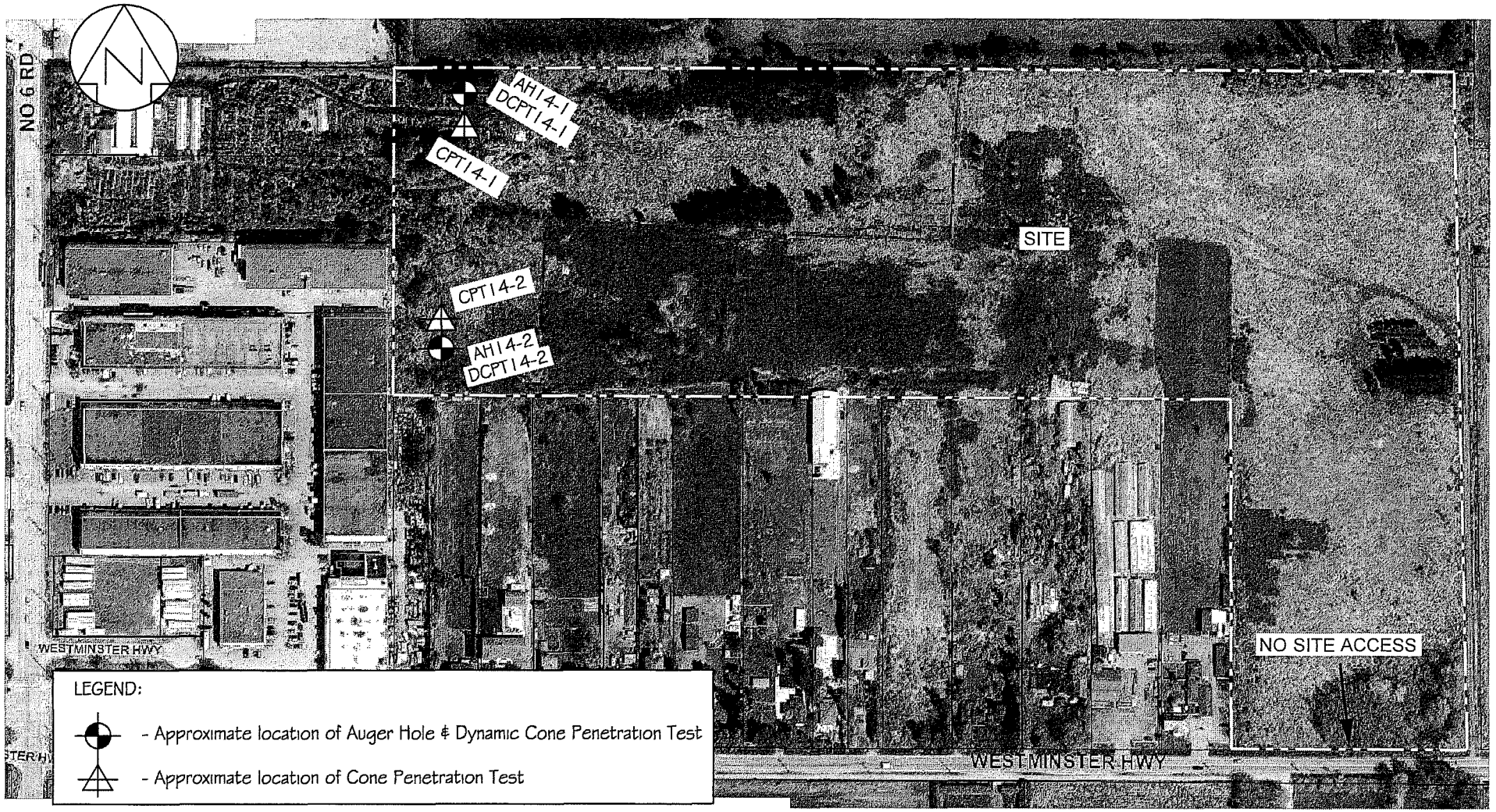


Reference: City of Richmond Aerial Photography

DOUGLAS KAVANAGH
16060 Westminster Hwy, Richmond, BC

PROPOSED DEVELOPMENT
14791 Westminster Hwy, Richmond, BC

TEST HOLE
LOCATION PLAN
GP - 99

HORIZON ENGINEERING INC

Scale:	Job No:	Date:	FIGURE:
NTS	114-3648	OCT/2014	2

Des:	Dwn:	Chk:	Rev:
HS	BB	KK	

Auger Hole LOG

Auger Hole No.: AH14-1

LOGGED BY: LC ON: 19 / 09 / 2014 REVIEWED BY: HS COLLAR ELEVATION: _____ METHOD: Track Mounted Drill Rig

