

DRAFT SOUTHWEST ABBOTSFORD SOIL REMOVAL STUDY

The aim of this study is to add more certainty to the process for soil removal permits in southwest Abbotsford. The draft study was received by Council on January 21, 2008 where Council referred it to a public information meeting to receive public input. The public consultation meeting will be held March 3, 2008, 6:00 p.m. to 8:00 p.m., at Abbotsford Traditional Secondary School gymnasium, 2272 Windsor Street, Abbotsford. The results of this meeting and public input will be reported back to Council. The draft report is also available from the Engineering Department, City Hall, 32315 South Fraser Way.



COUNCIL REPORT

Report No. ENG 1-2008
January 9, 2007
File No: 4520-40/11

Executive Committee

To: Mayor and Council
From: Elvis Riou, Manager, Engineering Services
Subject: Draft South West Abbotsford Soil Removal Study Presentation

RECOMMENDATIONS

1. THAT Report No. ENG 1-2008, regarding the draft South West Abbotsford Soil Removal Study Presentation dated January 9, 2008, from the Manager, Engineering Services, be received;
2. THAT the results of the draft study from AMEC be referred to a public information meeting; and
3. THAT staff report back to Council on the results of the public information meeting.

BACKGROUND

Council directed staff to commission a study to develop a Soil Removal Eligibility Area in the southwest portion of Abbotsford. The aim of the South West Abbotsford Soil Removal Study (study) is to add more certainty to the permit process for soil removal permits in this area (Appendix 1).

AMEC Earth & Environmental (AMEC) was selected in January 2007 to conduct the study. The budget for this study is \$40,000. AMEC gathered data and conducted site visits between January and June 2007, followed by consultation with aggregate producers and the applicable Provincial Government ministries in July and August. Then from September to December, AMEC analyzed the input received and further refined its data to produce the attached draft report (Appendix 2).

The next step is to present the findings of the study to the public and receive its input, following which a final report will be prepared for Council. The establishment of a Soil Removal Eligibility Area requires an amendment to the Soil Removal and Deposit Bylaw (SRDB).

ANALYSIS

A representative of AMEC will attend the January 21, 2008 Executive Committee meeting to present the draft report.

Soil Removal and Reclamation Strategy

The following is a summary of AMEC's recommendation that the City adopt a Soil Removal and Reclamation Strategy for the study region:

- adopt the eligible and non-eligible areas shown on Figure 10 of the draft report;
- process applications in progress under the current SRBD;
- amend the SRBD so that applicants must:
 - indicate the highest anticipated groundwater levels;
 - include a study to determine if individual Townsends moles are found on the property for the region east of Columbia Street and south of King Road;
- include a provision in the SRDB to consider applications for future soil removal eligibility in areas designated as non eligible in the following cases:
 - a change in the higher value/non compatible land use occurs, such that soil removal could occur;
 - a property is bisected or partially designated as eligible and non-eligible;
 - a detailed hydrogeological assessment indicates that the depth of the water table from the existing ground surface is significantly greater than the zero to five metre range, as presently anticipated by the regional groundwater model
- conduct detailed planning studies concerning land use planning and potential for future soil removal for aggregate production in the following three areas on Figure 3:
 - bounded by Bradner Road – Fraser Highway – Mt Lehman Road – Simpson Road;
 - located approximately on the raised terrace between Bradner Road to the west and Peardonville Road to the east and from just south of Huntingdon Road to just north of Marshall Road;
 - north of Vye Road and east of McKenzie Road, west of Sumas Way, and South of Highway #1.

Other recommendations

- amend the SRDB to consider the range of groundwater fluctuation anticipated and the presence of the Townsends mole, even if the City decides not to implement the full proposed Soil Removal and Reclamation Strategy, as outlined above;
- develop an Aquifer Protection Plan for the Abbotsford-Sumas Aquifer;
- complete a capture zone analysis study to support development of a well protection plan for the existing wells ;
- compile comprehensive information regarding environmentally sensitive areas to guide future planning studies .

SUMMARY

The draft report from AMEC on the study to determine eligible and non-eligible areas for soil removal in South West Abbotsford is complete. After AMEC's presentation, the report will be referred to a public information meeting and the results will be reported to Council.



Jim Gordon, P.Eng.
Director, Engineering



Elvis Riou, P.Eng.
Manager, Engineering Services

ER/sj

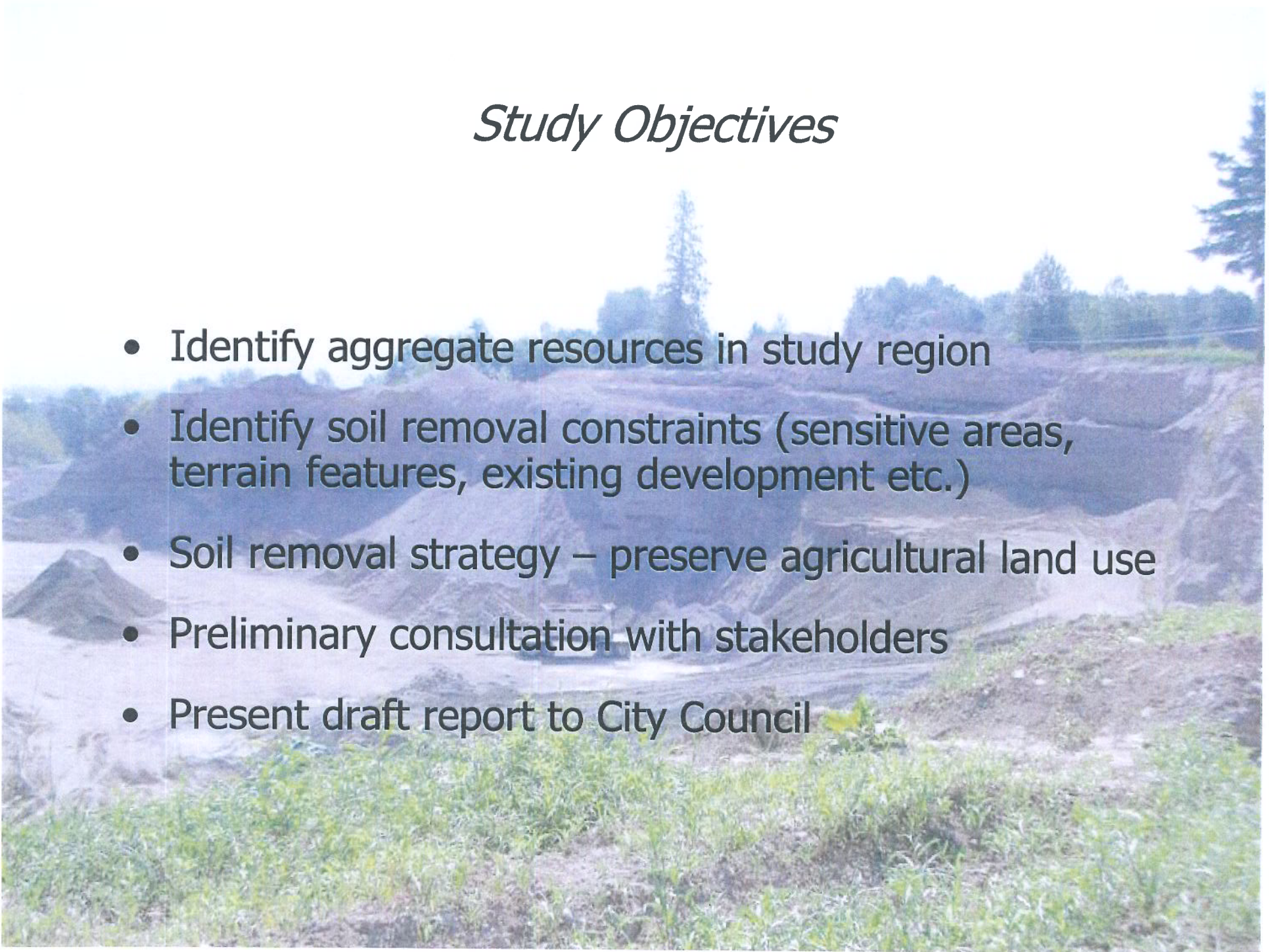
City of Abbotsford
Southwest Sector Soil Removal Study

January 2008
Greg Reid, P. Eng. P. Geo.




Study Objectives

- Identify aggregate resources in study region
- Identify soil removal constraints (sensitive areas, terrain features, existing development etc.)
- Soil removal strategy – preserve agricultural land use
- Preliminary consultation with stakeholders
- Present draft report to City Council



Soils of Interest "Sumas Drift" – glacial deposits of sand and gravel (light green)

City of Abbotsford Southwest Sector Soil Removal Study



ABBOTSFORD

Surficial Geology and Terrain Features

Legend

- Study Region
- Terrain Feature
- Old Pit Location (Interpreted from 1971 aerial photo coverage)

Main Soil Types

- Silt and Clay (Post Langley Formation)
- T8 (Sumas Drift)
- Fluvial/Channel Deposits (Sumas Drift)

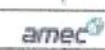
December 2007 Figure 3

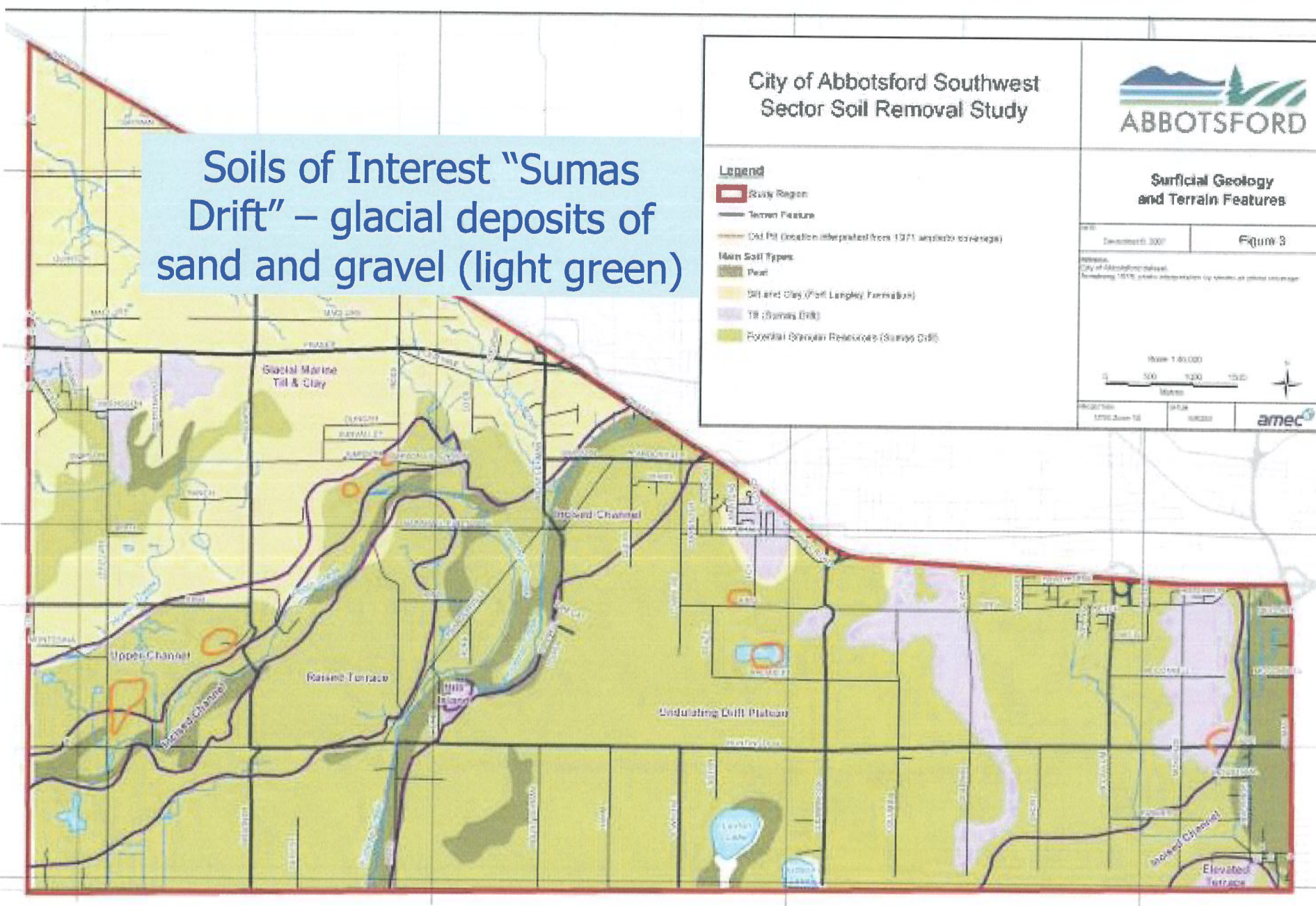
Address:
City of Abbotsford
Township 101S, 101W (Interpreted by Amec from aerial coverage)

Scale: 1:60,000

0 500 1000 1500 Meters

Project No: 12002-000-10 Date: 08/2007





Grey crosshatch – excluded
 Orange – former producers
 Green – active producers

City of Abbotsford Southwest Sector Soil Removal Study



Legend

- State Region
- MDT Aggregate Storage Pit
- Excluded Area
- Potential Excluded Area
- City of Abbotsford Soil Remediation Permit Areas**
 - Current
 - Former (includes sites where remediation is complete or in progress)

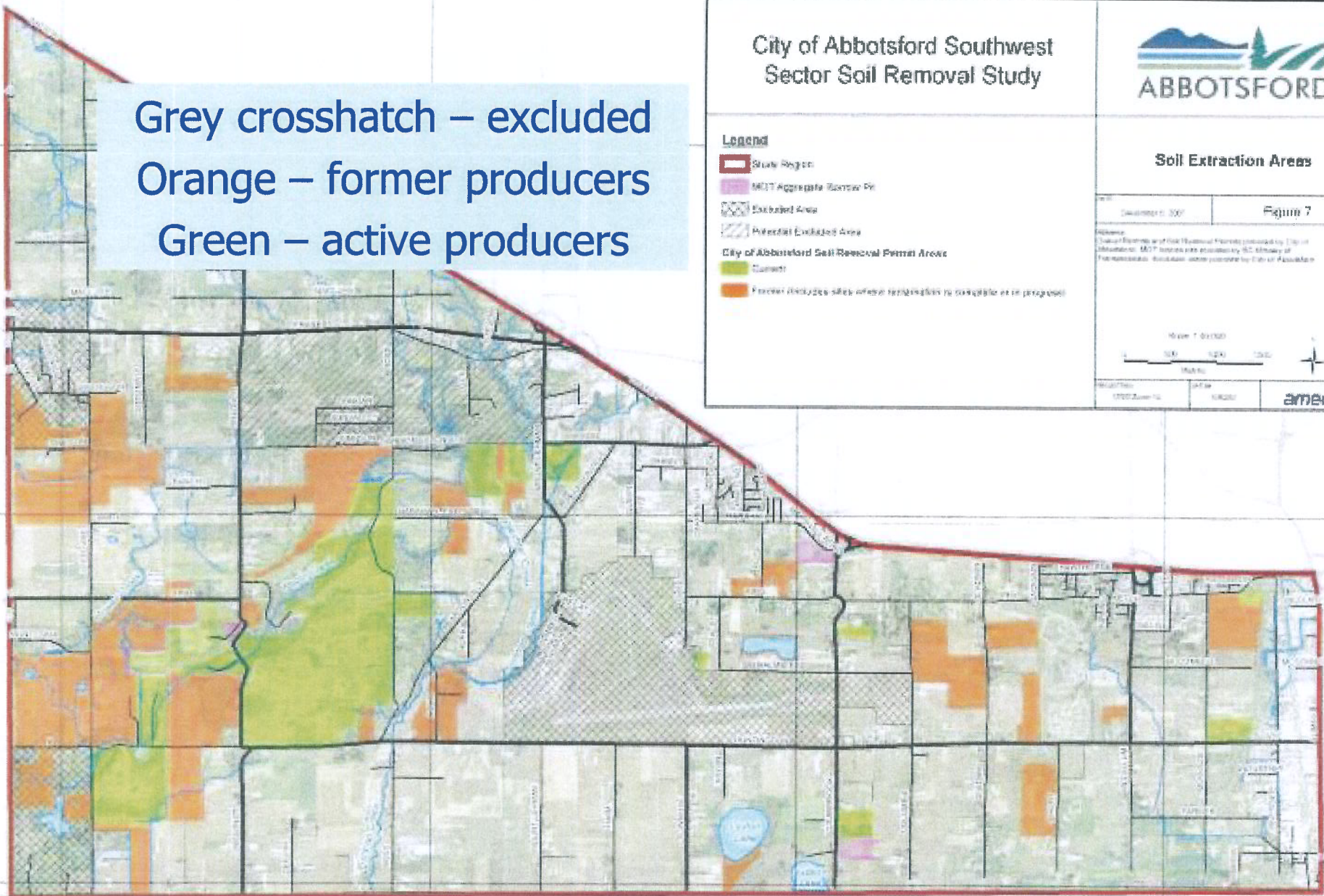
Soil Extraction Areas

Scale: 1:5000
 Figure 7

Notes:
 1. Current Remediation and Soil Remediation Permits controlled by City of Abbotsford. MDT permits are controlled by BC Ministry of Environment. Remediation sites controlled by City of Abbotsford.



PROJECT: 15002-000-10
 DATE: 10/20/10



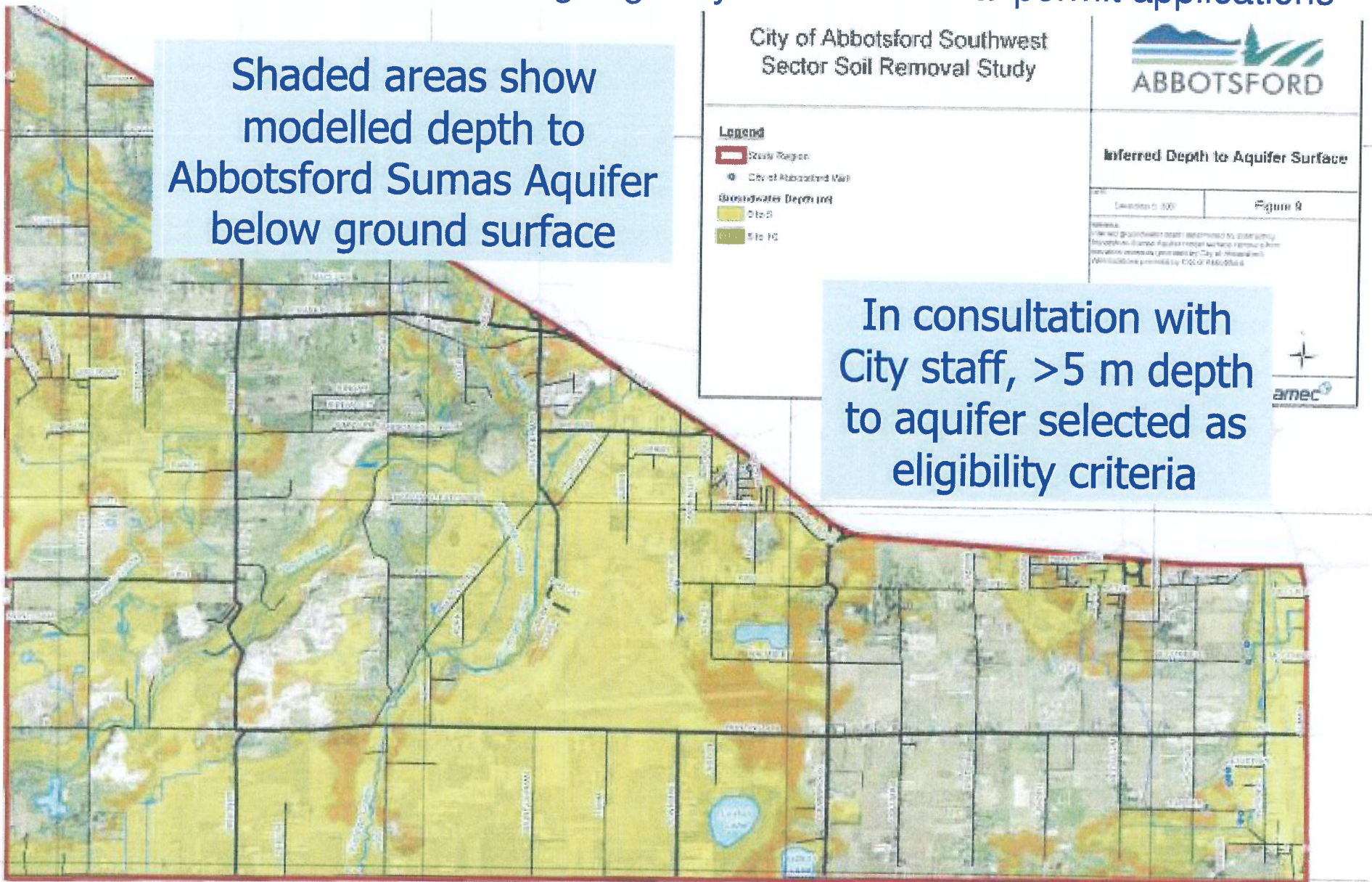


Soil Removal Constraints

Existing land use the most obvious constraint to future soil removal ...not likely to occur near

- Parks, watercourses,
- Existing high productivity farmland,
- Areas of existing/planned residential subdivisions,
- Commercial, industrial, institutional areas.

In addition to land use, AMEC considers proximity to groundwater should be an important criteria in considering eligibility for soil removal permit applications







Shaded regions (purple – land use, yellow - proximity to aquifer) designated as “not eligible” for future soil permit applications

City of Abbotsford Southwest Sector Soil Removal Study



Proposed Eligible and Non Eligible Areas

Legend

-  Study Region
-  Non Eligible Area: Higher value and incompatible land uses (residential neighbourhoods, commercial and institutional sites, schools, and parks/leisure)
-  Non Eligible Area: Low elevation region (Where the groundwater depth has been determined to be within 5 metres of the ground surface)
-  Eligible Area: All non shaded regions of the study area remain eligible for consideration for future soil removal permit applications (subject to the provisions of the soil removal by-law).

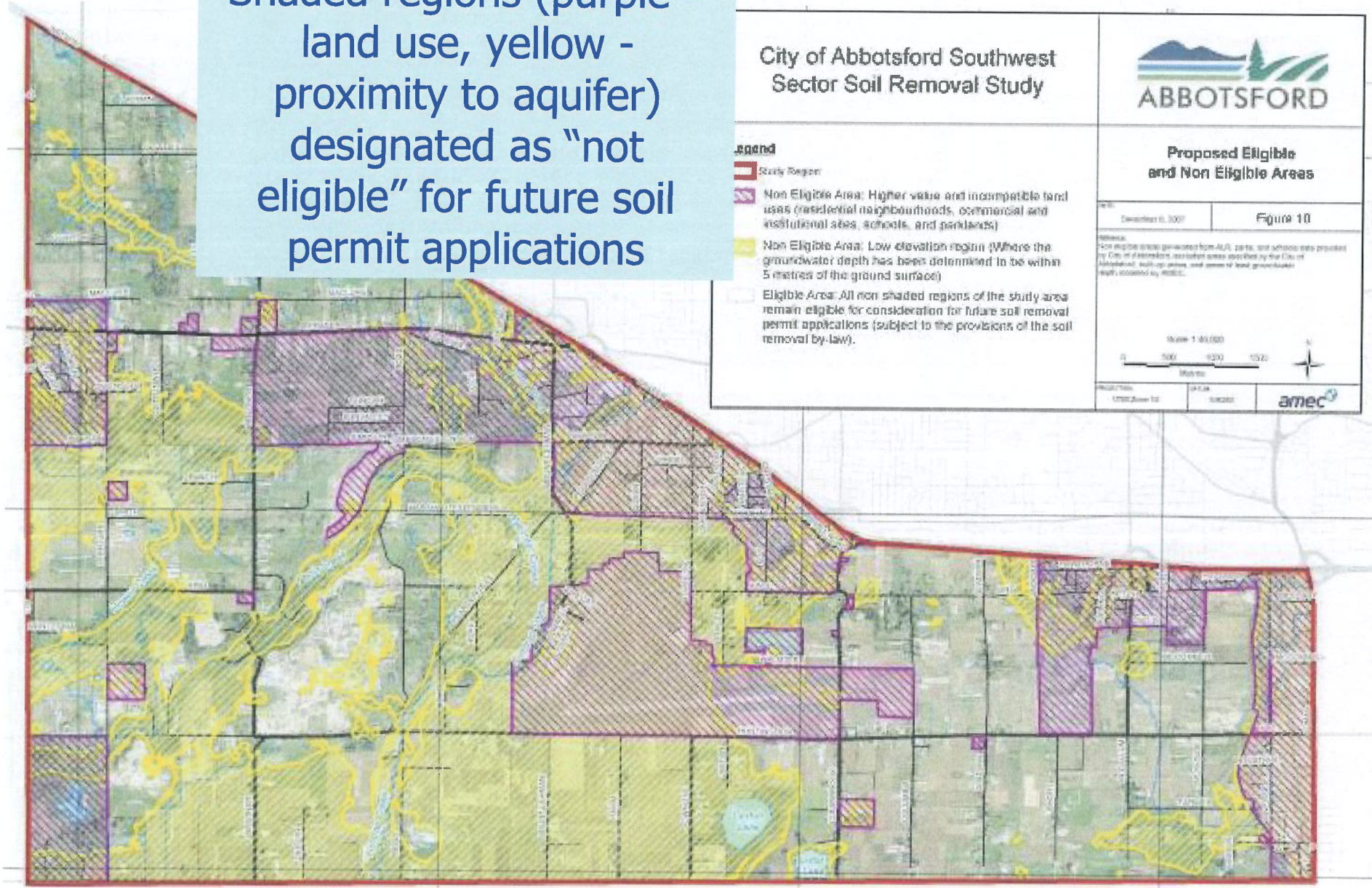
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Figure 10

Notes:
 *Soil maps were generated from AAS, parts, and address data provided by City of Abbotsford. Parcel area provided by the City of Abbotsford. Multi-use areas, and areas of land groundwater depth (000000) by AMEC.



Scale: 1:50,000
 Date: 12/02/2010
 AMEC logo



Conclusions

- Favourable soils in much of study region, many areas have been worked, reclaimed, returned to farmland;
- Competing land uses and values limit access to granular resources, especially presence of Abbotsford-Sumas Aquifer;
- Eligibility criteria and study findings could be used as planning tool & guidance for considering future soil removal permit applications;
- Present bylaws appear effective in achieving objectives, minor amendments have been recommended;
- Considering importance of Abbotsford-Sumas Aquifer to community, City should consider development of comprehensive aquifer protection plan.

CITY OF ABBOTSFORD
COUNCIL REPORT – EXECUTIVE COMMITTEE

REPORT NO.: ENG 19 - 2006
Date: April 11, 2006
File No.: 4520-40/11

TO: Mayor and Council
FROM: Jim Duckworth, Manager, Engineering Services
SUBJECT: Criteria For Development of a Soil Removal Eligible Area Study in South West Abbotsford

RECOMMENDATIONS

1. THAT Report No. ENG 19-2006 dated April 11, 2006, from the Manager of Engineering Services, regarding the criteria for development of a soil removal “eligible area” study in the south west area of Abbotsford, be received; and
2. THAT the criteria listed in this report, to develop an “eligible area” study for the south west area of Abbotsford, be approved.

BACKGROUND

Council denied two soil removal applications in south west Abbotsford over the past nine months. One of these applications at 2676 Ross Road was denied twice; once in November, 2005 and in February, 2006. At the time of the second denial Council directed staff to review the possibility of the development of a soil removal “eligible area” in the south west area of the City to accommodate future applications.

The City has an existing soil removal “eligible area” on Sumas Mountain. This was established in 1997 through the use of an Engineering Consultant with Lower Mainland expertise in aggregate extraction reclamation planning. The key steps in establishing that Plan were:

- the criteria to be used for determining the development of an “eligible area” was established;
- public and other key stakeholder consultation carried out;
- the development of a report for consistent application of removal in the area; and
- the amendment and adoption of the bylaw, and the establishment of a clearly defined area where soil removal applications can be accepted.

DISCUSSION

The south west area of the City has been open to soil removal for over 50 years. The majority of pits occur south of Simpson Road, west of Ross Road. There is also a scattering of pits south of King Road, between the Airport and Riverside Road. The pit applications have generally followed the known

aggregate formations in the area.

Staff suggests the following criteria for the development of an "eligible area" to allow consideration of future applications:

- identify existing gravel formations;
- identify environmentally sensitive areas such as watercourses, ravines, wetlands;
- estimate the recoverable reserves in the defined area;
- note existing permitted gravel operations;
- identify acceptable transportation routes;
- use any pre-determined boundaries set by Council (see attached petition from Ross Road neighbourhood);
- no intrusion into flat, agriculturally productive lands;
- identify potential major deposit sites;
- key stakeholders such as neighbourhood residents, Industry, Agricultural Land Commission (ALC), Mines Ministry, Department of Fisheries and Oceans, Ministry of Environment, Ministry of Transportation, and School District No.34 to be consulted;
- installation of processing plants; and
- develop a reclamation strategy acceptable to ALC, Industry, and City staff.

ANALYSIS

An "eligible area" for soil removal in the south west area of the City will assist staff to clearly accept or deny an application for further processing. It also provides certainty for Industry in pursuing land for future extraction.

There will be considerable public and regulatory agency input to the development of this area. It follows that once an area is adopted by Council, an application which falls within the area may not require further public input, other than Council's Executive Committee review.

Staff proposes to use the criteria above, or as amended by Council, to develop a Request for Proposal (RFP) to retain a Consultant to carry out this task. This is the same approach used for Sumas Mountain. We anticipate this project will take approximately nine to twelve months before a final report is available for adoption.

SUMMARY

Council recently directed staff to review the possibility of an "eligible area" for soil removal in the south west area of the City. Staff proposes to send out an RFP to retain a Consultant to develop this "eligible area" through an extensive stakeholder consultation process. This report outlines the detailed criteria that will establish the scope of the RFP

Jim Gordon, P.Eng.
Director of Engineering

Jim Duckworth, P.Eng.
Manager, Engineering Services



Our Ref. KX13137

December 14, 2007

City of Abbotsford
32315 South Fraser Way
Abbotsford, B.C.
V2T 1W7

Attn: Mr. Elvis Riou, P. Eng.

Re: Draft South West Abbotsford Soil Removal Study, Abbotsford, B.C.

As requested, AMEC Earth & Environmental, A Division of AMEC Americas Limited (AMEC) has conducted a geoscience study of the southwest sector of the City of Abbotsford (City). This study was commissioned by the City as per terms of reference set forth in a request for proposal document, "South West Abbotsford Soil Removal Eligible Area", File 4520-40, dated October 16, 2006. Acceptance of AMEC's response, "Proposal for Soil Removal Study South West Sector City of Abbotsford" KP10105, dated December 11, 2006 was provided by the City in the form of Purchase Order Number 143957 and written authorization to proceed with the work was received by fax on December 21, 2006.

The attached report provides the results of the study, including:

- maps depicting geoscience and other pertinent information collected during the study;
- a summary of comments received as part of a stakeholder and public consultation process;
- recommendations regarding eligibility of parts of the study area for potential future soil removal;
- commentary regarding the efficacy of the existing soil removal bylaw and permitting process; and
- recommendations for further consideration arising from the study.

We trust this report provides the information required at this time. If you have any questions or comments, please contact the undersigned.

Yours truly,

**AMEC Earth & Environmental,
A division of AMEC Americas Limited**

Greg Reid, P. Eng., P. Geo.
Associate, Senior Geological Engineer

GR/NP/se
KX13137 cover letter.doc

**SOUTH WEST ABBOTSFORD
SOIL REMOVAL STUDY
ABBOTSFORD, BRITISH COLUMBIA**

City of Abbotsford
32315 South Fraser Way
Abbotsford, B.C.

Prepared by:

AMEC Earth & Environmental,
A division of AMEC Americas Limited
913 Laval Crescent
Kamloops, British Columbia
Canada V2C 5P4

December 2007

AMEC Project No.: KX13137

EXECUTIVE SUMMARY

The City of Abbotsford (City) is considering updating its policies and present Soil Removal Bylaw to reflect current and future land uses, and protection of other potential resources or attributes within the southwest sector of the City, consisting of the region east of 276, south of Highway 1, west of Sumas Highway and north of the US border. The present bylaw philosophy takes into consideration a variety of factors and potential impacts of proposed soil removal activity, one of the key aspects of which is that soil removal, deposition and site reclamation is conducted in a manner such that the agricultural capability of the property is preserved or enhanced from its original condition once soil removal and reclamation is complete. AMEC Earth and Environmental, a Division of AMEC Americas Limited (AMEC), was retained by the City to conduct a study within this region regarding historic and potential future soil removal. As part of the terms of reference, AMEC was asked by the City to characterize and consider a variety of factors and attributes of the lands within the study region, and if possible develop a rationale for the City to use in considering the merits of future soil removal permit applications within the study region.

The study methodology included review of a wide variety of information about the study region including various physical attributes (soil, groundwater, location of environmentally sensitive areas), land uses including past and presently approved permits, interpretation of historic and current aerial photography, ground reconnaissance, development of a proposed soil removal and reclamation strategy, a stakeholder consultation process, integration of comments and concerns into recommendations for a soil removal strategy, and preparation of a summary report including maps to illustrate the information considered.

The results of the study suggest that soil removal activities are primarily focused on sand and gravel production for use as various construction aggregates. A large proportion of the study region is underlain by soil materials comprised of sand and gravel deposits, which are the target of interest for aggregate producers. Many parts of the study region with potential for granular aggregate/soil production and removal have either been previously worked or are presently in production, and many of the sites where former soil removal permits were granted have apparently been reclaimed and returned to agricultural production. Additionally, many areas within the study region with aggregate potential are already in use as productive agricultural lands, or have been subject to other development for residential, commercial, institutional or recreational purposes.

Several factors were considered to represent potential constraints with respect to future soil removal for aggregate production, including agricultural capability, land use, proximity to groundwater and presence of areas of environmental sensitivity. Consideration of agricultural capability concerns is the purview of other regulatory agencies and is outside the scope of the study. While environmentally sensitive areas were taken into consideration, the study did not find that any agency had previously explicitly designated particular areas within the study region as environmentally sensitive. Notwithstanding this, the study region contains several areas with wetlands, watercourses and water bodies, which may represent valuable habitat areas which could also be considered environmentally sensitive. Because most such areas are also a reflection of the underlying water table elevation, consideration of the proximity of groundwater to the ground surface (which was identified as a key constraint for future

soil removal) should also serve to "capture" such areas with respect to future soil removal. Consequently, a preliminary soil removal strategy was developed involving higher value/non compatible land use and proximity to groundwater as eligibility criteria for consideration of future soil removal permit applications.

A preliminary program of stakeholder consultation was undertaken as part of the study, directed at current permit holders/land owners/producers and interested government agencies. Each of the stakeholders identified by the City was provided with some background information about the study and preliminary findings, and invited to respond with their comments. The comments received were reviewed, and where appropriate were taken into consideration by AMEC with input and guidance from City staff in development of final recommendations for the study.

AMEC's principal finding as a result of this study is that a management strategy to guide consideration of future permit applications for soil removal in the study region should recognize the importance of higher value land uses already established, such as parklands, schools, institutional use, residential and other urban development within parts of the study region; and seek to safeguard water quality within the Abbotsford-Sumas Aquifer in the public interest. An appropriate method to accomplish these goals would be to designate portions of the study region as eligible and non eligible for consideration for future soil removal permit applications. The criteria selected for designation of non eligibility for soil removal were higher value land use, and proximity to groundwater. The latter criterion is based on a model of the surface of the Abbotsford-Sumas Aquifer, and is designated using the locations of parts of the study region where depth to groundwater within the aquifer was inferred to be at a depth of 5 m beneath the present ground surface. Additional elements of the proposed strategy include: consideration of using a "grandfathering" approach for present permit applications; consideration of specific amendments to the present bylaw to include proponents' incorporation of anticipated groundwater fluctuation in pit development plans, and consideration of the presence of Townsend's mole (an endangered species) by applicants located east of Columbia and south of King; and provision of some flexibility for City staff to consider future permit applications for areas designated as non eligible under certain circumstances. Three parts of the study region were identified where completion of further detailed planning studies could be considered, with the objective of such studies being the development of a coordinated, multi-property plan for soil removal and land reclamation. Such plans may also involve consideration of relocation of City roads and other infrastructure to facilitate aggregate production and reclamation and improvement of roads, services and runoff management, to the benefit of the community in the long term.

The study recommendations presented include: consideration of adoption of the proposed soil removal and reclamation strategy; in the event that the strategy is not fully implemented, amendment of the existing soil removal bylaw to include consideration of the range of groundwater fluctuation anticipated, and consideration of the presence of Townsend's mole in part of the study region east of Columbia and south of King by future soil removal permit applicants; and in recognition of the value of the groundwater resource represented by the Abbotsford-Sumas Aquifer, that the City give consideration to development of an appropriate and comprehensive aquifer protection plan for the portions of the Abbotsford-Sumas Aquifer which fall within its jurisdiction and regulatory mandate.

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1.0 INTRODUCTION

The City of Abbotsford (City) has exercised a degree of control over the removal and deposition of soil materials from lands within the municipal boundaries for several decades, through a permitting process established by bylaw. The current regulation, Bylaw No. 1228-2003 "Soil Removal and Deposit Bylaw, 2003" seeks to accommodate soil removal within City limits (including agricultural areas), while minimizing impact to agricultural lands and other values such as environmentally sensitive areas, adjoining properties, roadways, ground water resources etc. As noted in the City's request for proposal document ("South West Abbotsford Soil Removal Eligible Area", File 4520-40, dated October 16, 2006), the bylaw philosophy, "contemplates improvement of agricultural capability of rolling terrain, but not over excavation creating pits that require import backfill for reclamation purposes".

The main objective of this study was to characterize the physical attributes and potential development constraints within the south west geographical portion of the City, and to assess the feasibility of future soil removal within the study area. To the extent possible based on the information obtained and study results, AMEC was requested to develop a technical rationale and recommendations for establishment of areas of eligibility and non-eligibility for future soil removal. The intent of such designation, if approved, was to serve as a guide and planning tool both for future applicants and municipal staff in development and consideration of soil removal permit applications. For the purposes of this study, "soil removal" is taken to represent the activities associated with operation of a sand and gravel extraction or borrow pit, which may also include some form of associated materials handling and processing.

The limits of the study area defined by the City are Highway 11 to the east, the Canada-US border to the south, Township of Langley boundary to the west, and Highway 1 to the north. Several areas of existing urban development within the study area, including the Airport lands, the region bounded by 276 - Maclure - Lefevre - Simpson, and the region bounded by Bradner - Fraser - Ross - Simpson were identified by the City as excluded (or in the latter case potentially excluded) sections of the study region. Figure 1 attached shows the location of the study area and excluded areas.

2.0 TERMS OF REFERENCE AND METHODOLOGY

To assess the feasibility of future soil removal within the study area, review and/or research of the following attributes was to be included in the study:

- the surficial geology of the study area, to identify regions where sand and gravel and other soil types may be present;
- locations of environmentally sensitive areas (watercourses, ravines, wetlands);
- locations of existing land uses which may represent constraints to future soil removal (other areas of concentrated urban development, parks/recreational areas, schools, designated transportation routes);

along with consideration of any other attributes deemed to be relevant. The project commenced in January of 2007, beginning with transfer of digital geographic and technical background information from the City. Section 2.1 below provides a summary of the information obtained by AMEC for reference for the study.

2.1 Reference Information

Reference information used in this study was obtained from a number of sources including public domain, data transfer of City information, and observations made within the study area by AMEC staff. For analytical and illustrative purposes, much of the information obtained was collated and/or summarized using Geographic Information System (GIS) software. The table below provides a list of the types of information and sources for the references used in completion of the study.

information	type of data	source
stereo airphotos BC5406 No. 08-14, 49-52	1971 black & white photos	UBC library loan
stereo airphotos SRS 6912 - 31-39, 80-87, 136-139	2004 colour photos	UBC library loan
Agricultural Land Reserve boundaries	digital shape files	City of Abbotsford
aquifer location	digital shape files	City of Abbotsford
study area boundaries and areas of exclusion	digital shape files	City of Abbotsford
land use - schools, parks, community facilities etc. Maps 2A,5A,8A	digital .pdf files	City of Abbotsford
topographic features, roads, property boundaries	dem files, shape files	City of Abbotsford
study area orthophoto image	2006 digital image	City of Abbotsford
drainage network/waterbodies (Map 6)	digital .pdf file	City of Abbotsford
Soil Removal Permits (several different lists provided)	spreadsheet lists	City of Abbotsford
aggregate supply inventory: "Lower Mainland Aggregates Demand Study Volume 1 Aggregate Supply and Consumption".	June 1996 economic research/technical report	BC Ministry of Employment and Investment (internet search). Levelton Engineering Ltd. File 196-091
aggregate producer inventories, circa 2004	map and spreadsheet list	BC Ministry of Energy Mines and Petroleum Resources
soil types - Map 1485A Surficial Geology Mission	digital transfer of paper map	Geological Survey of Canada Armstrong, 1976
City well locations	digital shape files	City of Abbotsford
study area physiography - Landforms of British Columbia	published report	Holland, 1976. BC DMPR Bulletin 48
Ministry of Transportation pit location maps - Strong Pit, Parker Pit.	digital .pdf files	Ministry of Transportation
Soil Removal and Deposit Bylaw, 2003	text file	City of Abbotsford web site, Bylaw No. 1228-2003
regional groundwater table, contour map (5 m intervals)	digital dataset	Dr. Diana Allen, P. Geo. Associate Professor, Department of Earth Sciences, Simon Fraser University.