Type of Test
- O Dynamic Cone Penetrometer Test (DCPT)
- ● Becker Denseness Test (BDT)
- ▲ Number of blows - Standard Penetration (SPT)
- ■ Moisture Content (% of dry weight)
- › Plastic limit
- ‹ Liquid limit

TYPE -- Type of sample
- SPT -- Split spoon
- S -- Shelby tube
- G -- Grab
- O -- Other (specify)

▽ Ground water level

Notes: DCPT14-1 Located at AH14-1
Backfill - Drill Cuttings and Bentonite Chips

Depth m	Depth ft	DESCRIPTION	Symbol	Depth	SAMPLE DCPT	SAMPLE TYPE	DCPT 20 40 60 80	Piezometer / Comments / Additional Testing
0	0	**SAWDUST**			4		O	
		TOPSOIL (dark brown) silt, firm, some organics, wet		1.25	6		O	
					5		O	
1					5		O	
		SILTY CLAY (grey) trace to no sand, very soft, wet		4	8		O	
	5				1	G 1	O	▽
		- 4 to 5, very loose fine grained sand layer			0		O	Groundwater was measured to be at 5.5 ft below grade at the end of drilling
2					0	G 2	O	
					4		O	
					2		O	
3	10				1		O	
					2		O	Auger hole open to 7 ft at end of drilliing
		SAND (grey)		12	12		O	
4		fine grained sand, trace silt, compact to dense, wet			12	G 3	O	
					21		O	
	15	- 20 to 27 ft, dense			20		O	
5					23		O	
		- 35 ft and below, dense			26		O	
					18		O	
6	20				25		O	
					33		O	
					37		O	
					37	G 4	O	
7					32		O	
					37		O	
	25				33		O	
8					35		O	
					27	G 5	O	
					25		O	
9					24		O	
	30				21		O	
					16		O	
10					20		O	
					24		O	
					26		O	
	35				33		O	
11					39		O	
					38		O	
12								
	40	Auger Hole terminated at a depth of 40 feet DCPT termianted at a depth of 38 feet		40		G 6		
13								

HORIZON ENGINEERING INC

PROJECT: 14791 Westminster HWY, Richmond, BC

JOB NO.: 114-3648

SHEET 1 of 1

GP - 100

TESTHOLE LOG 114-3648.GPJ HORIZON.GDT 8/10/14

Auger Hole LOG

Auger Hole No.: AH14-2

LOGGED BY: LC ON: 19 / 09 / 2014 REVIEWED BY: HS COLLAR ELEVATION: _____ METHOD: Track Mounted Drill Rig

Type of Test
- O Dynamic Cone Penetrometer Test (DCPT)
- ● Becker Denseness Test (BDT)
- ▲ Number of blows - Standard Penetration (SPT)
- ■ Moisture Content (% of dry weight)
- > Plastic limit
- < Liquid limit

TYPE -- Type of sample
- SPT -- Split spoon
- S -- Shelby tube
- G -- Grab
- O -- Other (specify)