In addition to the above, visual observations of parts of the study area were conducted, primarily to confirm the aggregate producer inventory information provided, and where

possible to characterize the nature and status of production sites as visible from adjoining public roadways.

2.2 Study Methodology

The methodology followed by AMEC to carry out this study involved completion of six main tasks as described below.

Task 1 - Base Plan Preparation. This task involved collation and transfer of background data, mainly as provided by the City of Abbotsford into an Arcview GIS database, and review of the data for gaps/inconsistencies. Once compilation was complete the data was ordered into a series of base maps used for reference during the project. The base maps illustrated the study limits, excluded areas, roads, watercourses and various other attributes of the land base such as ground contours, land use, locations of aggregate production as listed in the inventories referenced, etc. This task also included review of terrain features evident on the available stereo airphoto coverage of the study region, to assist in characterization of the region and identification of areas of interest for follow-up.

Task 2 - Collect Supplemental information. The objective of this task was to provide a level of "ground truthing", and obtain additional information about the aggregate producers as obtained from the City's list of current soil removal permits and other inventories available. This was undertaken by local AMEC staff, who completed a series of "drive by" reconnaissance observations of targetted regions within the study area. The intent was to characterize the current status of a particular property (operating, not operating, reclaimed etc.), and to the extent possible where visible from public roads describe the local setting of soil removal operations (scale of works, rough estimate of progress of pit development within the site, presence of constraints which may restrict production such as proximity to other properties or presence of groundwater seepage).

Task 3 - Data Analysis. This task involved compilation of the supplemental information into the GIS database, identification of the major aggregate resource locations within the study area, and identification of technical constraints which may impact future aggregate recovery.

Task 4 - Develop Preliminary Soil Removal Strategy, Conduct Stakeholder Consultation. This task consisted of formulation of a conceptual strategy for future soil removal in the study area. The strategy formulated was to consider the main technical constraints for future removal and make preliminary identification of regions deemed to be eligible and not eligible for consideration of future soil removal permit applications. With approval and direction from the City, once the strategy was developed, AMEC conducted an initial round of consultation with various stakeholders, including current aggregate permit holders/applicants, and agencies with jurisdictional or regulatory interests within the study area. The final component of this task involved refinement of the soil removal strategy to take into account any significant concerns raised during the stakeholder consultation.

Task 5 - Prepare and Present Draft Plan to City Council and Public. This task involved preparation of the soil removal study results in draft form for consideration at a City Council meeting and Public Hearing.

Task 6 - Submission of Final Report. This task involved consultation with City staff to incorporate any changes arising from the presentation to Council and Public Hearing.

3.0 SITE CHARACTERIZATION

This section of the report provides a description of the physical attributes of the study region which relate to the potential aggregate resources which may present. Discussion of the various attributes is grouped into three main themes: the physiographic setting of the study area, characterization of land use patterns, and a description of historic and current aggregate production. It is based largely on review of the available reference information, review and interpretation of the airphoto coverage, and observations made during site reconnaissance of the study area by AMEC staff. No specific subsurface investigations were carried out by AMEC. The information collected has been assembled into a GIS database for reference and presentation purposes. Most of the figures attached as part of the report have been generated from the information collected. Copies of the field reconnaissance observations made are attached in Appendix A.

3.1 Physiographic Setting

The study area comprises a region about 14 km long, and 9.5 km wide along its western boundary and 4 km wide on its eastern boundary. It is located within the Fraser Lowland, which represents a low lying region of depositional origin within the larger Georgia Lowland physiographic region (Holland, 1976). The Fraser Lowland region is described as an area of extensive low hills or uplands separated by wide, flat-bottomed valleys. The uplands are characterized as having "cores" composed of either unconsolidated deposits or bedrock, mantled with undulating to rolling surfaces of glacial till and glacio-marine deposits, flat or terraced surfaces of glacial outwash, or raised marine delta deposits. The depositional history during and following the last glacial period is described as very complex, "involving marine and non-marine, glacial and non-glacial deposition. During several glacial advances, ice accumulated to depths of as much as 7500 feet [2300 m], and during each major glaciation the land was depressed relative to the sea. The submergence of the land surface based on the occurrence of marine fossils amounted to 575 feet [175 m] and is interpreted to have been as much as 1000 feet [305 m]" (Holland, 1976, p37).

The study area mainly comprises one of the "upland" or hilly areas within the Fraser Lowland, along with a very small portion of one of the prominent valley bottom features (Sumas Prairie) along its eastern margin. The upland area is dissected by several modern stream channels (Salmon River, Howes Creek, Pepin Creek, Fishtrap Creek) as well as some ancient post-glacial fluvial features, including relict spillway or flow channels, terraces and mid-channel island or gravel bar landforms. Two small ponds of standing water located near the central part of the southern boundary of the study area, Laxton Lake and Judson Lake may represent kettle features, residual depressions caused by melting of entrapped ice blocks in glacial moraine and outwash deposits.

The relief across the study area varies from the tops of small hills in the north-central part of the study area at 140 m ASL (north of Simpson Road between Bradner and Ross), to 10 m ASL in the low - lying region in the Riverside and Sumas Highway along the eastern boundary of the study area. The study area comprises several main landform features, each with distinctive physiographic character reflecting the respective depositional origin and composition of the underlying soil materials. From west to east, the features include an undulating to hummocky glacio-marine upland, an ancient glacio-

fluvial channel complex, a drift plateau, and a second, low-lying incised channel (see Figure 2).

The glacio-marine upland in the northwestern quadrant of the study area is comprised of stony silt and clayey glacio-marine deposits, marine sediments and till identified as the Fort Langley Formation, which is reported to vary from 8 to 100 m thick (Armstrong, 1976). The remainder of the study area to the southeast is all comprised of recessional glacio-fluvial deposits mapped as the Sumas Drift (Armstrong, 1976), in the form of channel-related deposits and outwash (kame) deposits. The deposits of fluvial origin include terraces, bars, channels and mid-channel islands and are located in two parts of the study area: a northeast-southwest-trending band including the modern reaches of Fishtrap and Pepin Creeks which extends down to the south-west corner of the study area, and a narrow band along the eastern side of the study area. Though many parts of these features have relatively flat terrain elements, there is typically 20 to 50 m of local relief between the channel floor and the terrace surfaces. The central part of the study area consists of an undulating kame terrace of Sumas Drift (deposits of gravel and sand with till and silt lenses), which extends 8-9 km east of Fishtrap Creek where it terminates in a locally steep escarpment slope 40 to 50 m in height.

Figure 3 attached illustrates the surficial geology or distribution of principal soil types within the study area. For the purposes of this report, the soil materials depicted have been grouped by grain size and/or composition into four main types:

- peat, representing modern floodplain and alluvial deposits in low-lying areas;
- silt and clay, representing mainly the region comprised of Fort Langley Formation glacio-marine deposits;
- till, representing local regions of Sumas Drift with clayey silt and trace to some sand and gravel; and
- potential granular resources, representing regions of Sumas Drift comprised primarily of sand and gravel deposits.

3.2 Groundwater

A large part of the study area is underlain by a regional aquifer designated by the BC Ministry of Environment (BC MoE) as Aquifer 151A(20) ([http://webmaps.gov.bc.ca-BCWater Resources Atlas](http://webmaps.gov.bc.ca-BCWaterResourcesAtlas), a website administered by BC MoE), also known as the Abbotsford-Sumas Aquifer. Our original study methodology involved review of the BC Waterwell Database to characterize the extent of the aquifer and in particular to gain insight as to aquifer depth below ground surface. At the commencement of the study we inferred (based on our site observations, anecdotal evidence and information from the City's wells), given the soil conditions, waterbodies and surface elevations present that groundwater probably occurred very near surface across much of the study area. In the latter stages of the project, we were successful in contacting Dr. Diana Allen of Simon Fraser University, who was able to provide AMEC with a digital copy of a computer model of the groundwater surface. The information consists of a map of the regional aquifer surface with a contour interval of 5 m which was developed as part of a separate study on groundwater quality, and is based on groundwater information as reported in the water well database and as observed in a number of monitoring wells. Figure 4 attached is a map of the Abbotsford-Sumas Aquifer groundwater surface within the study region. It should be noted that in some parts of the study area, the groundwater surface

elevations illustrated are higher than the existing ground surface, indicating that in such areas the aquifer is pressurized and exhibits artesian flow conditions.

3.3 Land Use

There is a wide range of existing land uses within the study region, with the predominant use being agricultural. Figure 5 shows the distribution of areas within the study region designated by the Provincial Agricultural Land Commission as being within the Agricultural Land Reserve (ALR). Other land uses within the study area include industrial and commercial developments, residential subdivisions, the Abbotsford International Airport, institutional (Matsqui Regional Prison, Fraser Fish Hatchery), school grounds, parks and recreation, and Ministry of Transportation gravel pits. Figure 6 attached shows the distribution of major land uses within the study region.

3.4 Historic and Current Aggregate Production

Some indications of previous aggregate production within the study area can be found through review of historic airphoto coverage. For example, on the set of 1971 airphotos reviewed for this study, seven areas of borrow extraction have been identified (see Figure 7). Over the years, several agencies (including previous regional aggregate studies, BC Ministry of Mines Energy and Petroleum Resources, City of Abbotsford) have developed a list or database of aggregate producers. The City's files pertaining to soil removal permit applications seem to provide the most up-to-date and complete list, however all relevant sources of information were reviewed by AMEC. Figure 7 attached shows the resulting summary, illustrating the distribution of current and former aggregate producers within the study area. The information provided to AMEC from the various sources typically consisted of point locations on a map and street addresses. For illustrative purposes, AMEC has designated such locations by shading each property where production has occurred or is presently permitted using the full limits of the respective property. It should be noted that actual production (whether former or current) within each property identified is not likely to have involved soil removal works across the full limits of the property.

4.0 DATA ANALYSIS AND SOIL REMOVAL CONSTRAINTS

This section of the report provides a discussion of the study region attributes, based on our present understanding of the region's characteristics as described in the preceding section. Consideration and analysis of the data is focused on aspects which relate to potential future soil removal in the study area, some of which may serve as constraints to potential future soil removal activity. The discussion seeks to answer some of the questions posed in the terms of reference including:

- the types of soil of economic interest for soil removal, and where such materials are found;
- where the soil removal has and is presently occurring;
- where future soil removal might occur; and
- which technical factors may limit or influence patterns of future soil removal.

4.1 Soil Production

Review of the literature and information available about soil materials produced within the study region suggests that production of granular aggregate, as opposed to general soil materials or topsoil for horticultural purposes has been the predominant activity associated with historic and present day soil removal. This is considered to be a reflection of the general demand for such materials within the Lower Mainland, presence of a source of recoverable aggregate within the study area, and general lack of accessible comparable sources at other locations within the Lower Mainland region.

Comparison of Figure 3, Surficial Geology Map with Figure 7 Soil Extraction Areas indicates that no production sites, past or present are situated in areas underlain by the Fort Langley Formation glacio-marine sediments. The past and current aggregate producing properties with soil removal permits more or less all fall within regions underlain by sand and gravel deposits ascribed to the Sumas Drift. Further, the pattern of historic and current production suggests that the locations of potential aggregate resources are generally known or understood by industry, such that there are no "new" or "overlooked" locations of potential aggregate resources within the study region. Also, comparison of many areas of former soil removal permits (i.e. areas where properties have been described in the City's files as "closed", "reclaimed" or "under reclamation") with a 2006 orthophoto image of the study suggests that many of the properties where soil removal activity has occurred have been returned to agricultural production. This is an important finding, as it indicates that in general terms the present goals and objectives of the City's existing soil removal bylaw appear to be working, in that many properties where soil removal permits have been issued and where production has occurred have been returned to agricultural production. Please note, review of individual properties and consideration of the detailed agricultural capability of particular properties was beyond the scope of AMEC's assignment, and has not been addressed as part of this study.

In summary, our observations of the present producers, and review of the locations of previous permit holders which are now closed, reclaimed and returned to agricultural production suggest that in many parts of the study region areas underlain by potential granular aggregate have either been previously worked or are currently in production.

Comparison of the areal extent of areas underlain by potential granular resources within the study region (i.e. sand and gravel deposits within the Sumas Drift as indicated on Figure 3) suggests that there are significant parts of the study area underlain by granular soils where potential future aggregate production could theoretically occur. This includes the region forming the central part of the study area (east of Fishtrap Creek between the Marshall Road - Highway 1 and 0 Ave. corridors, and the hillslope west of Riverside. However, as described in the next section of the report, consideration of other factors such as higher value or incompatible land uses within this and other parts of the study area, and proximity to the regional groundwater aquifer may serve as constraints on future soil removal activities.

4.2 Constraints to Future Soil Production

Based on the research conducted for this study, AMEC considers that aside from economic considerations there are at least three types of constraints present which may serve to limit present and future soil removal for aggregate production in the study region. These constraints include: alienation of potential aggregate reserves by existing land use or proximity to other land uses or topographic features; alienation due to the

location of local utilities and infrastructure; and proximity to the regional groundwater table within the Abbotsford-Sumas Aquifer. It is noted that designation of a property as being within the ALR may not necessarily represent a constraint to soil removal. We understand that soil removal may be considered an acceptable form of activity within agricultural lands by the MC ministry of Agriculture and Provincial ALC, particularly where the final objective of such works involves reclamation of the affected area to a higher level of agricultural productivity than existed prior to the commencement of the activity.

With respect to potential environmentally sensitive areas within the study region which may represent a potential constraint to soil removal, AMEC did review several potential sources of information regarding such areas. We did not find that the City or other agency has made any such definition or designations within the study region. We did ascertain that there is a potentially sensitive occurrence for a particular species which may be located within or near part of the study region. However, on review of the information with BC MoE biology staff, this occurrence is not considered to represent an environmentally sensitive area within the context of this study. We have considered that wetlands, larger watercourses and waterbodies may represent features of high value as aquatic, riparian and terrestrial habitat which ideally should not be subject to potential impact from soil removal activities. As is described in Sections 5 and 6 of the report, AMEC has recommended that proximity of groundwater to the ground surface be used as an eligibility criteria for future soil removal, and as such selection of proximity to groundwater as an eligibility criteria will also "capture" such potentially environmentally sensitive areas, because virtually all of the major watercourses and waterbodies present within the study region reflect the groundwater conditions present.

4.2.1 Land Use

Alienation due to land use can occur when, even though a property or area may be underlain by aggregate resources, a designated land use either within the property or on an immediately adjoining property is such that soil removal will not occur. There are numerous examples within the study area where such alienation of areas underlain by granular soils has occurred, for instance at the southwest corner of the study region within the limits of Aldergrove Lake Regional Park, within the Abbotsford International Airport lands, or within several areas where residential subdivision and development have occurred. The City has recognized this, through identification of several zones within the study region which were to be excluded from the study, because present land use will exclude such areas from consideration for future soil removal permit applications by the City. These specific zones of exclusion are depicted on Figure 1 and include:

- Abbotsford International Airport Lands;
- the residential area west of Lefeuve between Simpson and Maclure; and
- the residential area at Simpson and Ross.

AMEC was asked by City staff to consider a larger potential zone of exclusion surrounding this latter neighbourhood, extending between Bradner Road to the west and Mt Lehman Road to the east, Simpson to the south and Fraser Highway to the north. Most of this area is presently designated as agricultural and lies within the ALR, but we understand that the neighbourhood at Ross and Simpson has requested that the larger region be excluded from consideration for future soil removal.

As a result of this study, AMEC considers that several other parcels or areas within the study region should be considered as areas of exclusion for future soil removal permit applications. Such areas include:

- designated parkland and recreational areas as shown on the City's Planning Map 5A (includes Lake Aldergrove Regional Park, Aberdeen Cemetery on Fraser Highway, and a former gravel pit north of Walmsley);
- all school locations and other community facilities, as indicated on the city's Planning Map 8A (Aberdeen, King, Ross, Simpson, Jackson and South Poplar Elementary Schools, Dashmesh Punjabi Independent School);
- all major institutional sites including University College of the Fraser Valley, Matsqui Institution, Fraser Valley Trout Hatchery;
- areas presently excluded from the ALR where future development may occur;
- existing designated BC Ministry of Transportation borrow pits; and
- other urbanized areas of existing commercial/industrial/residential development in the study area (i.e. area east of Mt Lehman and north of Marshall, area east of Jackson along King, and Riverside - Sumas Highway area east of the bluff).

4.2.2 Local Utilities and Infrastructure

Under the City's current soil removal bylaw, for each individual property where soil removal occurs a pit development and site reclamation plan must be prepared. These plans must take into account a number of site features and concerns and address them appropriately including slope stability and impact on adjoining structures, utilities and infrastructure. In some parts of the study area, it is obvious that aggregate recovery, in terms of the resources present, has been reduced or impacted by the need to preserve slope stability and maintain the integrity of existing utilities and infrastructure such as roadways, power poles, overhead lines, and buried utilities. This can lead to situations where power poles, structures or even entire road corridors are supported by remnant 'islands' or 'peninsulas' of soil left at the original ground elevation following soil removal. As a management strategy, City staff and other regulatory agencies who review such development plans should seek to work with applicants to adjust development plans where possible, to maximize resource recovery and minimize conflict/impact with utilities, including where technically and economically possible, relocation of the utilities. In some cases, access to locally significant reserves of aggregate could be facilitated if "coordinated" aggregate development plans could be developed, involving cooperation from multiple landowners, utility managers, and the City. For example, in some parts of the study region soil removal permits have been approved for property owners on both sides of a roadway segment, where the granular soils of interest also extend beneath the roadway. If the roadway segment could be relocated temporarily or permanently, a revised development plan could be developed to take better advantage of local topographic soil deposit conditions. One such area where the prospects for road relocation and enhanced aggregate production could be considered is along Ross Road, particularly the segment between Marshall and King. Another area which could be considered for more detailed study for enhanced planning for aggregate production is the area west of Riverside, north of Vye and east of Mackenzie.

4.2.3 Proximity to Groundwater

The Abbotsford-Sumas Aquifer underlies a significant proportion of the study region. This aquifer is classified in the BC Water Resources Atlas as a high productivity, high demand, high vulnerability aquifer. We infer that this latter classification relates to the

comparatively shallow depth of the groundwater resource to the ground surface, and the lack of a widespread cover of lower permeability soil materials overlying the more permeable sand and gravel deposits which constitute the aquifer. The lack of an aquitard cover, i.e. materials with low permeability, and relatively short flow path length present between the ground surface and the groundwater means that some parts of this aquifer where it occurs naturally at or very close to the ground surface may be more vulnerable to impacts from surface activities.

In addition to the aquifer characteristics, the City has a number of wells installed within the aquifer which provide a significant and growing proportion of the City's municipal water supply needs. Consequently, the Abbotsford-Sumas Aquifer is considered by AMEC to represent a very important and high value resource within the study region.

The City's present soil removal bylaw recognizes the value represented by surface and ground water, and the bylaw regulations include permit application refusal if proposed soil removal would, in the City's opinion adversely affect a watercourse or ground water aquifer (Section 12). Other bylaw sections which deal specifically with the aquifer and groundwater include:

- 8(h): submittal of, "detailed ground water survey covering the proposed soil removal or soil and other material deposit site and all adjacent lands";
- 9(l): submittal of survey/engineering plans to accompany application showing water table elevations;
- 14 (g):... "the excavation shall not lower the effective water table at wells on any other lands without the written consent of the owner of such lands";
- 14 (j): "no excavation shall be carried out into the aquifer except to construct settling ponds, water supply pits and man-made lakes";
- 17 (b): "the deposited soil or other material shall not in any way interfere with the established above or below ground drainage pattern of any adjoining lands and shall not cause the ground water table to rise on adjoining lands so as to cause flooding or malfunctioning of any private sewage disposal system or contaminate any well";
- 18 (d) and (f), which require installation of perimeter drainage and leachate control systems for sites where wood waste deposits are made following soil removal;

Notwithstanding the above, and particularly in the absence of a formal aquifer protection plan which in similar situations has been implemented by a municipal agency, AMEC considers that:

- because the predominant soil type in much of the study area is pervious sand and gravel deposits;
- in many parts of the study region the groundwater table is located in close proximity to the ground surface; and
- potential contamination of the aquifer is of concern because the aquifer resource is used by multiple users including the City for a significant and growing portion of the domestic water supply;

consideration should be given to excluding parts of the study region from future soil removal where there is very high potential for aquifer contamination. These areas would be defined in terms of the relative proximity of the aquifer to the existing ground surface.

4.3 Preliminary Soil Removal Eligibility

Based on the analysis and discussion presented above, a preliminary map was developed for the study region, showing areas proposed as "eligible" and "non eligible" for consideration of future soil removal permit applications (see Figure 8). For illustrative purposes, two types of non eligible areas were depicted:

1. areas with higher value land uses deemed incompatible with soil removal (residential neighborhoods, commercial and institutional sites, schools and parks).
2. area where the Abbotsford-Sumas Aquifer was inferred to be located close to ground surface.

This map, along with an accompanying letter of explanation was sent to various stakeholders as part of a consultative process, which is described in Section 5.0 below. Please note, at the time when this map was prepared (July 2007) AMEC had not yet received the detailed groundwater table information from Dr. Allen of SFU (depicted on Figure 4 attached). Consequently, location of the non eligible areas relating to the proximity of the water table to the ground surface was based simply on the ground surface elevation, which at the time was taken to be the 50 m elevation contour. These proposed non eligible areas have subsequently been revised to reflect the more detailed groundwater elevation information received, as described in Section 6.0 below.

5.0 STAKEHOLDER CONSULTATION

5.1 Description

As per the study methodology requested by the City, AMEC coordinated a program of stakeholder consultation regarding the preliminary soil removal strategy (designation of areas within the study region as eligible or not eligible for consideration of future soil removal permit applications). An information package consisting of a cover letter and Figure 8 was developed by AMEC in consultation with City staff and distributed to a list of potentially interested parties, including current permit holders/operators/land owners, and various government agencies. The letter requested stakeholders to forward any comments they may have about the soil removal strategy to representatives of the City and/or AMEC. A total of 25 letters were mailed to recipients on July 26, 2007, using a list of stakeholder contacts/addresses provided by the City. The list of government agencies from which comments were requested included:

- Provincial Agricultural Land Commission;
- Department of Fisheries and Oceans Canada;
- BC Ministry of Environment;
- BC Ministry of Energy Mines & Petroleum Resources;
- BC Ministry of Agriculture.

In addition to distribution of the information packages by mail, a copy of the letter and map were posted on the City's website (www.abbotsford.ca). A sample copy of the information package (letter and map) is included in Appendix B, along with a list of stakeholder recipients.

5.2 Stakeholder Response

Of the letters mailed, two (G.R.O.W. Inc. and Abbotsford Gravel Sales) were returned to AMEC as undeliverable. AMEC requested that the City follow up with these recipients individually to ensure that they received the information. In the cover letter, recipients were requested to respond by August 31, 2007. Some respondents contacted AMEC or City representatives by telephone, to discuss the matter in person prior to framing their response. A total of 6 written responses were received by letter or email by the end of August, all from current permit holders/land owners/pit operators. The responses received were distributed to Mr. Elvis Riou, P. Eng. of the City for review and consideration of the points of discussion raised. A copy of each of the responses received is also included in Appendix B. AMEC provided City staff with a capsule summary of the responses received and concerns raised under separate cover, along with recommendations for individual follow-up and reply by the City to some of the respondents. As part of the study methodology AMEC subsequently reviewed the concerns raised in the responses received in consultation with City staff.

In the latter stages of the study process AMEC received two additional responses from some of the government agencies contacted. Copies of their comments are also provided in Appendix B. The following section provides a summary of the comments received, and where appropriate, a corresponding response.

5.3 Summary of Comments Received

Some of the comments received from respondents were general in nature, others were more site specific and were triggered by a particular designation on the preliminary map sent out. Some of the respondents viewed the concept of soil removal eligibility more positively than others, some considered that the present bylaw and application process should remain unchanged. Some of the respondents accepted the criteria used to designate eligibility or non eligibility, others had various concerns. A summary of specific concerns are paraphrased without attribution below, along with responses.

- *The use of zoning/land use for eligibility criteria is inconsistent, notably the area north of Simpson between Ross and Mt Lehman. Response:* this region was included on the preliminary map at the request of City staff who did so in response to a request from local residents in the existing residential area at Ross and Simpson. The surficial geology information (Figure 2) suggests that some parts of this area are underlain by potential reserves of granular soils. The area in question is still apparently within the ALR. If the City does wish to restrict soil removal in this area (i.e. by designating it as non eligible), but does anticipate that additional residential development might occur through a future change in ALR status and/or zoning, it is reasonable to assume that site earthworks, including regrading and potentially also soil removal might also occur in conjunction with such development. Conversely, if this area is to remain zoned as rural-agricultural, AMEC understands that soil removal activity may be considered to be acceptable to the Provincial ALC, particularly if the proponent's site development plan incorporates a final goal resulting in enhancement or improvement of the agricultural capability of a particular property. Further review of longer term land use planning objectives may be needed in this part of the study region, to decide whether the public interest supports its designation as not eligible. In the absence of other factors, and based on the study

methodology, AMEC would otherwise have recommended that at least part of this region which is underlain by Sumas Drift soils (i.e. potential granular aggregate resources) be considered as eligible for future permit applications.

- *Groundwater conditions within the study region are variable, use of the 50 m elevation contour as a criteria for eligibility should be reviewed, it would be better to use groundwater as a criteria based on site specific conditions. Response:* AMEC concurs, use of the 50 m elevation contour was used as an eligibility criteria in the preliminary consultation document in the absence of more specific information. AMEC has since received much more specific information with respect to regional groundwater conditions and is now recommending use of this information as an eligibility criterion. See Section 6.0 below.
- *The study should also have environmentally sensitive areas identified, and if appropriate use them as an eligibility criteria. Response:* As part of our research and terms of reference, AMEC was asked to show such areas and take them into account in considering an appropriate soil removal strategy. Our research did not determine that any agency including the City has previously designated any sites or specific areas within the study region as "environmentally sensitive". AMEC does consider that wetlands, natural water bodies and watercourses are typically regarded as valuable natural habitat, and as such they could be considered as environmentally sensitive. Review of the groundwater information obtained suggests that almost all of the larger wetlands, stream channels and prominent water bodies within the study area lie in areas where the regional groundwater table is at or very close to the present ground surface. Consequently, selection of proximity to groundwater as an eligibility criteria will also "capture" such areas, resulting in their designation as not eligible for consideration of future soil removal permits. It is also noted that the existing bylaw provides for refusal of soil removal permit applications if in the City's opinion the proposed development would adversely affect the environment or any adjacent watercourse.
- *The criteria used for determination of eligibility should reference agricultural capability - an "eligible" designation may be misleading for areas with high agricultural capability. Response:* AMEC concurs that consideration of agricultural capability with regards to approval for soil removal is a valid technical criterion within the study region. However, applicants proposing to undertake soil removal must seek approval from several agencies including the City to do so. It is AMEC's understanding that consideration of agricultural aspects of land use within lands designated as part of the ALR falls under the jurisdiction of the Provincial ALC, and is taken into consideration by that body when approvals for such activities are requested by proponents. The City, at its discretion may seek to work more closely with the Provincial ALC to better define areas of high agricultural capability within the study region in the future. The Provincial ALC was contacted as a part of the stakeholder consultation process, but to date no comments were received.
- *While generally supportive of the concept, proximity to the water table in and of itself may not necessarily pose a risk to ground water quality, the degree of risk is more closely related to the specific pit development plan. Response:* AMEC concurs that the potential for impacts on groundwater is strongly dependent on the details of pit operation, aggregate recovery and the manner in which development, reclamation

and backfilling are carried out (i.e. the specifics of the pit development plan implementation and execution by the operator). However, AMEC considers that the probability for potential adverse impacts to occur is significantly higher in areas where the pit operations occur in very close proximity to the water table, because the "flow path length" is obviously shorter in areas where development is at or very near to the water table. Further, as reliance on the Sumas-Abbotsford aquifer as a municipal water supply source is anticipated to increase over time, safeguarding the quality of the water may also be of increasing importance. Consequently AMEC considers that taking steps to protect the quality of the groundwater resource in the public interest may outweigh recovery of aggregate within particular sites. The soil removal strategy described in Section 6.0 outlines our recommendations for future soil removal eligibility, including non eligibility of areas where the aquifer surface is anticipated to be within 5 m of the existing ground surface.

- *The soil removal strategy involving designation of ineligible areas is heavy-handed, imprecise and unfair, and sets a precedent for other parts of the City/other commercial activities. A preference is expressed for the existing bylaw/permit application to remain in place. Response:* One of the City's core functions is to guide future development and seek resolution or compromise between competing interests, and concerns. Within the study region there is already a wide assortment of values which is reflected by the present zoning, pattern of land use, and community development plan. It is acknowledged that such values may change over time as will land usage. Adoption of planning and land management strategies is an important tool through which communities seek consensus on the manner in which their future development may be guided. AMEC does not believe that implementation of a soil removal strategy as contemplated by this study would represent a precedent in the sense expressed by the respondent.
- *The criteria for determination of eligibility should be based on a scientific assessment of the presence of aggregates and technical ability of the property operator [i.e. through design and implementation of a pit development plan] to remove them without adverse impacts on the environment, not political or other irrelevant considerations. Response:* the two main eligibility criteria proposed in this study are consideration of higher value/existing land uses, and proximity to the Abbotsford-Sumas Aquifer. There is a key element of safeguarding the public interest involved in selection of both of these factors as eligibility criteria for future soil removal. AMEC does not consider safeguarding public interest in a land use policy framework to be an irrelevant consideration. Implementation of the eligibility criteria can also be viewed as a form of "risk management", in which the agency with stewardship responsibility for the community seeks to set an appropriate level of protection for the attribute under consideration, for the benefit of the entire community.
- *There is a desire for the City to establish a time limit for the soil removal permit application process, and eliminate the "environmental" aspect of the present permit application procedure, since this is incorporated into the eligibility criteria if the strategy recommended in the study is adopted. Response:* Establishment of an appropriate time frame for consideration of soil removal permit applications seems to be a reasonable request, and should be considered by the City. Proponents should bear in mind however that in considering an application, the City must also exercise an appropriate level of due diligence, which may mean providing time sufficient for information gathering and third party referrals (i.e. input from other agencies) to

occur. The eligibility strategy recommended in this study is based on regional-level information, particularly with respect to the groundwater surface. Local conditions may, and probably do vary somewhat from the regional information available. Adoption of the strategy is not intended as a substitute for individual proponents to complete an appropriate level of investigation and planning relating to their specific situation and conditions, or relieve them of their responsibility to exercise due diligence in developing an appropriate site-specific development plan for proposed soil removal and/or deposition, including site-specific environmental aspects.

- *Soil removal permit applications in progress under the existing bylaw should be "grandfathered" in the event that a new bylaw incorporating eligibility limits is adopted. Response:* AMEC considers that this procedure is commonly used by municipalities and other agencies when bylaws or regulations change over time. In the event that the City considers a revised **Soils Removal Bylaw** to incorporate the soils removal strategy proposed by this study, consideration could also be given to "grandfathering" of permit applications already in progress. Proponents should understand, however, that "grandfathering" of an individual application does not imply acceptance or approval: the City may at its discretion accept or refuse the application subject to the provisions of the present bylaw.
- *The study is flawed in that some areas with aggregate resources are designated as ineligible [proponent cites an example locality east of Ross, north of Simpson]. Land areas should be unencumbered by eligibility criteria if the property is in the ALR and can be improved to a higher agricultural capability as part of a soil removal/pit development plan. The cost of potential litigation should be taken into account in the event that designation of "ineligible areas" [which may represent resulting economic loss for a land owner or pit operator] is accepted by the City. Response:* the area of specific concern identified by the respondent was "pre-defined" by the City as a potential exclusion area. This concern is similar to the first one listed above, with an additional reference to potential legal action. Our response is similar to the one given above, with a reminder to the respondent that the City has a mandate to act "in the public interest" in this matter. We reiterate that it may be prudent for the City to undertake additional consultation and review present and future land use and zoning within the Bradner-Fraser Highway-Mt Lehman-Simpson area, to assess whether all or part of this portion of the study region should be designated as not eligible for future soil removal.
- *Aggregate producers have a strong interest in maintaining continued access to aggregate resources in the study region. One respondent acknowledges that reserves on its present production sites area dwindling and it is actively developing plans to replace these reserves. Response:* none required.
- *Any policy developed to categorize lands within the study region as eligible or non eligible should be flexible enough to recognize unique circumstances to specific properties. Response:* AMEC considers that if this approach was taken and broadly applied, the intent of the eligibility designation (i.e. regional recognition of other land uses and protection of the Abbotsford-Sumas Aquifer) may be lost. Proponents and City staff however should be granted sufficient flexibility to prepare and consider an application for soil removal for a particular property in the event that the property is bisected by an eligibility boundary (i.e. part of the property has been designated

eligible and part has been designated non eligible) or in the event that through the results of further detailed technical study, the groundwater condition on the property is demonstrated as being significantly lower than in elevation than anticipated in the regional model. Under such circumstances, proponents should be aware that consideration of an application by the City does not guarantee its acceptance: review of the application following the terms of the bylaw would still be completed, with the outcome dependent on the City's consideration of the information presented. The City may also wish to make provision for periodic updating of the eligible/non eligible areas, in the event that further information and scientific study is undertaken which results in a need for adjustment of the eligibility designations.

- *Part of the study region, specifically the area east of Columbia and south of King extending to 0 Avenue/US border has been identified as habitat for Townsend's mole, a species which has been designated as "endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Preparation of a recovery plan is in progress. This species has very limited distribution in Canada in localized areas, including the identified portion of the study region, and its habitat should be preserved/protected. Response:* AMEC is aware that the Federal Endangered Species Act serves to protect habitat for endangered species in regions where the lands are administered or otherwise subject to jurisdiction by agencies of the federal government. It is our understanding that the terms of the legislation may not apply to privately owned lands. Notwithstanding this, it is in the public interest to provide appropriate stewardship of the environment, and in particular strive to protect the natural habitat of endangered species. Consequently AMEC recommends that this potential concern should be taken into account through amendment of the existing soil removal bylaw. Further details are provided in Sections 6.0 and 7.0 below, but in general it is suggested that applicants with sites located within this part of the study region be directed to complete a study of their site, to determine if Townsend's mole (or the apparently more common coast mole which is not endangered) may be present within the affected part(s) of the site. Such studies should also address whether a mitigative strategy could be developed and adopted as part of the pit development plan, in the event that Townsend's mole is found to be present.
- *Seasonal fluctuations should be taken into account in considering proximity to the water table - the worst case scenario should be used in when considering proximity to the groundwater. The activity of soil removal per se may not represent the highest risk to impact on ground water, but rather the method in which soil removal is carried out, the source(s) of backfill used if fills are placed, and the operational controls and procedures put in place. Response:* The groundwater model used as one of the eligibility criteria is a regional one, and we have already noted that the model may be locally imperfect or inaccurate. AMEC concurs that where significant seasonal variations in the groundwater elevation may occur the highest or worst case scenario should be taken into account in considering the merits of a particular removal permit application. Our recommendations in the following sections of the report include consideration for an amendment to the existing soil removal bylaw, such that proponents should indicate and take into account the worst case or anticipated highest elevation groundwater conditions anticipated at a particular site.

Working in consultation with City staff, all of the comments received were reviewed and considered in terms of the issues raised and degree of relevance to the proposed soil removal strategy and study objectives. AMEC believes that the elements of the

proposed soil removal and reclamation strategy developed as a result of this study take into account the technical findings and concerns raised during initial stakeholder consultation.

6.0 PROPOSED SOIL REMOVAL AND RECLAMATION STRATEGY

AMEC's principal finding as a result of this study is that a management strategy to guide consideration of future permit applications for soil removal in the study region should recognize the importance of higher value land uses already established, such as parklands schools, institutional use, residential and other urban development within parts of the study region; and seek to safeguard water quality within the Abbotsford-Sumas Aquifer in the public interest. An appropriate method to accomplish these goals would be to designate portions of the study region as eligible and non eligible for consideration for future soil removal permit applications. The rationale for and general discussion of these eligibility criteria is provided in Section 4.0 of the report. A brief discussion of the revised criterion proposed for proximity to groundwater is provided in Section 6.1 below.

6.1 Criterion for Proximity to Abbotsford Sumas Aquifer

As indicated in Section 5.0 above, our preliminary stakeholder consultation was based in part on an eligibility criteria involving proximity to groundwater, which was revised during the course of the study to reflect more accurate water level information within the Abbotsford-Sumas aquifer (Map 4). To illustrate the proximity of the groundwater within the aquifer to the present ground surface within the study region, a "depth of groundwater" model was constructed using GIS modeling techniques by "subtracting" groundwater elevation model surface (Map 4) from the existing ground surface (Map 2). It should be noted that the resulting "depth to groundwater" contour model does contain the potential for local inaccuracy, as the groundwater model was based on 5 m contour elevations which were subtracted from 10 m ground surface elevations.

The resulting model was contoured in 5 m intervals, and for clarity the regions where groundwater is nearest to the present ground surface i.e., within 0-5 m and 5-10 m respectively were shown. It should also be noted that, for further clarity, the 0-5 m interval as presently rendered also includes areas where artesian groundwater conditions are present (i.e. areas where groundwater pressures are such that the static water level is higher than the local ground surface elevation). Figure 9, Depth to Groundwater Surface illustrates the inferred depth of unsaturated soil cover over groundwater within the Abbotsford-Sumas Aquifer beneath the current ground surface. In consultation with City staff, the boundary of the 0-5 m depth interval and 5-10 m depth interval was selected to represent the proposed minimum proximity to groundwater eligibility criterion for consideration of future soil removal permit applications. This was considered to represent an appropriate technical consideration of the relative degree of vulnerability of the aquifer, the flow path length between the existing ground surface and the aquifer, and the potential for impacts to occur from surface or near surface activities, from a risk management perspective.

6.2 Soil Removal and Reclamation Strategy

Based on the results of AMEC's research and the preliminary stakeholder consultation conducted during the course of this study, AMEC proposes that the City consider acceptance of a soil removal and reclamation strategy for the study region. The proposed strategy includes five elements:

1. Adoption of higher value/non compatible land use and proximity of the Abbotsford-Sumas Aquifer as eligibility criteria for consideration of future soil removal permit applications;
2. Consideration of "grandfathering" of current applications in progress, in the event that the soil removal bylaw is amended to include the eligibility criteria;
3. Consideration of specific amendments to the present soil removal bylaw as follows:
 - Within areas identified as eligible, applicants' inclusion of information regarding the range of anticipated groundwater fluctuation and incorporation this information into the respective pit development plans, with provision for worst case or highest anticipated groundwater levels in the respective pit development plans;
 - Applications for soil removal within the region east of Columbia and south of King must also include appropriate study of the respective property to determine whether it may include populations of Townsend's mole, an endangered species. In the event that this species is found to be present, the application should also include provisions for incorporation of an appropriate mitigation plan in the event that the soil removal may have a detrimental impact on Townsend's mole population/habitat.
4. Provision of some flexibility for City staff to consider applications for future soil removal eligibility in areas designated as non eligible if one or more of the following guidelines is met:
 - A change in the higher value/non compatible land use occurs, such that soil removal could occur;
 - A property is bisected or partially designated as eligible and non eligible;
 - The proponent has conducted detailed hydrogeological assessment of a property and surrounding parcels sufficient to indicate that the regional groundwater model on which the non eligibility criterion (proximity to Abbotsford-Sumas aquifer) is locally inaccurate, such that the depth of the water table from the existing ground surface is significantly greater than the 0 to 5 m range as presently anticipated by the regional model.
5. The City give consideration to completion of more detailed planning studies concerning land use planning and potential for future soil removal for aggregate production in three main parts of the study region as follows:

- In the region bounded by Bradner - Fraser Highway - Mt Lehman - Simpson, undertake additional consultation and review present and future land use and zoning including consideration of the City's regulatory role for agricultural zoned lands within the ALR, in particular where Provincial ALC approval of soil removal for the purposes of agricultural capability enhancement has been granted;
- In the region approximately between Bradner to the west and Peardonville to the east and from just south of Huntingdon to just north of Marshall, i.e. the landform area identified as a raised terrace on Figure 3.
- In the region north of Vye and east of McKenzie.

With respect to the latter two areas in particular, there may be significant aggregate resources present, but development opportunities may be restricted by the presence of adjoining properties, structures and infrastructure including City roads and buried utilities. For example, if the City were to consider the possibility of focusing future soil removal (providing that suitable granular aggregate resources are present) in the region immediately north of the two current borrow pits located north of Vye (one of which is the City's own pit), a possible development scenario could be the eventual re-grading of lands currently forming a terrace margin and bluff face west of Riverside to an elevation closer to the commercial areas adjoining Riverside. In a similar manner, if the City were to consider the prospects for realignment of a segment of Ross Road north of King at a different location and lower elevation than present, there may be an opportunity to work cooperatively with local landowners to develop a coordinated multi-property plan for reclamation of soil removal areas currently adjoining the existing Ross Road corridor.

Figure 10 attached is a map of the study region depicting the locations of eligible areas and non eligible areas using the eligibility criteria proposed. For reference purposes we have elected to distinguish between those areas designated as non eligible due to the both main eligibility criteria proposed, i.e. higher value/non compatible land uses and proximity to the Abbotsford-Sumas Aquifer.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this study AMEC can offer the following general conclusions:

1. Significant portions of the study region are underlain by soil materials which include potential aggregate resources. These resources consist of sand and gravel which have commercial value as construction aggregates. Most historic soil removal permits have been pursued for production of construction aggregates of various types, as opposed to soil production for agricultural/horticultural purposes.
2. Many former production areas are closed, and have been reclaimed, and have been returned to agricultural production. Many of the existing producers are well advanced into their development plans, such that reserves are in decline.