▽ Ground water level

Notes: DCPT14-2 Located at AH14-2
Backfill - Drill Cuttings and Bentonite Chips

Depth m	Depth ft	DESCRIPTION	Symbol	Depth	SAMPLE DCPT	SAMPLE TYPE	Piezometer / Comments / Additional Testing
0	0	**TOPSOIL** (reddish brown) silt, soft, some organics, wet			1		
					1		
					0		
1		**SILTY CLAY** (grey) trace to no sand, very soft to firm, wet		3	0		
					0	G 1	
	5				0		
					0		
2					0		
					5		
					3		
		SILTY SAND (grey) fine grained sand, trace silt, very loose, wet		9	3		
3	10				4		
		SAND (grey) fine grained sand, trace silt, compact to dense, wet		11	12	G 2	
					12		
4		- 37 ft and below, dense			20		
	15				14		
					15		
5					19		
					13	G 3	
					22		
6	20				21		
					23		
					24		
7					12	G 4	
					10		
	25				13		
					13		
8					12		
					22		
					31		
					28		
9	30	Auger Hole terminated at a depth of 30 feet DCPT terminated at a depth of 38 feet		30	20		
					17		
					20		
10					25		
					28		
	35				29		
11					36	G 5	
					37		
12	40						
13							

▽ Groundwater was measured to be at 6 ft below grade at the end of drilling

Auger hole open to 9 ft at end of drilling