3. There is apparently buoyant demand for the aggregate materials produced, not just in the City but within the Lower Mainland region in general. Existing producers desire access to potential future aggregate resources which may be present.
4. The predominant land use within the study region is agricultural, and under some circumstances, particularly if the outcome may represent an enhancement of agricultural capability, soil removal is an acceptable activity with lands zoned for agricultural use.
5. Some other existing land uses within the study region represent higher or other values which are not compatible with soil removal, such that future soil removal proposals may be considered to have detrimental impacts, and would not be approved by the City.
6. A large part of the study region which is underlain by soil materials which may represent potential aggregate resources is also underlain by a regional aquifer which is designated as high demand, high yield and high vulnerability. Because this aquifer is used by the City and others as a supply of drinking water and considering its potential vulnerability, it is likely in the public interest to take appropriate steps to safeguard the quality of the groundwater resource by minimising the potential for contamination to occur. One such step is restriction future soil removal activities in areas where the groundwater surface is located in close proximity to the ground surface.
7. The City's present soil removal bylaw appears to be functioning in the manner intended, in that the objective of returning areas where soil removal has occurred under City permit back to agricultural production following reclamation seems to be occurring, based on comparison of recent orthophotography of the study region with historic permit application locations.
8. Notwithstanding this, it may be prudent to consider amendment of the existing bylaw to include a management strategy for future soil removal, in which for technical reasons some parts of the study area are designated as eligible and not eligible for consideration for future soil removal permits.

Based on the results of this study, AMEC provides the following recommendations:

1. The City give consideration of adoption of the soil removal and reclamation strategy described in Section 6.2 of this report.
2. In the event that the City decides not to proceed with full implementation of the proposed strategy, consideration should be given to amendment of the existing soil removal bylaw to include consideration of the range of groundwater fluctuation anticipated, and consideration of the presence of Townsend's mole in part of the study region as indicated in Item 3, Section 6.2.
3. In consideration of the value of the groundwater resource represented by the Abbotsford-Sumas Aquifer, and in recognition that acceptance of a soil removal eligibility criteria may serve as only one component of a management strategy designed to protect the integrity of the resource in the long term, the City should give consideration to development of an appropriate and comprehensive aquifer protection plan for the portions of the Abbotsford-Sumas Aquifer which fall within its jurisdiction and regulatory mandate. In the event that a well protection plan has not yet been implemented for the City's existing wells, consideration should

be given to completion of appropriate capture zone analysis study to support development of a well protection plan for the existing wells.

4. AMEC was unable to reference any comprehensive information regarding environmentally sensitive areas within the study region, although some consideration was given to the presence of valuable habitat associated with wetlands and watercourses, which is considered to have been "captured" through the proximity to groundwater eligibility criterion recommended. The City may wish to consider compilation of such information as may be available regarding environmentally sensitive areas, such that it could be used to guide future planning studies which may be undertaken.

8.0 CLOSURE

This report has been prepared for the exclusive use of the City of Abbotsford for the specified application described within. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on information provided in this report. This report has been prepared in accordance with generally accepted geological engineering practices. No other warranty, expressed or implied, is made.

We trust this report provides the information required at the present time. If you have any questions or comments, please contact the undersigned.

Yours truly,

**AMEC Earth & Environmental,
A division of AMEC Americas Limited**

Reviewed by:

Greg Reid, P. Eng., P. Geo.
Associate, Senior Geological Engineer

Nick Polysou, P. Eng.
Senior Associate, Geotechnical Engineer
Regional Manager, Central B.C.

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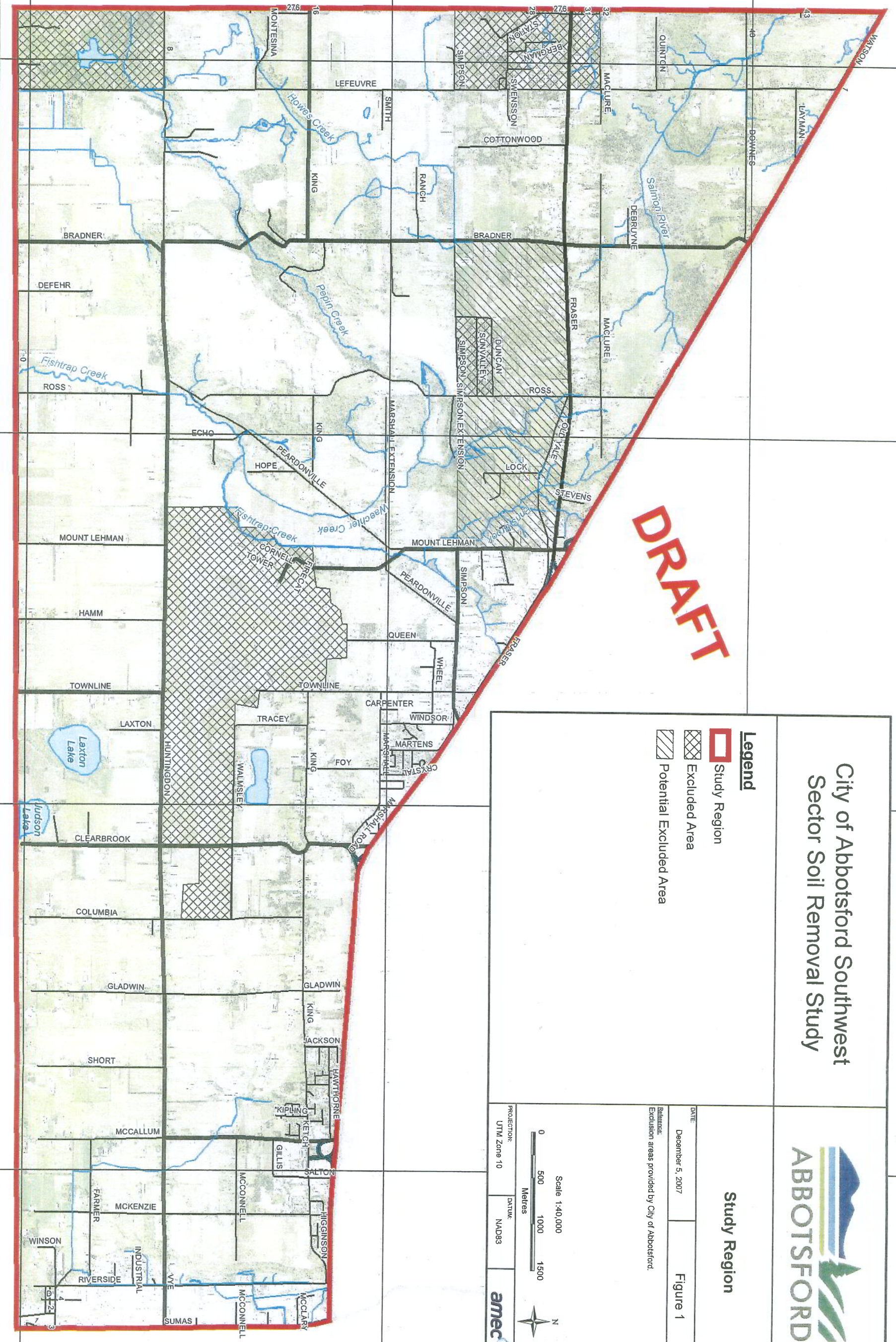
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City of Abbotsford Southwest Sector Soil Removal Study

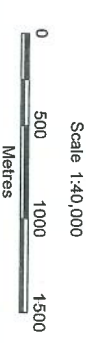


- Legend**
- Study Region
 - Excluded Area
 - Potential Excluded Area

Study Region

DATE: December 5, 2007
 Figure 1

Reference:
 Exclusion areas provided by City of Abbotsford.



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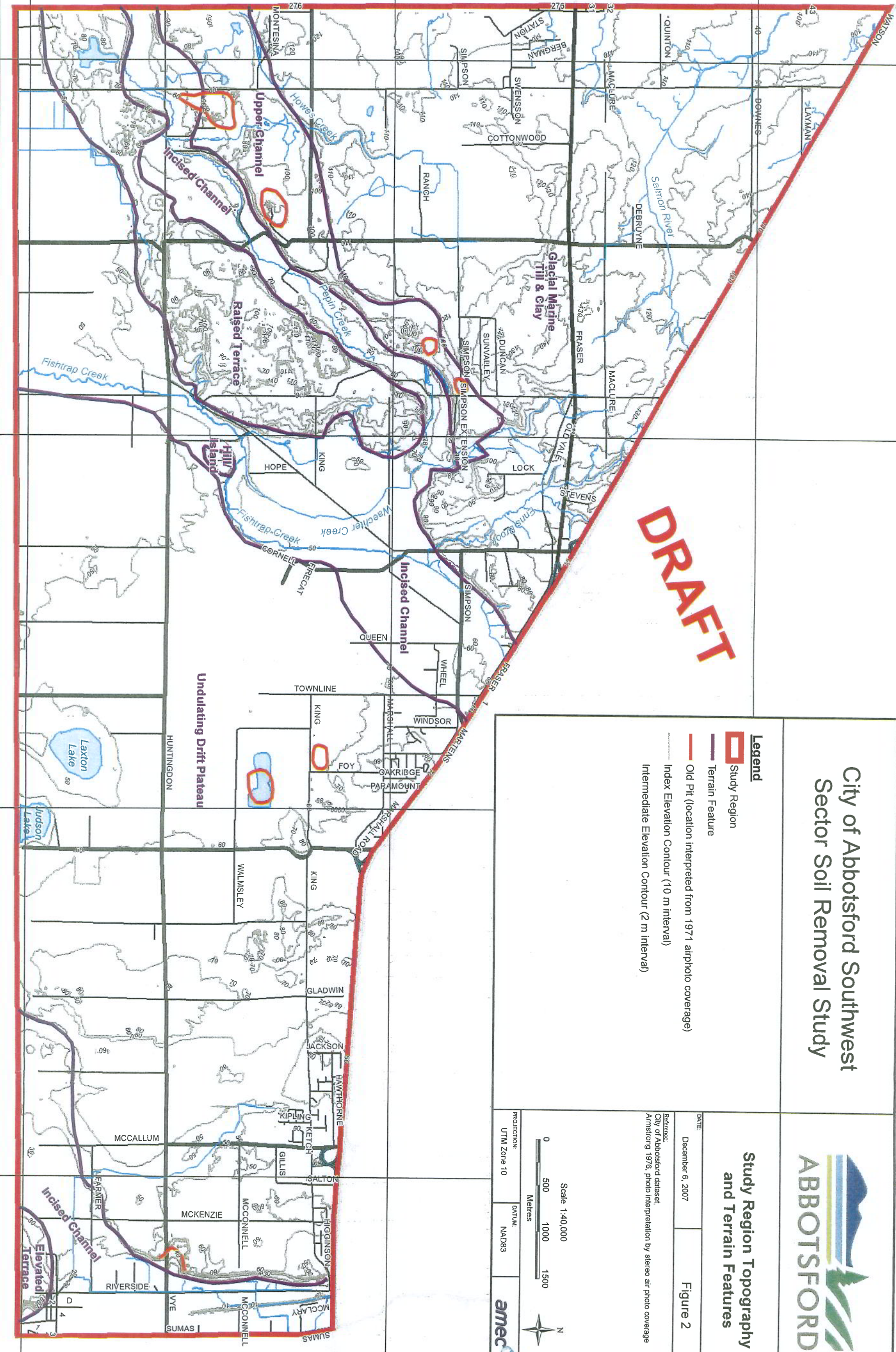
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City of Abbotsford Southwest Sector Soil Removal Study



- Legend**
- Study Region
 - Terrain Feature
 - Old Pit (location interpreted from 1971 airphoto coverage)
 - Index Elevation Contour (10 m interval)
 - Intermediate Elevation Contour (2 m interval)

Study Region Topography and Terrain Features

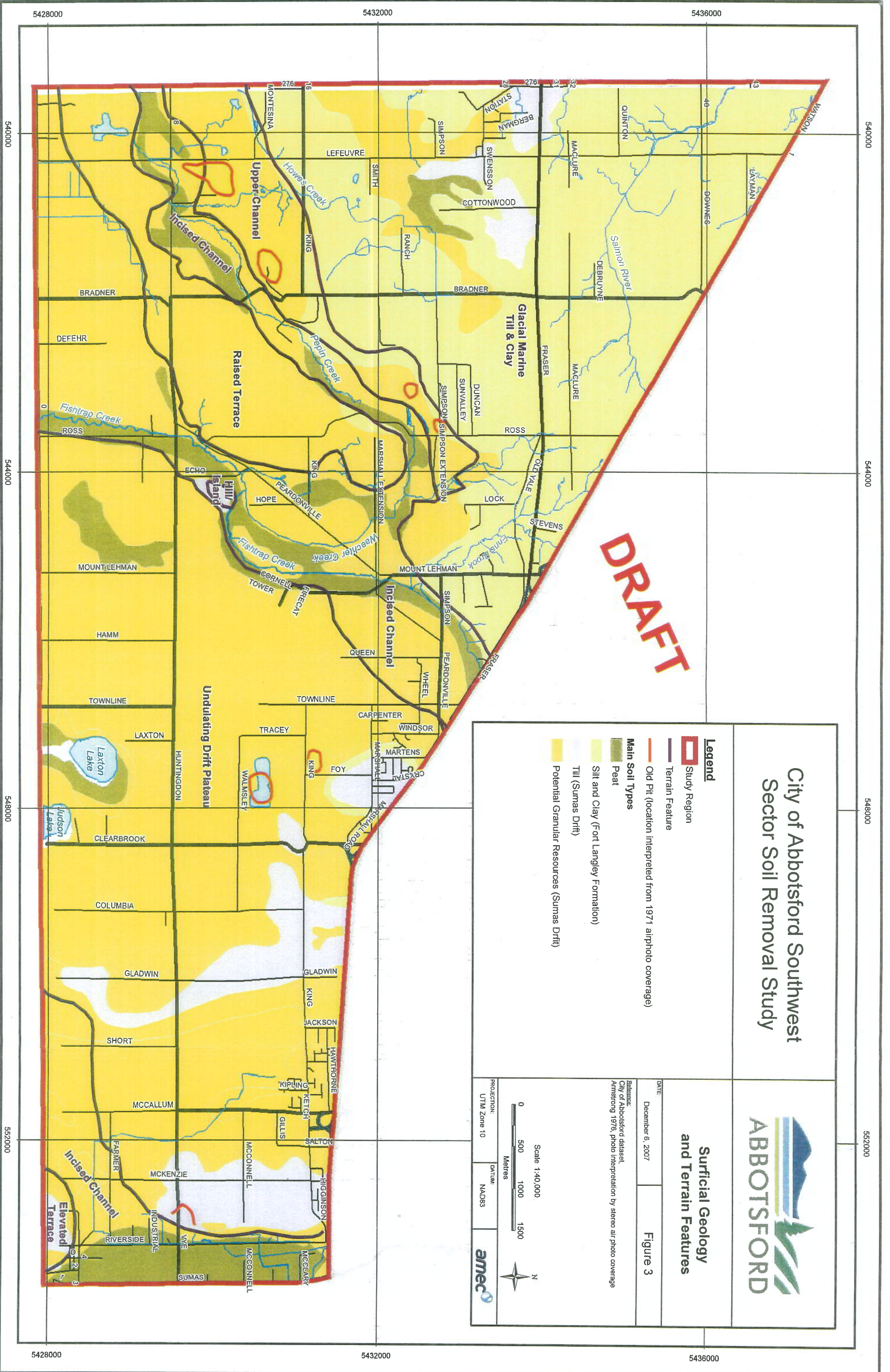
DATE: December 6, 2007
 Figure 2

Reference:
 City of Abbotsford dataset,
 Armstrong 1976, photo interpretation by stereo air photo coverage

Scale 1:40,000

0 500 1000 1500
 Metres

PROJECTION: UTM Zone 10
 DATUM: NAD83



City of Abbotsford Southwest Sector Soil Removal Study



Surficial Geology and Terrain Features

- Legend**
- Study Region
 - Terrain Feature
 - Old Pit (location interpreted from 1971 airphoto coverage)

- Main Soil Types**
- Silt and Clay (Fort Langley Formation)
 - Peat
 - Till (Sumas Drift)
 - Potential Granular Resources (Sumas Drift)

DATE: December 6, 2007
Figure 3

Reference:
City of Abbotsford dataset,
Armstrong 1976, photo interpretation by stereo air photo coverage

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DATUM: NAD83

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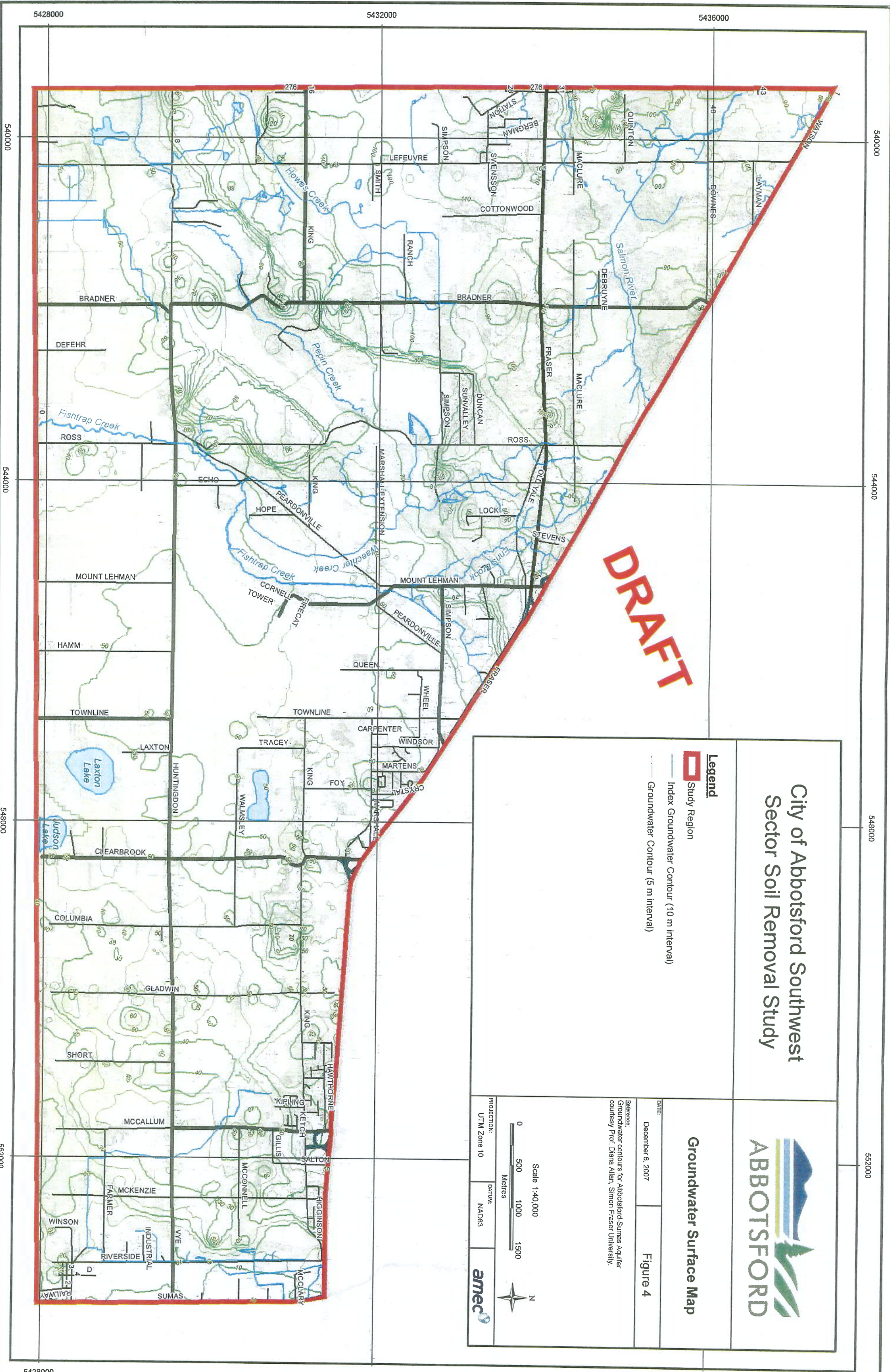
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City of Abbotsford Southwest Sector Soil Removal Study



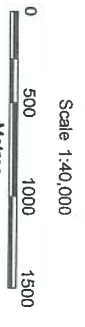
Groundwater Surface Map

- Legend**
- Study Region
 - Index Groundwater Contour (10 m interval)
 - Groundwater Contour (5 m interval)

Figure 4

DATE: December 6, 2007

Reference:
Groundwater contours for Abbotsford Sumas Aquifer
courtesy Prof. Diana Allan, Simon Fraser University.