HORIZON ENGINEERING INC

PROJECT: 14791 Westminster HWY, Richmond, BC

JOB NO.: 114-3648

SHEET 1 of 1

GP - 101

TESTHOLE LOG 114-3648.GPJ HORIZON.GDT 8/10/14

HE TESTING

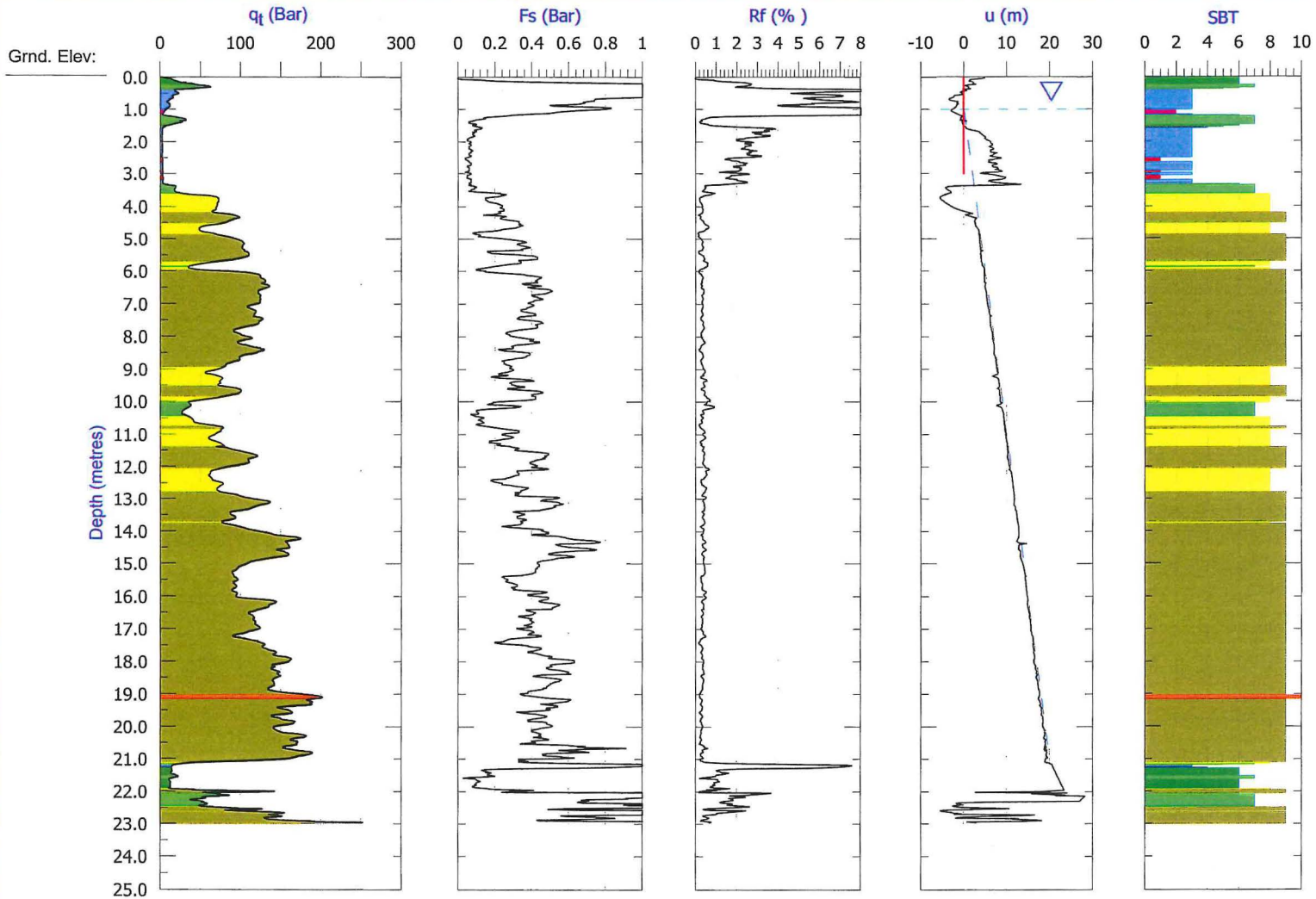
Cone Penetration Test

Job No: 114-3648
Date: September 19, 2014
Site: 14791 Westminster Hwy (5440 No. 6 Rd.), Richmond
HE File: 114-3648 - CPT14-1 - Sept. 19-16

Sounding: 1
CPT Test Hole: CPT14-1
Coords: 49°10.40'N, 123°3.95'W
Cone: I-CFXYP20-10 130722

Max Depth: 22.96m
Depth Increment: 0.02m
Data Interpreted: Every interval

Data & Results



Comments

- No Drill out required
- Refusal at 22.96m at 252 Bar
- Pore pressure line and water level is estimated based on inferred Soil Behaviour Type. Engineer to interpret actual level
- 10 Bars = 1 MPa
- 1 Bar = 100 kPa

Soil Behaviour Type (Robertson et al 1986)

1: Sensitive fine grained
2: Organic material
3: Clay
4: Silty clay to clay
5: Clayey silt to silty clay
6: Sandy silt to clayey silt
7: Silty sand to sandy silt
8: Sand to silty sand
9: Sand
10: Gravelly sand to sand
11: Very stiff fine grained
12: Sand to clayey sand

HE Testing & Monitoring
102-173 Forester St, North Vancouver, BC

HE TESTING

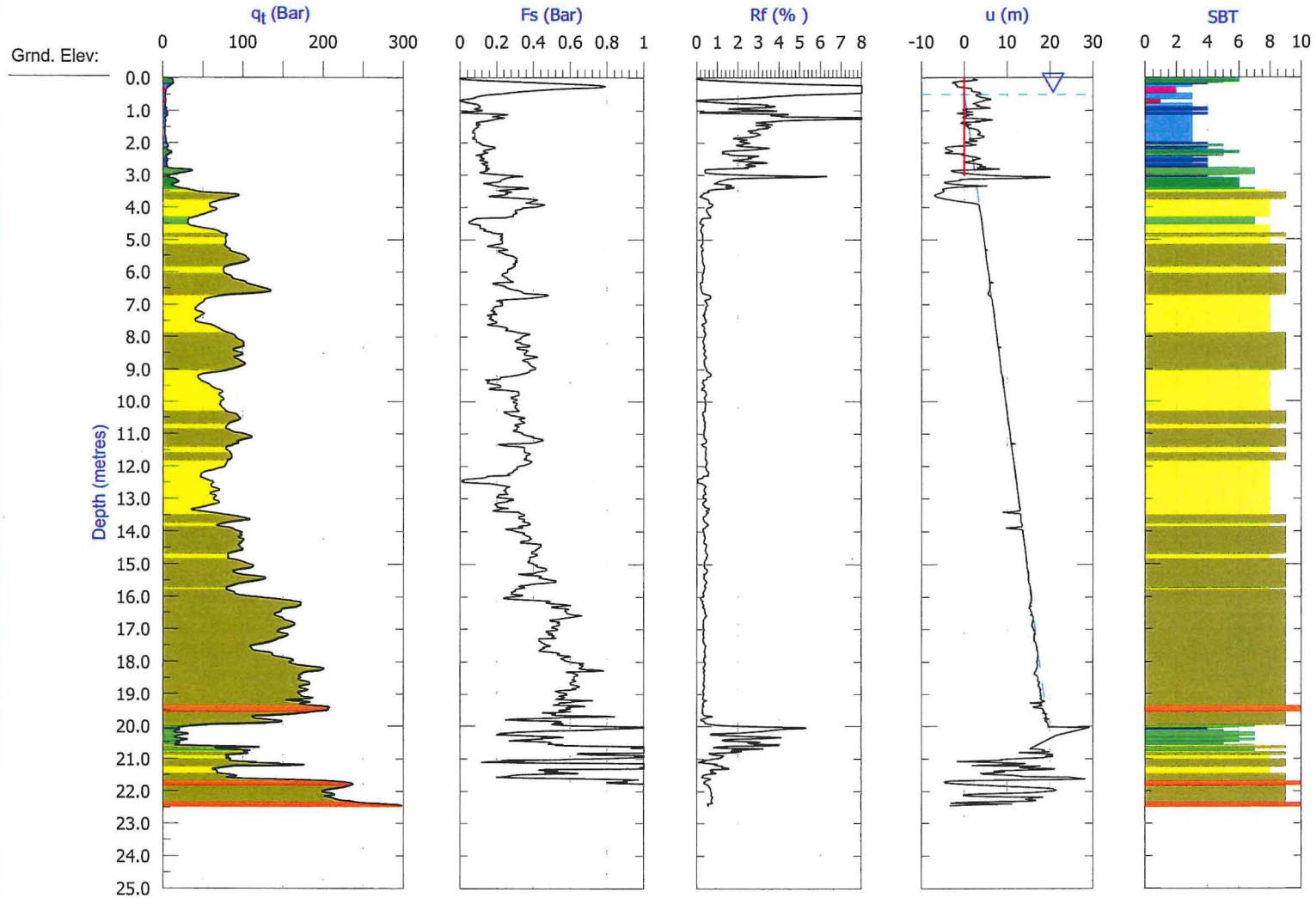
Cone Penetration Test

Job No: 114-3648
Date: September 19, 2014
Site: 14791 Westminster Hwy (5440 No. 6 Rd.), Richmond
HE File: 114-3648 - CPT14-2 - Sept. 19-16

Sounding: 2
CPT Test Hole: CPT14-2
Coords: 49°10.33'N, 123°4.02'W
Cone: I-CFXYP20-10 120317