PROJECTION: UTM Zone 10
DATUM: NAD83



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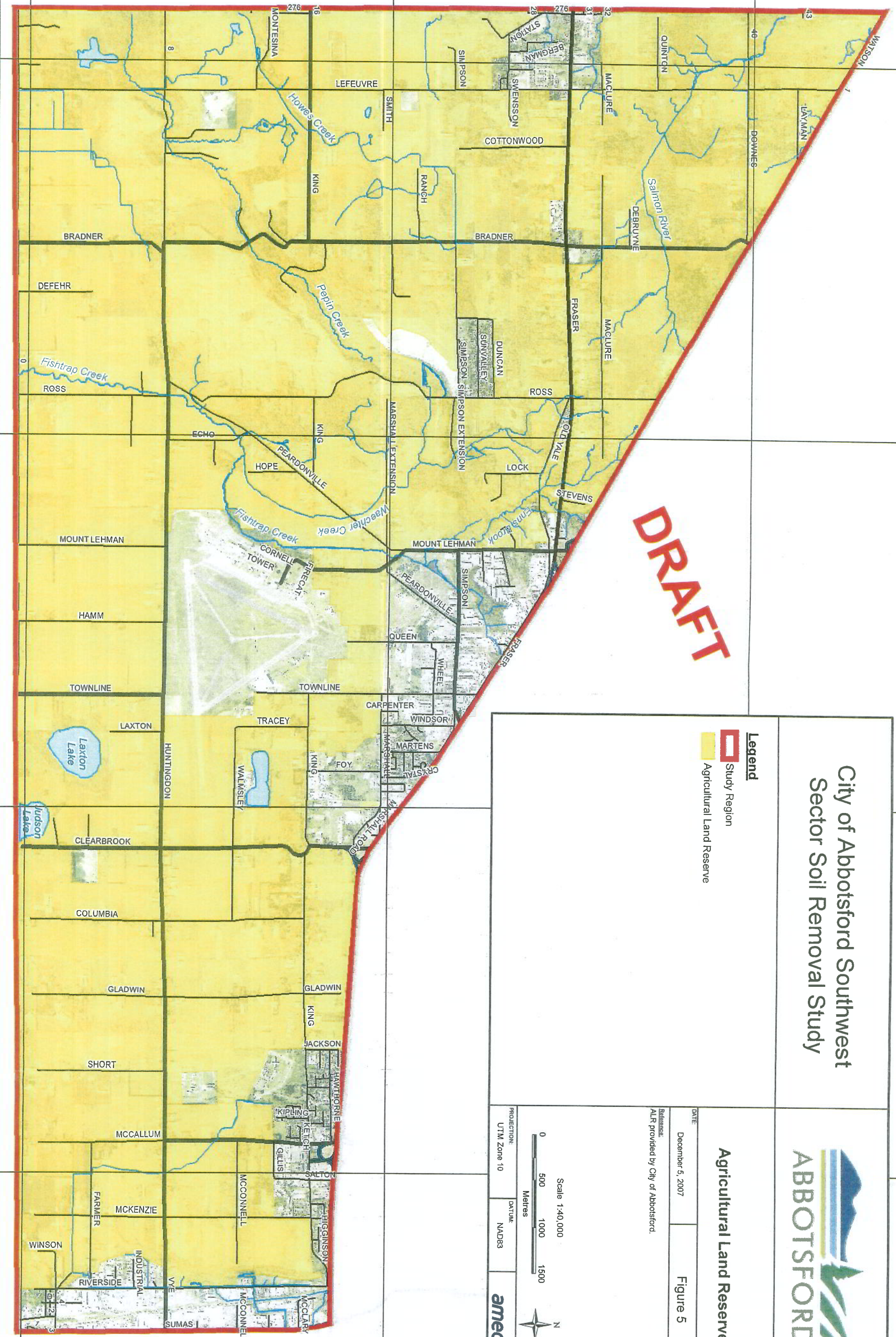
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**City of Abbotsford Southwest
Sector Soil Removal Study**



- Legend**
- Study Region
 - Agricultural Land Reserve

Agricultural Land Reserve

DATE: December 5, 2007
 Reference: ALR provided by City of Abbotsford.
 Figure 5



PROJECTION: UTM Zone 10
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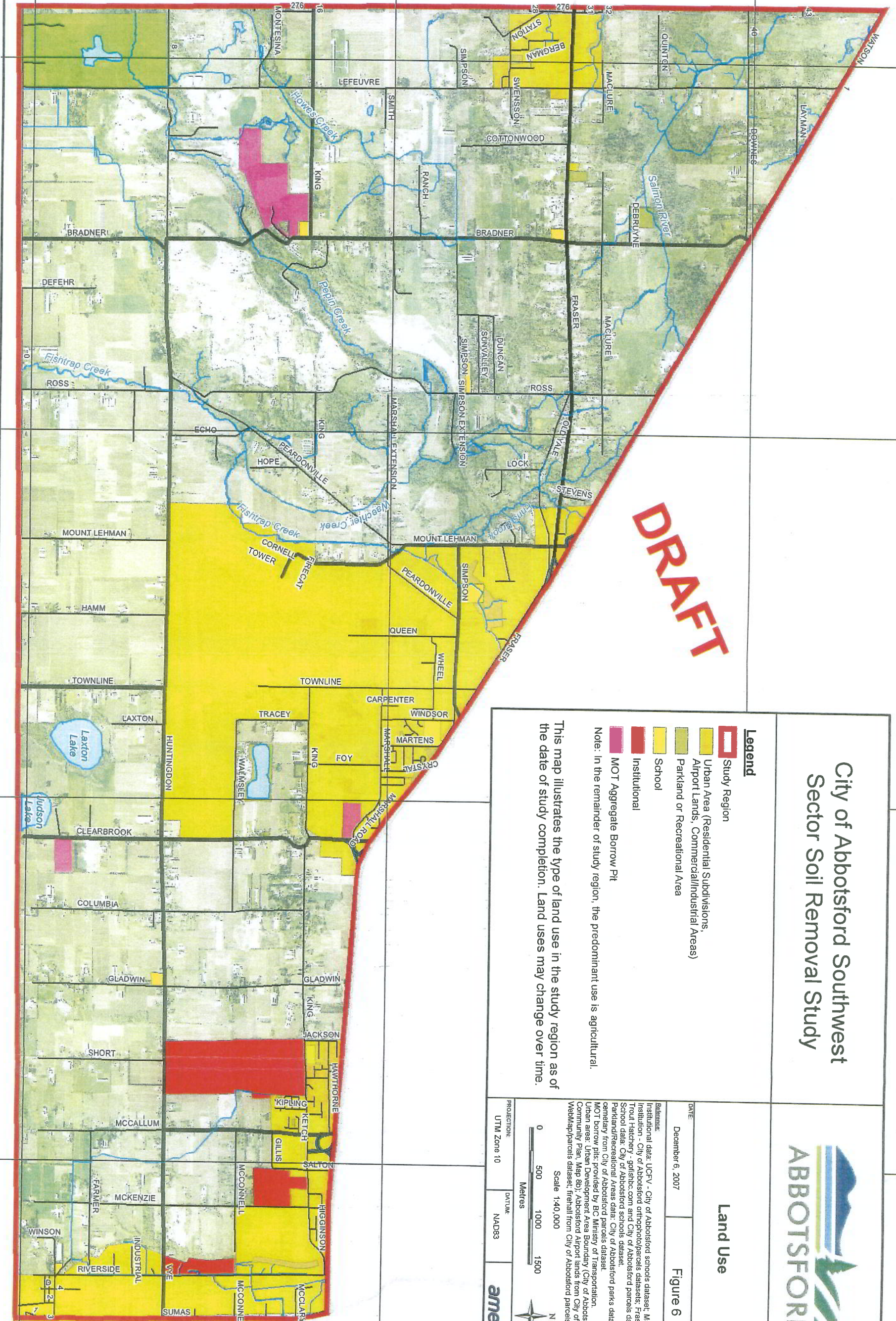
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City of Abbotsford Southwest Sector Soil Removal Study



Legend

- Study Region
- Urban Area (Residential Subdivisions, Airport Lands, Commercial/Industrial Areas)
- Parkland or Recreational Area
- School
- Institutional
- MOT Aggregate Borrow Pit

Note: In the remainder of study region, the predominant use is agricultural.

This map illustrates the type of land use in the study region as of the date of study completion. Land uses may change over time.

Land Use

DATE: December 6, 2007

Figure 6

Reference:
 Institutional data: UCFV - City of Abbotsford schools dataset; Matsqui Institution - City of Abbotsford orthophoto/parcels datasets; Fraser Valley Trout Hatchery - govfishbc.com and City of Abbotsford parcels dataset; School data: City of Abbotsford schools dataset; Parkland/Recreational Areas data: City of Abbotsford parks dataset; cemetery from City of Abbotsford parcels dataset; MOT borrow pits: provided by BC Ministry of Transportation; Urban area: Urban Development Area Boundary (City of Abbotsford Official Community Plan, Map 8b); Abbotsford Airport lands from City of Abbotsford WebMap/parcels dataset; firehall from City of Abbotsford parcels dataset.
 Scale 1:40,000



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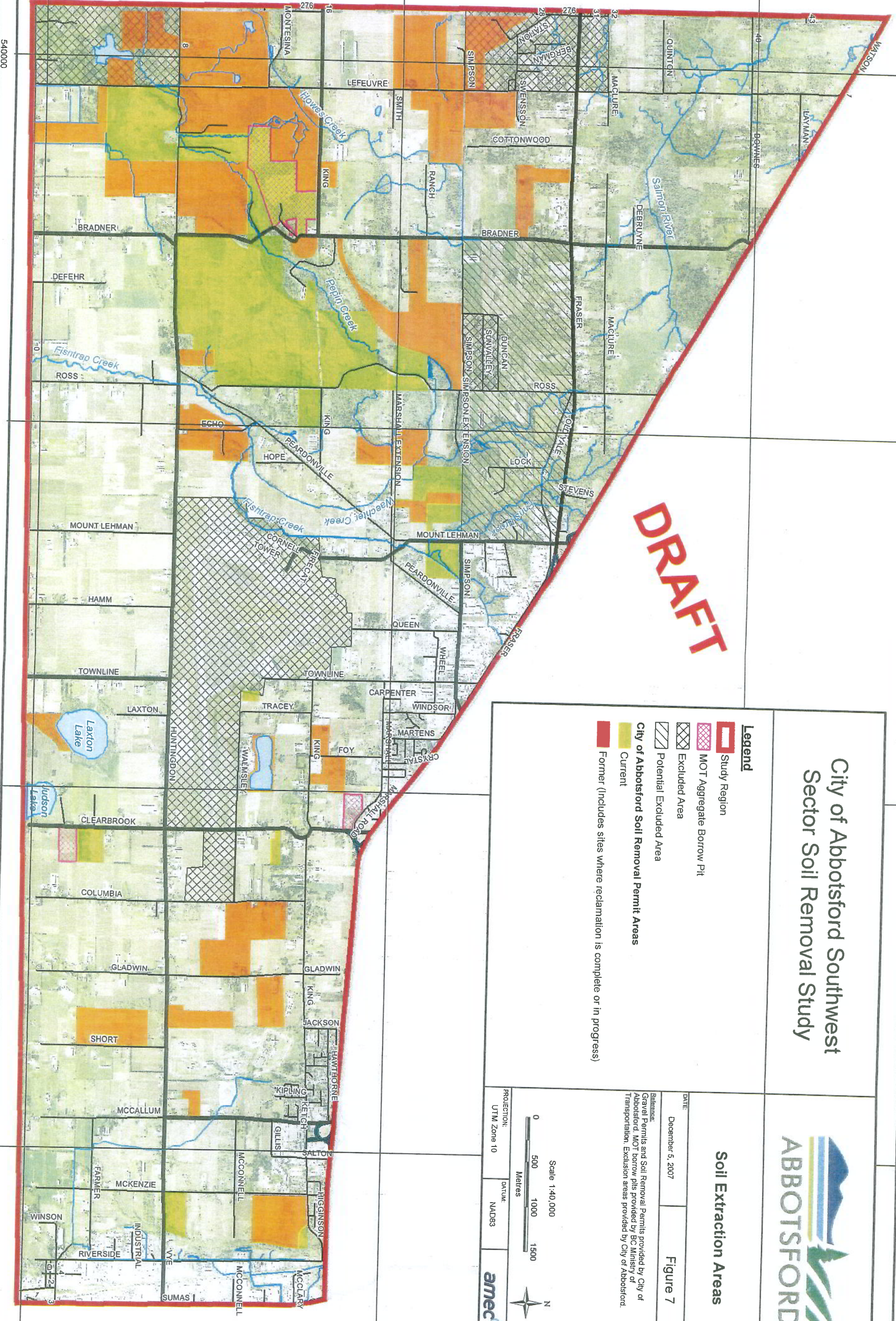
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City of Abbotsford Southwest Sector Soil Removal Study



Soil Extraction Areas

- Legend**
- Study Region
 - MOT Aggregate Borrow Pit
 - Excluded Area
 - Potential Excluded Area
 - City of Abbotsford Soil Removal Permit Areas
 - Current
 - Former (Includes sites where reclamation is complete or in progress)

Figure 7

DATE: December 5, 2007

Reference: Gravel Permits and Soil Removal Permits provided by City of Abbotsford, MOT borrow pits provided by BC Ministry of Transportation. Exclusion areas provided by City of Abbotsford.

Scale 1:40,000

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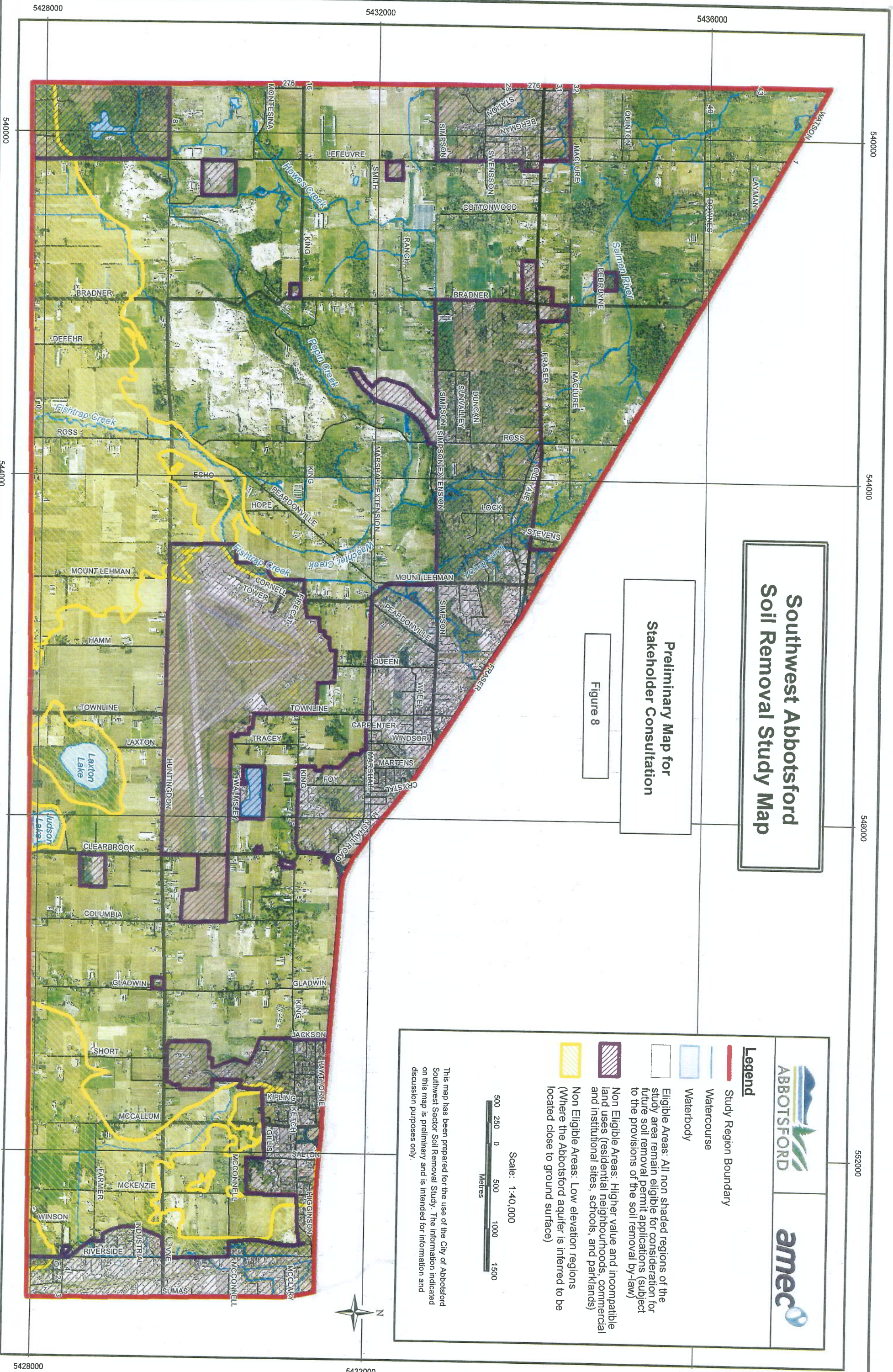
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Southwest Abbotsford Soil Removal Study Map


Preliminary Map for
Stakeholder Consultation

Figure 8




Legend

-  Study Region Boundary
-  Watercourse
-  Waterbody

 Eligible Areas: All non shaded regions of the study area remain eligible for consideration for future soil removal permit applications (subject to the provisions of the soil removal by-law)

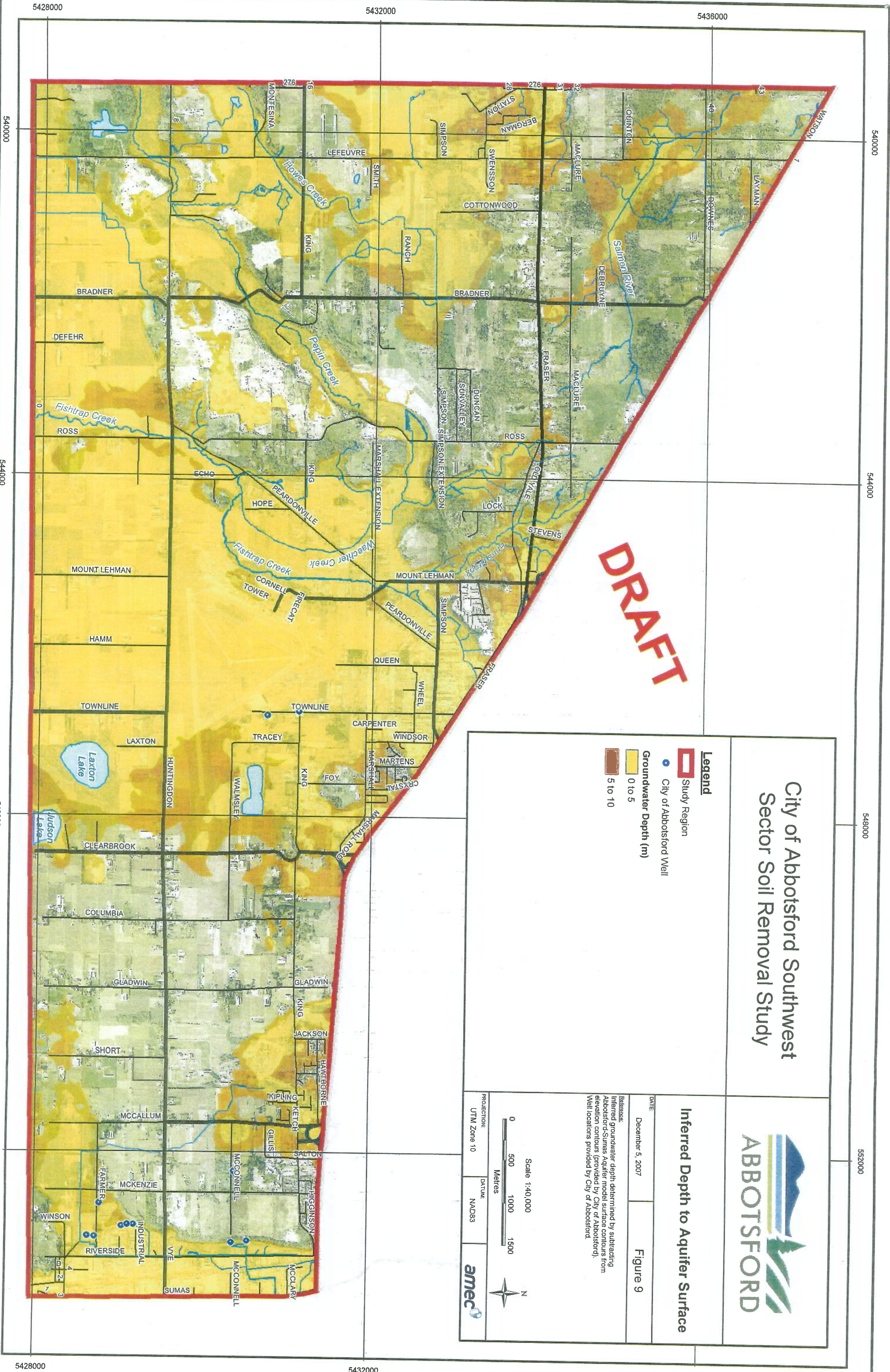
 Non Eligible Areas: Higher value and incompatible land uses (residential neighbourhoods, commercial and institutional sites, schools, and parklands)

 Non Eligible Areas: Low elevation regions (Where the Abbotsford aquifer is inferred to be located close to ground surface)



This map has been prepared for the use of the City of Abbotsford Southwest Sector Soil Removal Study. The information indicated on this map is preliminary and is intended for information and discussion purposes only.