Max Depth: 22.44m
Depth Increment: 0.02m
Data Interpreted: Every interval

Data & Results



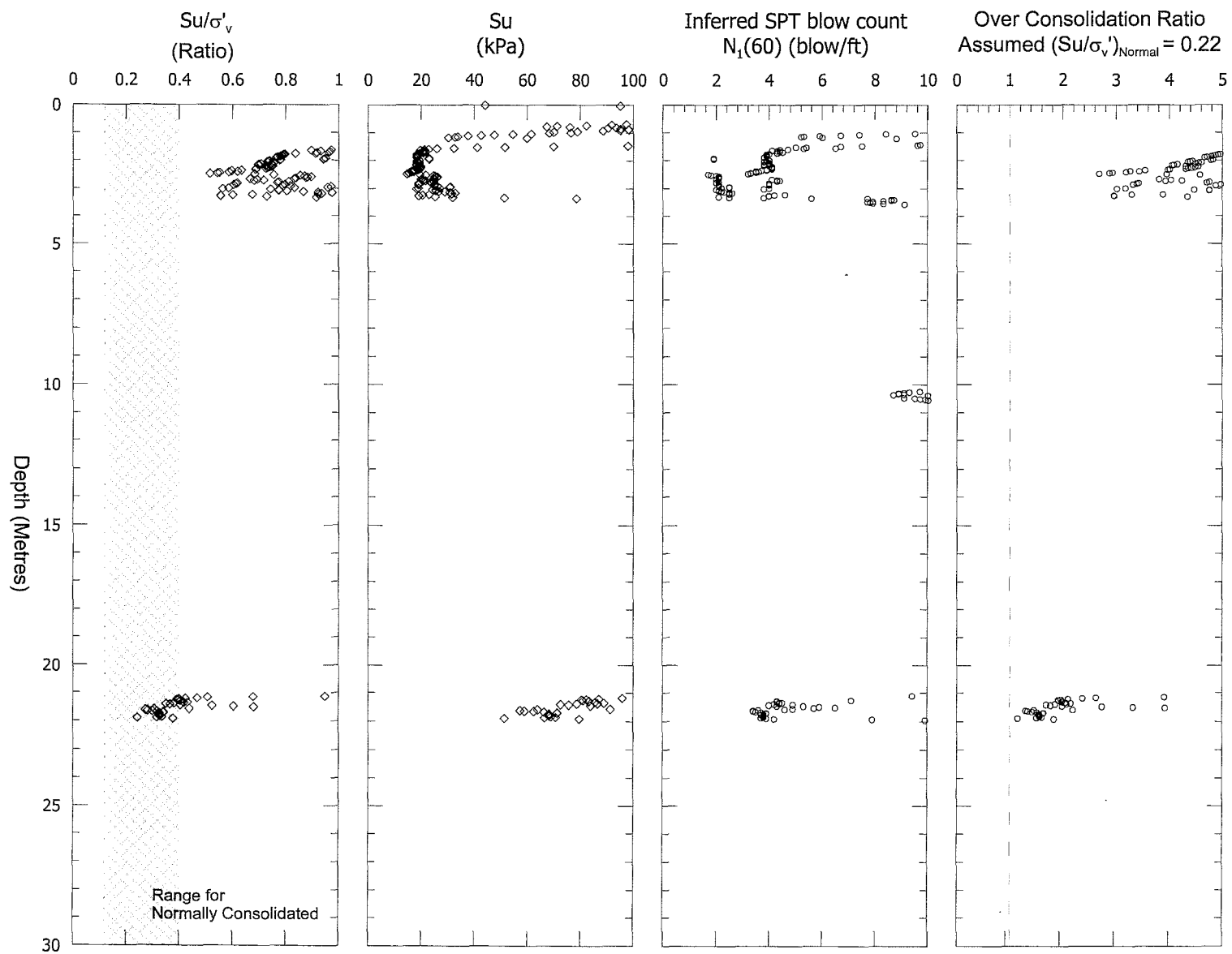
Comments

- No Drill out required
- Refusal at 22.44m at 298 Bar
- Pore pressure line and water level is estimated based on inferred Soil Behaviour Type. Engineer to interpret actual level
- 10 Bars = 1 MPa
- 1 Bar = 100 kPa