City of Abbotsford Southwest Sector Soil Removal Study



Inferred Depth to Aquifer Surface

- Legend**
- Study Region
 - City of Abbotsford Well
- Groundwater Depth (m)**
- 0 to 5
 - 5 to 10

Figure 9

DATE: December 5, 2007

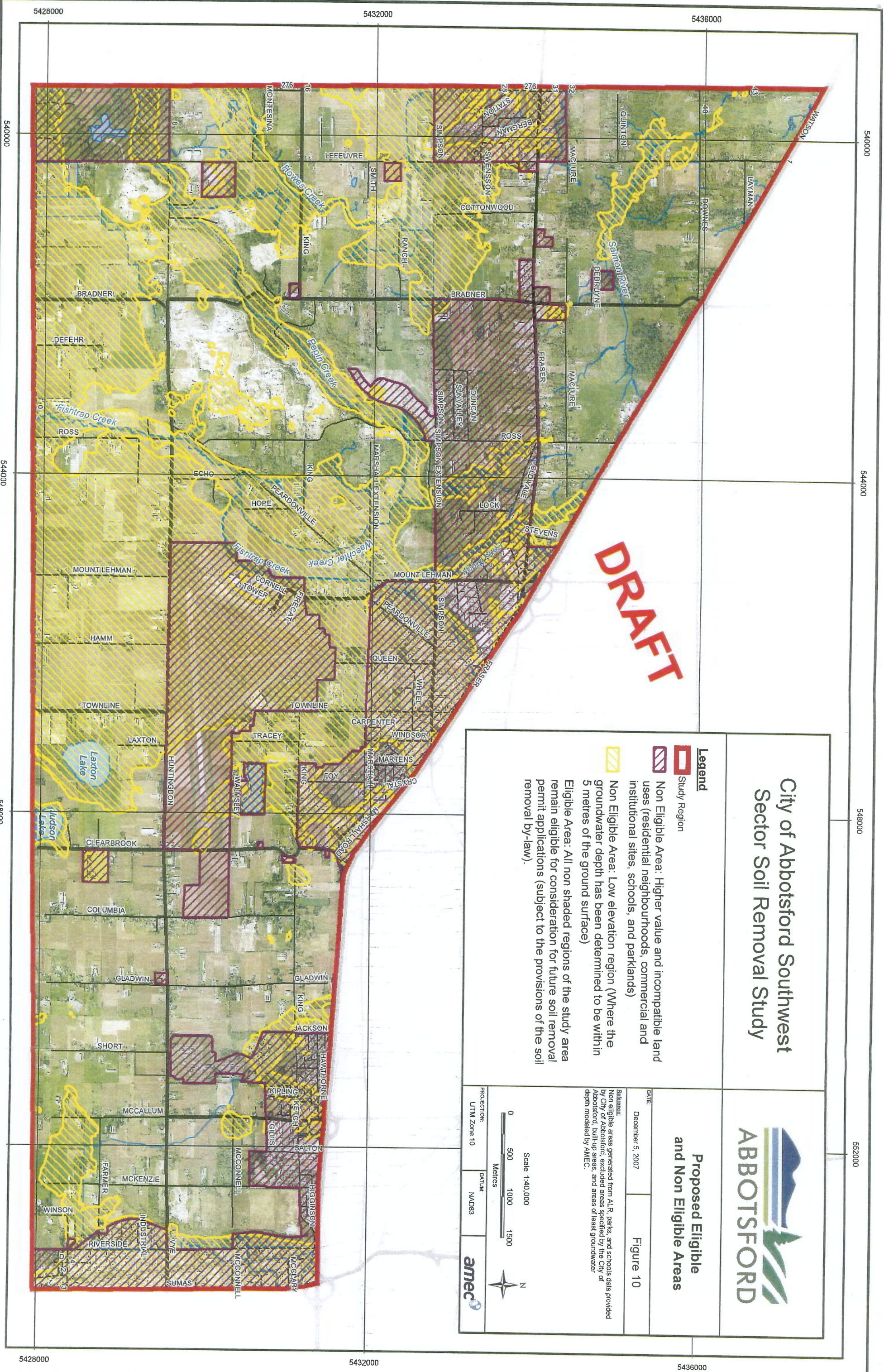
Reference: Inferred groundwater depth determined by subtracting Abbotsford-Sumas Aquifer model surface contours from elevation contours (provided by City of Abbotsford). Well locations provided by City of Abbotsford.

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Projection: UTM Zone 10 Datum: NAD83

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City of Abbotsford Southwest Sector Soil Removal Study



- Legend**
- Study Region
 - Non Eligible Area: Higher value and incompatible land uses (residential neighbourhoods, commercial and institutional sites, schools, and parklands)
 - Non Eligible Area: Low elevation region (Where the groundwater depth has been determined to be within 5 metres of the ground surface)

Eligible Area: All non shaded regions of the study area remain eligible for consideration for future soil removal permit applications (subject to the provisions of the soil removal by-law).

Proposed Eligible and Non Eligible Areas

DATE: December 5, 2007
 Figure 10

Reference:
 Non eligible areas generated from A.L.R. parks, and schools data provided by City of Abbotsford, excluded areas specified by the City of Abbotsford, built-up areas, and areas of least groundwater depth modelled by AMEC.

Scale 1:40,000

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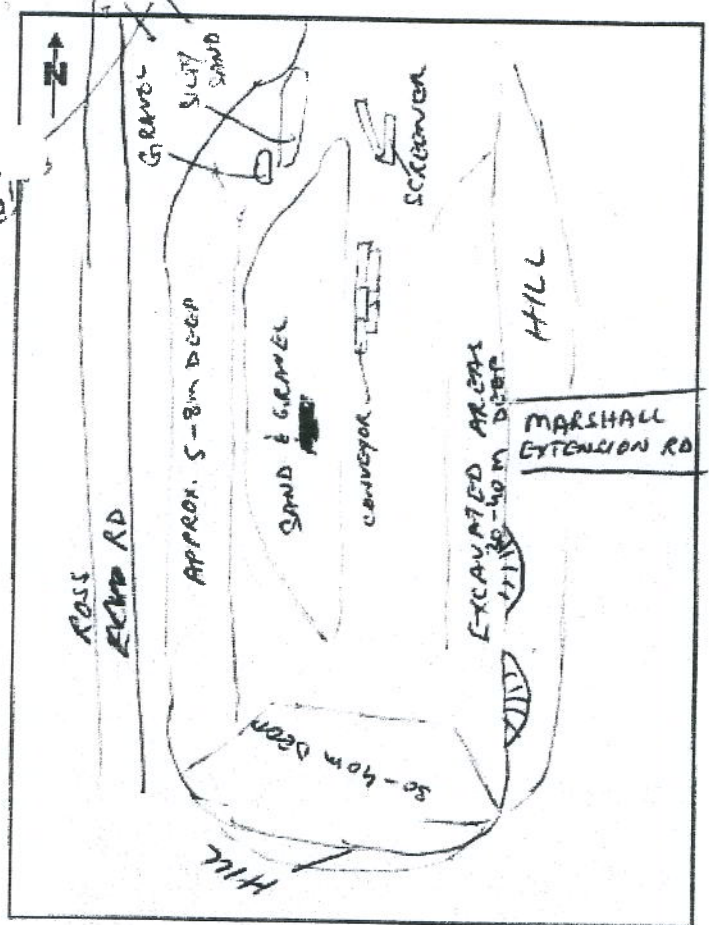
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Date: MAY 10/07



Inspector: TW

Site Address: ROSS RD / MARSHALL EXTENSION RD
~~AMEC ID 25/24~~
AMEC ID 11
LITTLE ROCK QUARRIES
2050-ROSS RD. (LOWER ROSS RD. PIT)

Base Elev.: 30 TO 40m FROM MARSHALL RD

Visibility: MEDIUM TO CLEAR *Level with North side of Ross*

Pit Contact: _____

Activity: Not active. Slight slopes.

(Relative Size?)

Product Exported: SCREENED GRAVEL, SAND

(Screened? Soil Type?)

Development Constraints: ADJACENT TO RESIDENTIAL PROPERTIES/FARM LAND

(Natural Base Elev.? Proximity to Adj. Property?)

Features: HILL SOUTH & EAST

(Hills? Creeks? Ponds? Elev.?)

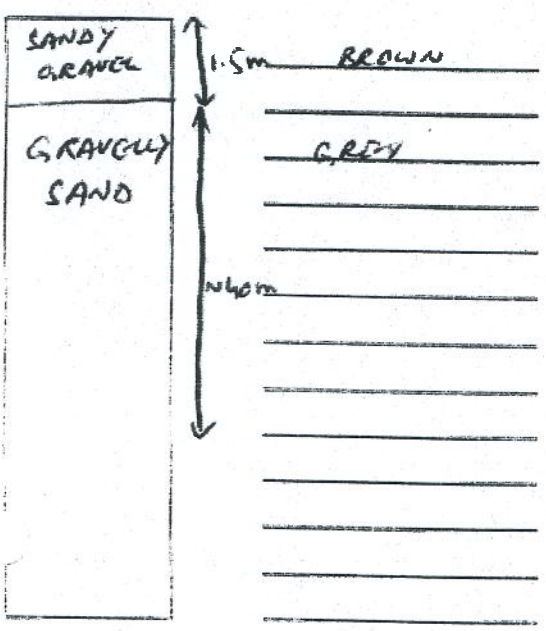
Potential: 1/4 OF TOTAL

(How much more soil can they take?)

Topography/Relief

<input type="checkbox"/>	Flat	_____
<input checked="" type="checkbox"/>	Hilly	_____
<input type="checkbox"/>	Undulating	_____

Soil Profile



Summary: DEAD END OF MARSHALL EXTENSION ROAD. LARGE SIZE PIT. NO CURRENT ACTIVITY ON-SITE. A SCREENER & CONVEYOR ARE PRESENT ON-SITE.

2 slides and erosional problems are evident on east wall.

General Comments: LOOKS LIKE 25/24 ARE CONNECTED.

Possible over-steepening of Residential property and Marshall extension should excavation continue eastward.

Office Info

Expected Soils: Sand & Gravel

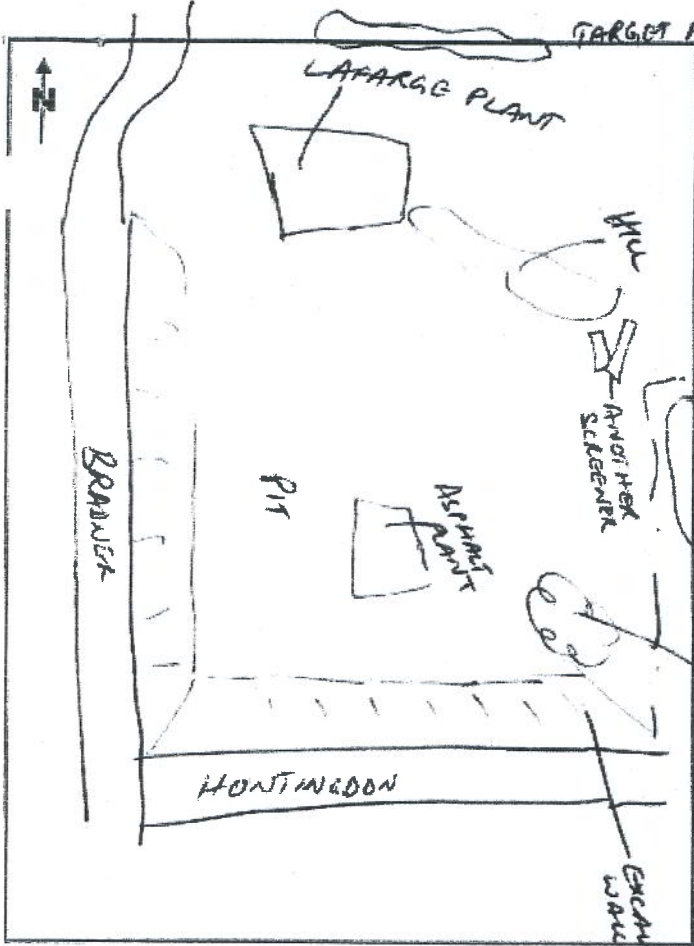
Groundwater: _____

Pit Contact: Little Rock, Active in database



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

Date: MAY 10/07



Inspector: TW

Site Address: 1050 BRADNER RD.
ADJACENT TO GRANDVIEW BLACKTOP LTD,
LAFARGE PLANT / (ASPHALT PLANT DETOT)
1050 BRADNER RD.

Base Elev.: 20-25m FROM HONTINGDON RD.

Visibility: MEDIUM - FENCE/TREES/PILES

Pit Contact: _____

Activity: ASPHALT PLANT - LARGE
(Relative Size?)

Product Exported: ASPHALT MIX & GRAVEL/LAND
(Screened? Soil Type?)

Development Constraints: HILL ON NORTH & EAST SIDES
(Natural Base Elev.? Proximity to Adj. Property?)

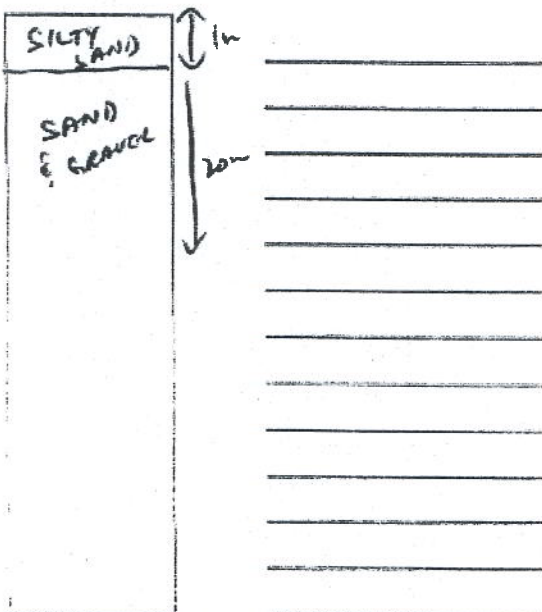
Features: Fence
(Hills? Creeks? Ponds? Elev.?)

Potential: 1/2 completed.
(How much more soil can they take?)

Topography/Relief

<input type="checkbox"/>	Flat	_____
<input checked="" type="checkbox"/>	Hilly	_____
<input type="checkbox"/>	Undulating	_____

Soil Profile



Summary: VERY LARGE SIZE PIT, ASPHALT PLANT ON SITE, MANY EXCAVATORS WORKING, LOADERS, SCRAPER ETC.

General Comments: GRANDVIEW BLACKTOP LTD,
LAFARGE / TARGET PRODUCTS - ALL PITS ADJACENT TO EACH OTHER
AMEC IDS # 2, 5, 6, 19, 20, 8, 10, 11, 12 & 13 ARE ALL CONNECTED.

Office Info

Expected Soils: Sand and gravel.

Groundwater: _____

Pit Contact: _____



NEW ORP LTD

Date: MAY 10/07

Inspector: PL

Site Address: 1720 ROSS ROAD

Base Elev.: 15-20 m FROM ROSS ROAD

Visibility: POOR, BELMS

Pit Contact: _____

Activity: Large
(Relative Size?)

Product Exported: GRAVEL/SAND
(Screened? Soil Type?)

Development Constraints: None
(Natural Base Elev.? Proximity to Adj. Property?)

Features: Ross Road + Adj. Properties
(Hills? Creeks? Ponds? Elev.?)

Features: HILLS / UNDULATING

Potential: 44 completed. possible 3/4
(How much more soil can they take?) of land to be mined.

Summary: LARGE PITS ACROSS ROSS ROAD, MANY EXCAVATORS WORKING. TWO PITS ARE CONNECTED VIA CONVEYOR BELT, UNDERNEATH THE PAVED (NEWLY ONLY SMALL SECTION) ROSS ROAD

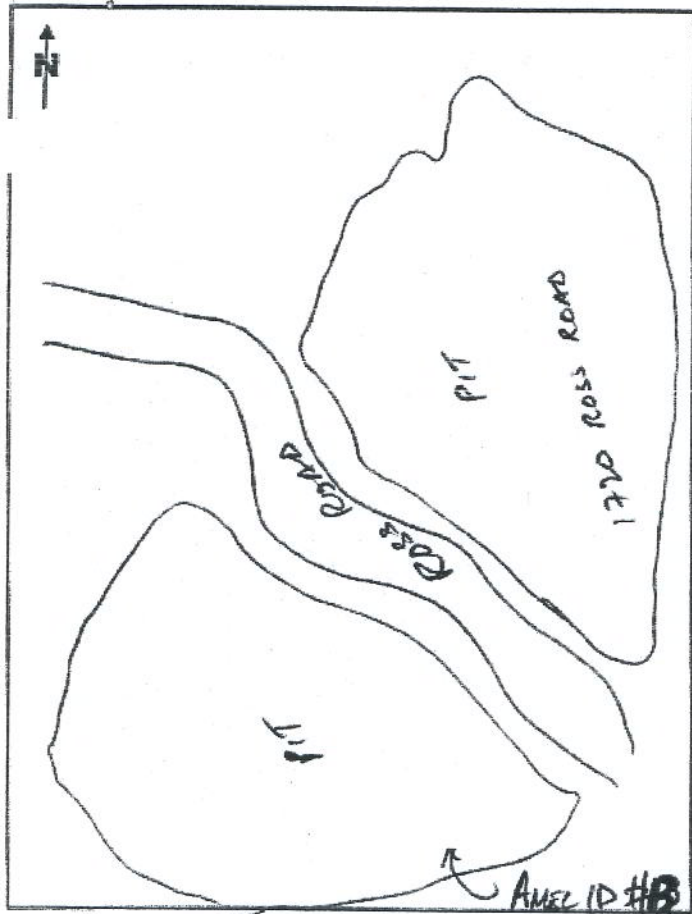
General Comments: POSSIBLY TARGET / LARGE PIT

Office Info

Expected Soils: _____

Groundwater: _____

Pit Contact: West Coast Aggregates



Topography/Relief

Flat _____

Hilly _____

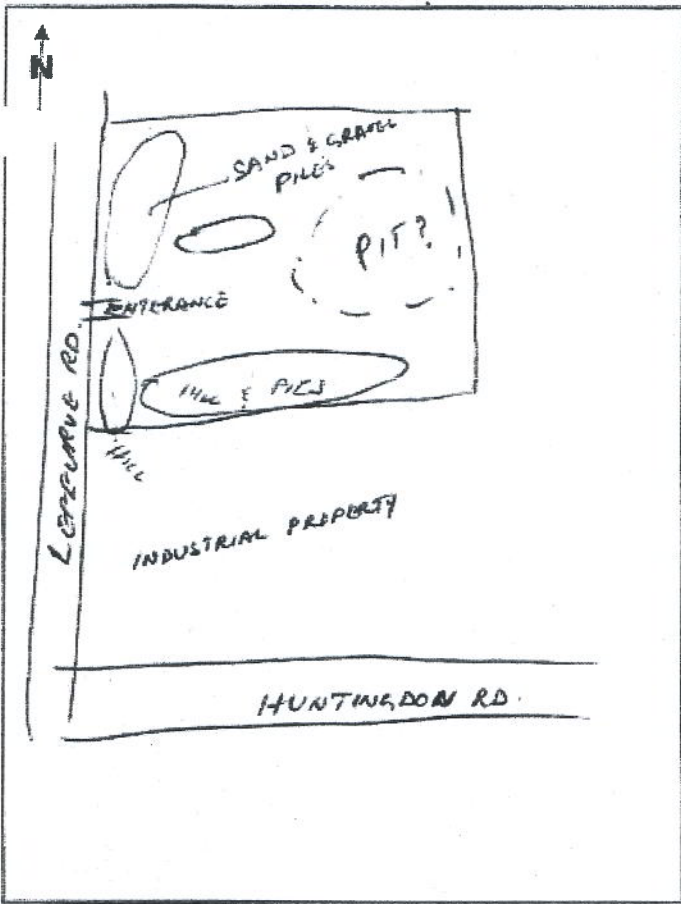
Undulating _____

Soil Profile

A hand-drawn soil profile diagram showing three distinct layers. The top layer is labeled 'SAND, some gravel' and has a vertical double-headed arrow next to it labeled '3m'. The middle layer is labeled 'SAND AND GRAVEL'. The bottom layer is also labeled 'SAND AND GRAVEL'. The diagram is enclosed in a rectangular box.