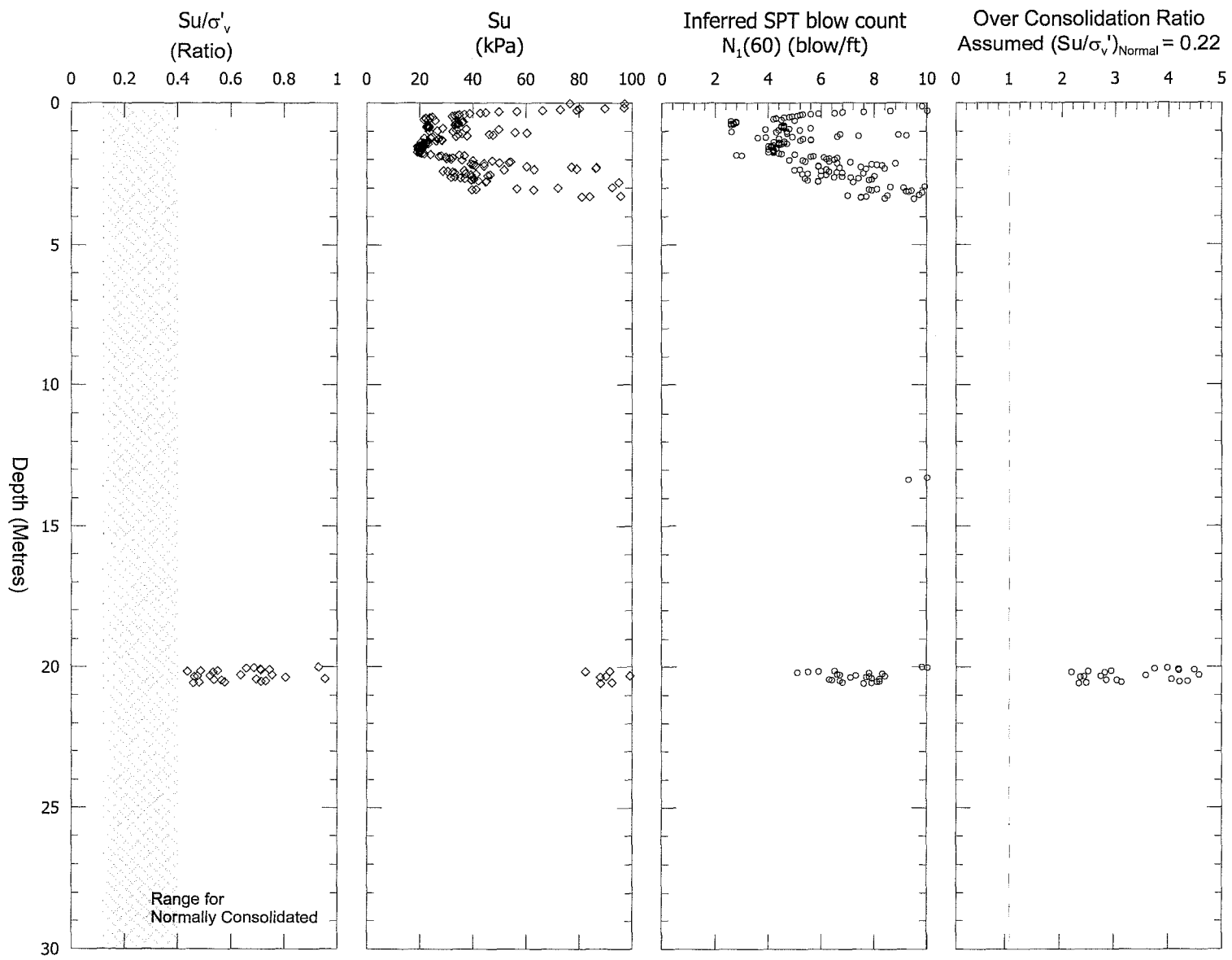
Soil Behaviour Type
(Robertson et al 1986)

1: Sensitive fine grained
2: Organic material
3: Clay
4: Silty clay to clay
5: Clayey silt to silty clay
6: Sandy silt to clayey silt
7: Silty sand to sandy silt
8: Sand to silty sand
9: Sand
10: Gravelly sand to sand
11: Very stiff fine grained
12: Sand to clayey sand

HE Testing & Monitoring
102-173 Forester St, North Vancouver, BC



HORIZON ENGINEERING INC	Sounding: CPT14-1 Cone Used: I-CFXYP20-10 CPT Date: 19-Sep-14 Location: Richmond	Strength Analysis Using CPT-1 Data	Douglas Kavanagh 16060 Westminster Hwy, Richmond	PROPOSED DEVELOPMENT 14791 Westminster Hwy, Richmond
			DWN: HS | CHK: KK | DATE: Oct 2014	FIGURE: 3648-SU1



Undrained Shear Strength

$$S_u = \frac{q_c - \sigma_o}{N_k}$$

S_u :Undrained Shear Strength
q_c :Cone tip resistance
σ_o :In-situ total overburden pressure
N_k :Cone factor (=12.5)

Inferred SPT value

ID	q_c/N	Soil Behaviour Type
1	2	Sensitive Fine Grained
2	1	Organic Material
3	1	Clay
4	1.5	Silty clay to Clay
5	2	Clayey silt to Silty clay
6	2.5	Sandy silt to Clayey silt
7	3	Silty sand to Sandy silt
8	4	Sand to Silty sand
9	5	Sand
10	6	Gravelly sand to Sand
11	1	Very stiff fine grained
12	2	Sand to Clayey sand

HORIZON ENGINEERING INC

Sounding: CPT14-2
Cone Used: I-CFXYP20-10
CPT Date: 19-Sep-14
Location: Richmond

Strength Analysis Using CPT-2 Data

Douglas Kavanagh
16060 Westminster Hwy, Richmond

PROPOSED DEVELOPMENT
14791 Westminster Hwy, Richmond

DWN: HS | CHK: KK | DATE: Oct 2014 | FIGURE: 3648-SU2