Date: MAY 11 / 07



Inspector: TW

Site Address: LEPPURVE RD, NORTH OF HUNTINGDON RD - (WEST COAST AGGREGATES)

Base Elev.: NOT VISIBLE

Visibility: POOR - ONLY FRONT VISIBLE

Pit Contact: N/A

Activity: LARGE - NOT ACTIVE
(Relative Size?)

Product Exported: NOT ACTIVE SAND & GRAVEL
(Screened? Soil Type?)

Development Constraints: ADJACENT TO INDUSTRIAL PROPERTY
(Natural Base Elev.? Proximity to Adj. Property?)

Features: HILLS
(Hills? Creeks? Ponds? Elev.?)

Potential: ~~closed~~ More soil can be taken to level with adjacent fields. But mostly complete.
(How much more soil can they take?)

Summary: CLOSED PIT, NO ACTIVITY, SCREENER & SCALE ARE VISIBLE.

General Comments: WEST COAST AGGREGATES NEW LOCATION AT 1080 BRADNER RD.

Topography/Relief

- Flat _____
- Hilly _____
- Undulating _____

Soil Profile

Office Info
Expected Soils: _____
Groundwater: _____
Pit Contact: _____



1000 1000 1000 1000





8 8 8 8

Date: MAY 10/07

Inspector: TAW

Site Address: STAR TRACKING LTD. SIMPSON/MT. LEMMAN RD.

Base Elev.: _____

Visibility: FENCE, GRAVEL/SAND PILES - POOL VISIBILITY

Pit Contact: _____

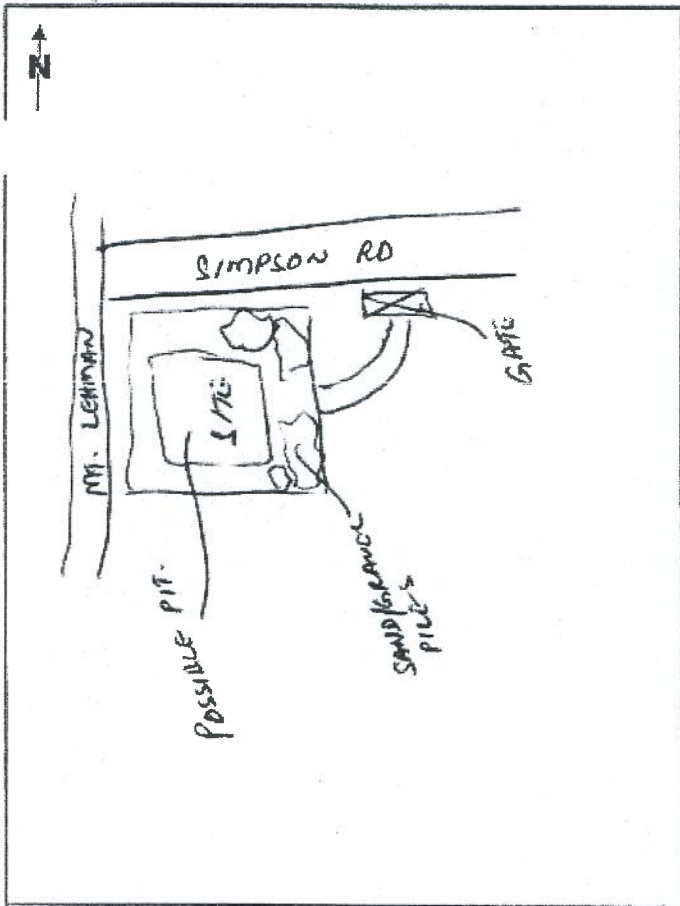
Activity: DO NOT KNOW - UNKNOWN
(Relative Size?) Likely inactive.

Product Exported: GRAVEL, SAND & GRAVEL, SAND
(Screened? Soil Type?)

Development Constraints: Creek and Pond
(Natural Base Elev.? Proximity to Adj. Property?)

Features: ADJACENT TO A CREEK
(Hills? Creeks? Ponds? Elev?)

Potential: _____
(How much more soil can they take?)



Topography/Relief

<input type="checkbox"/>	Flat	_____
<input type="checkbox"/>	Hilly	_____
<input type="checkbox"/>	Undulating	_____

Soil Profile

Summary: NO EXCAVATORS, A SCREENER IS PRESENT ON-SITE. SOME GRAVEL/SAND PILES ARE VISIBLE. ONLY THE EDGE OF THE PIT IS VISIBLE. SIZE NOT KNOWN. NOT CURRENTLY ACTIVE, GATE IS LOCKED.

General Comments: _____

Office Info
Expected Soils: _____
Groundwater: _____
Pit Contact: _____





STOP



1000 1000 1000 1000

Date: MAY 08/2007

Inspector: TL

Site Address: 416 CLEARBROOK RD.

Base Elev.: APPROXIMATELY 15-20m BELOW GROUND SURFACE

Visibility: POOR - SOIL REMOVAL

Pit Contact: BOB FEAN

Activity: LARGE PIT
(Relative Size?)

Product Exported: SAND & GRAVEL? (CAN'T SEE ACTUAL PIT)
(Screened? Soil Type?)

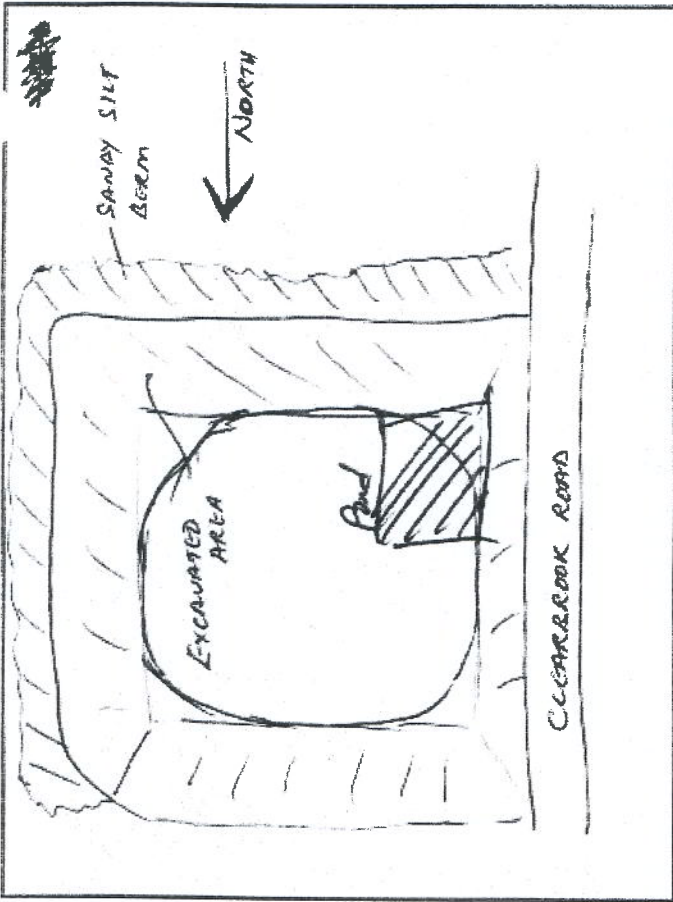
Development Constraints: ADJACENT TO RESIDENTIAL & FARMS
(Natural Base Elev.? Proximity to Adj. Property?)

Features: EXCAVATED (LARGE SIZE) PIT
(Hills? Creeks? Ponds? Elev.?)

Pond at SW corner

CAN'T SEE VERY WELL

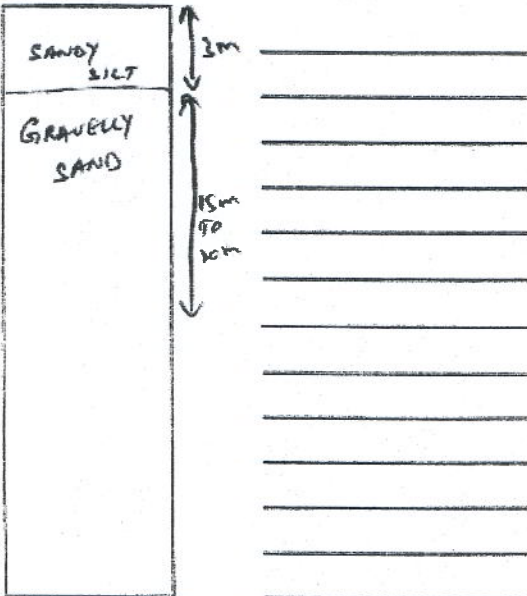
Potential: UNKNOWN
(How much more soil can they take?)



Topography/Relief

- Flat _____
- Hilly _____
- Undulating _____

Soil Profile



Summary: CURRENTLY 8 TRUCKS ARE BEING LOADED; TRAFFIC CONTROLLER WORKING.

General Comments: SIGNAGE FOR SCALE ON-SITE

Water ponding at base of excavation.

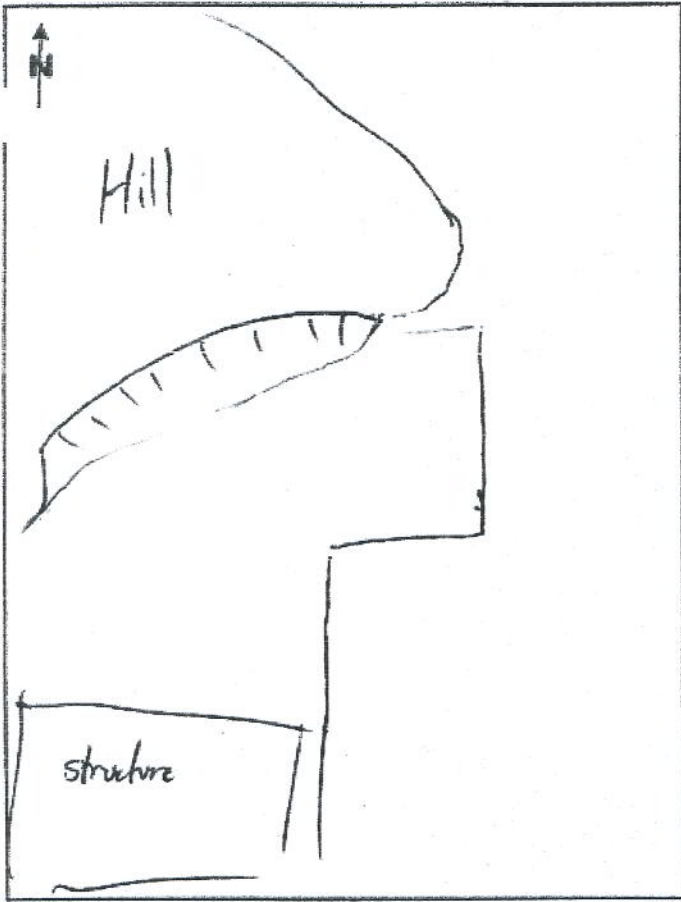
Office Info

Expected Soils: _____

Groundwater: _____

Pit Contact: _____





Date: May 7, 07

Inspector: V. Marques & T. Tavel

Site Address: 63 W. Railway

Base Elev.: _____

Visibility: Chainlink fence - good.

Pit Contact: Aggressive auto towing

Activity: Yard, ~~excavator~~ (excavator)

Product Exported: Pit run, possible fill

Development Constraints: Adj. property

to North

Features: Hill, ~~structure~~

toe is oversteeped

Potential: Yard can be extended into hill.

Topography/Relief

- Flat _____
- Hilly One hill
- Undulating _____

Soil Profile



Pit run (3")
Sand and
Gravel
appears to
have some
silt.

Summary:

toe of hill is oversteeped. to
allow more room for the workyard.
exc. slope is ~ 4:5 in high
bottom is at ~~base~~ road elevation

General Comments:

No stockpile visible, so soil
must have been exported.
An excavator is on site; potential
for more soil removal.

Office Info

Expected Soils: _____

Groundwater: _____

Pit Contact: _____



Date: MAY 7, 2007

Inspector: VM/TW
 Site Address: 23 # 23 / ERSET CONTRACTING, PIT # 23
AMEC PIT # 23

Base Elev.: _____
 Visibility: BEHIND PROSING MCKENZIE
MEDIUM - ONLY FROM 2 DRIVEWAYS

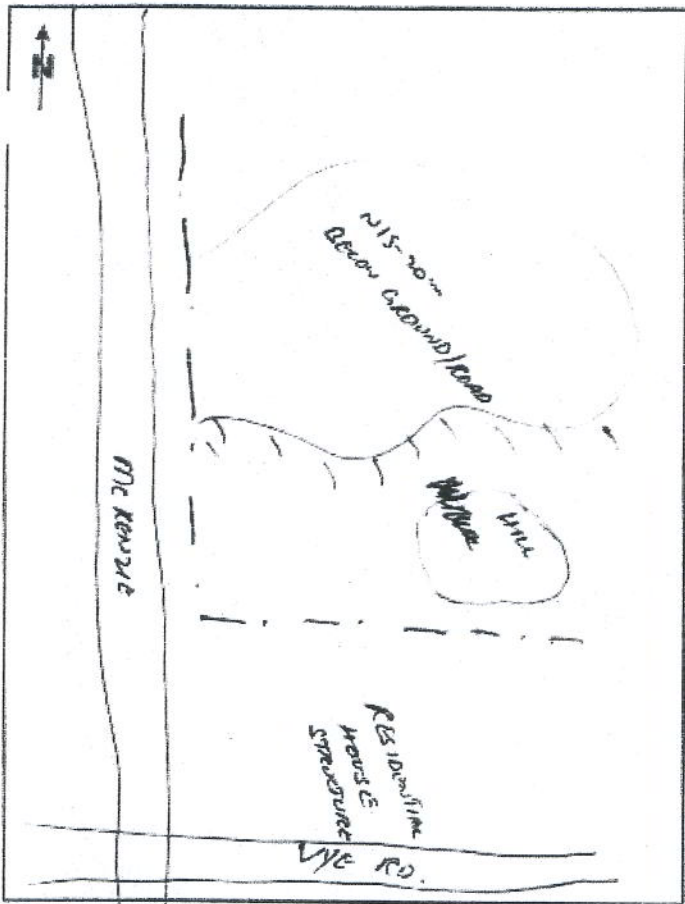
Pit Contact: _____
 Activity: (500 SERIES) 3 LOADERS, 1 SCREEN, INDUSTRIAL
SIZE PIT.

Product Exported: SCREENED
SAND, SAND & GRAVEL

Development Constraints: RESIDENTIAL SOUTHWARD
 (Natural Base Elev.? Proximity to Adj. Property?)

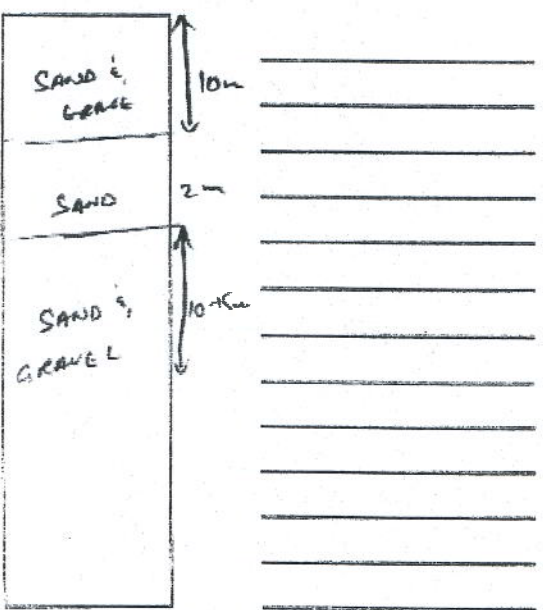
Features: HILLS (STEEP PIT WALLS),
20-25m FROM BOTTOM TO
TOP OF PIT WALL. APPROX.
10-15m BELOW THE ROAD SURFACE

Potential: N 3/4 COMPLETED
 (How much more soil can they take?)



- Topography/Relief
- Flat _____
 - Hilly _____
 - Undulating _____

Soil Profile



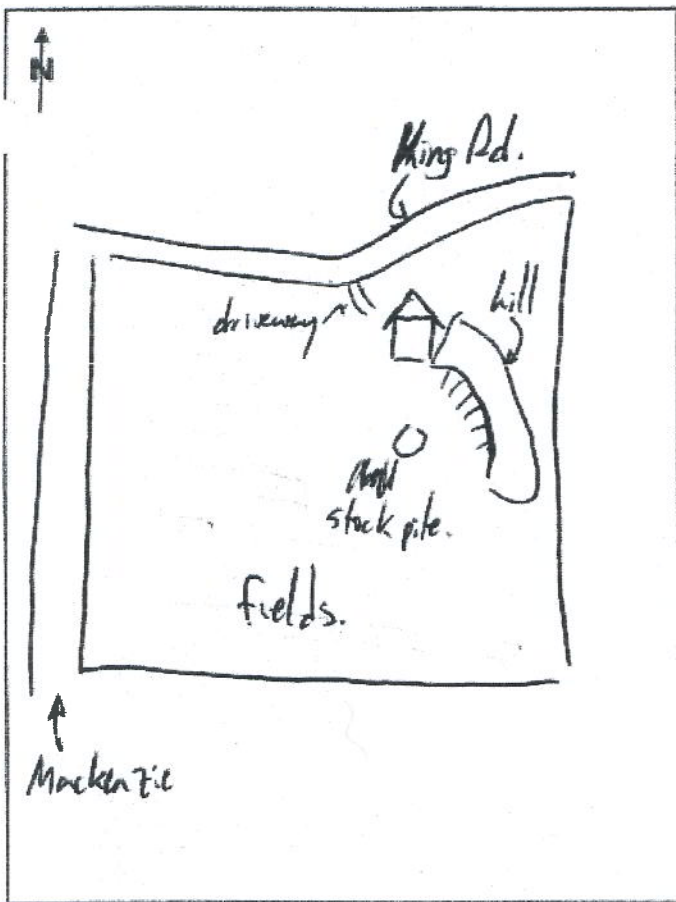
Summary: INDUSTRIAL/COMMERCIAL PIT,
CURRENTLY OPERATIONAL

General Comments: NE CORNER OF
VYE RD. & MCKENZIE RD.
- DUMP TRUCKS COMING IN
- HILL IS MADE OF SALT SAND (BROWN)

Office Info
 Expected Soils: _____
 Groundwater: _____
 Pit Contact: _____



0 1 2 3 4 5 6 7 8 9 10



Date: 7 May 2007

Inspector: UM & TW

Site Address: 34252 KING RD.

AMEC ID 16 King Rd & Mackenzie

Base Elev.: not visible

Visibility: poor - hedges around prop.

Pit Contact: _____

Activity: Appears dormant
(Relative Size?)

Product Exported: Pit run sand and gravel
(Screened? Soil Type?)

Development Constraints: house & adj. prop.
(Natural Base Elev.? Proximity to Adj. Property?)

Features: hill. half mined out.
(Hills? Creeks? Ponds? Elev.?)

Potential: 1/2 done remaining hill
(How much more soil can they take?)

Topography/Relief

- Flat one hill @ ENE corner.
- Hilly _____
- Undulating _____

Soil Profile

	<u>SAND AND GRAVEL</u>

Summary:

Mostly flat field
Unable to see depth of pit
Appears dormant.
Very small portion of property

General Comments:

Permit expires May 15-07
Soil Deposit Permit # 1312
INSPECTOR: RYAN DOMAN 604-626-2001

Office Info
Expected Soils: _____
Groundwater: _____
Pit Contact: _____







12.07.2007 10

T&D Contracting Ltd
852-3418 or 856-2216
DANGER! NO TRESPASSING!
DRAINING INFORMATION CLEAN FILM
No...
No...
No...
No...

12.07.2007 11

Distribution List of Stakeholders
Contacted for Preliminary Consultation

Firm or Organization
406751 BC Ltd
Valley Gravel Sales Ltd.
West Coast Aggregates / co Valley Gravel Sales
Abbotsford Gravel Sales
Little Rock Quarries Inc.
Mainland Sand & Gravel (Jamieson Quarries)
Warren Materials Inc.
Ross Road Aggregates (Imperial Paving Ltd.)
Fraser Valley Aggregates Ltd.
Sumas Shale
Woodbrook Aggregates Ltd.
Valley Rite-Mix Ltd.
532470 B.C. Ltd.
G.R.O.W. Inc.
4 B Developments Ltd.
Columbia Sand & Gravel Ltd.
Beautiworld Development Corp
Columbia National Investments
90617 BC Ltd
Ekset Contracting Ltd
Agricultural Land Commission
Department of Fisheries and Oceans
Ministry of Environment
Ministry of Energy, Mines & Petroleum Resources
Ministry of Agriculture