

April 28, 2004  
File: 19-4324-0

Thurber Engineering Ltd.  
Victoria, B.C.

J.E. Anderson & Associates  
c/o  
Renewal Land Company

to  
Report

SECTION 7 SAYWARD LAND DISTRICT  
CORTES ISLAND, BC  
GROUNDWATER SUPPLY STUDY  
PRELIMINARY REPORT

Continued...

This report was prepared by Mr. Bruce Ingmundson, P. Geo., registered with the Association of Professional Engineers and Geoscientists of British Columbia. He is a

## 2. PROFESSIONAL CREDENTIALS

The Regional District of Comox-Strathcona (RDSCS) has advised us that the Ministry of Transportation (MoT) is the approving authority. The MoT advises that the minimum requirement for residential wells on Cortes Island is 500 Imperial gallons per day per lot.

The terms of reference for the preliminary study were to investigate the potential for groundwater supply from wells for single family homes on up to 26 residential lots of between 1.5 and 2.0 hectares each. The wells are to provide individual service to each lot.

## 1. BACKGROUND

The use of this report is subject to the attached *Statement of General Conditions* located following the text of this report.

Further to your letter of March 23, 2004, we are pleased to present our preliminary report for your consideration. The location of the subject property is shown on Figure 1, in the Appendix.

Dear Phil:

### SECTION 7 SAYWARD LAND DISTRICT CORTES ISLAND, BC GROUNDWATER SUPPLY STUDY PRELIMINARY REPORT

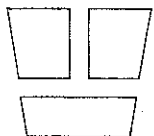
Attention: Phillip C. Buchanan, P. Eng.

Renewal Land Company  
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THURBER



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Continued....

The well records immediately adjacent to the subject property indicate the aquifer(s) are artesian. The well logs reviewed indicate that the water bearing zones are sand (likely the Quadra Sediments) and are confined (capped) by one or more layers of moraine "till" or marine clay/silt. Recharge is expected to come from local precipitation falling on the bedrock controlled terrain north of the Sutil peninsula. The relatively high estimated well yields shown on many of the driller's logs, suggest a possible hydraulic connection to the surface waters of Hague/Gunflint Lakes.

The available information indicates that the entire development is situated within the Quaternary and glacial sediments of the Sutil Peninsula at the south end of Cortes Island. The geological mapping indicates potentially deep deposits of Moraine (till) and/or Marine materials (sand, silt & clay) overlying glacio-fluvial granular material. The Geological Survey of Canada (Clague, 1977) shows an inferred deposition of Quadra Sand over the entire peninsula. The depth to bedrock is expected to be variable, with lesser depths expected to the north and north-east of the subject property and greater depths to the south. Well records within the immediate area of the subject property indicate most wells draw water from sand sediments above the granodiorite bedrock (Trettin & Roddick, GSC, 2002).

We reviewed the published surficial and bedrock geological mapping and water well information within the study area as listed in the "References" appended to this report.

### 3. STUDY AREA HYDROGEOLOGICAL SETTING

Mr. Ingimundson is an Associate of the Thurber Group and Past-President of the BC Groundwater Association, a trade association of well drillers, equipment suppliers, pump installers and engineering consultants. He is co-chair of the MWLAP Ground Water Advisory Board, charged with drafting regulations and a code of practice to protect the groundwater resource and set standards for well construction, testing, abandonment etc. He has published several papers on groundwater and was a contributing author of the BC Environment, 1993 publication, "Groundwater Resources of British Columbia".

Senior hydrogeologist, with 30 years of groundwater supply consulting experience on Vancouver Island and the Gulf Islands. He has acted as a groundwater supply consultant to the City of Parksville, Town of Qualicum Beach, District of North Cowichan and numerous water works districts. Recent local experience within the RDGS includes a groundwater supply study for a golf course on Quadra Island.

April 28, 2004

Renewal Land Company

Continued....

Based upon our review of the information noted above, we are of the opinion that there is a very good probability of developing at least a minimum supply of 500 Imperial gallons per lot from one or more wells on each of the proposed 26 residential, single family lots.

To meet the MOT minimum requirement of 500 Imperial gallons per day per lot, we offer the following conclusion:

**5. GROUNDWATER CAPABILITY ASSESSMENT**

A review of the MWLAP data base indicates that the aquifer(s) on Cortes Island have not been mapped. Similarly our search of the MWLAP data base did not reveal any information on water quality. We contacted the Vancouver Island Health Authority (VIHA) in Campbell River to inquire about any water quality problems with wells in the Sutil peninsula. VIHA has not responded to our inquiry at the time of issue of this report.

for at least a domestic supply from each well.

BCGS quadrant 93K00613 is more representative of wells expected to be within the subject property. The data search indicates that the above referenced driller estimated yields of domestic wells within the study area, would have a good potential

Location	Data Tabulation					% of Wells at
BCGS #	# of Wells	Ave. Depth metres (ft)	Est. yield range (gpm)	Ave. Yield (gpm)	1 - 5 gpm	11 - 30 gpm
92K00613	18	46 (150)	2 - 40	12	50	16
92K00631	10	107 (350)	1.5-33	12	50	40

In order to acquire an appreciation of the number and performance of wells within the general study area, we accessed the MWLAP Ground Water Data Base. We undertook an examination of approximately 750 ha (7.5 km<sup>2</sup>) area which surrounds the subject property. British Columbia Geographic System (BCGS) #92K00631& #92K00613 had a total of 28 wells on record. The following table shows the results of the well survey.

**4. AREA WATER WELL SUPPLY SURVEY & AQUIFER MAPPING**



## STATEMENT OF GENERAL CONDITIONS

### 1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

### 2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### 3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### 4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

### 5. INTERPRETATION OF THE REPORT

a) Nature and Extent of Soil and Contaminant Materials and Quantities: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

(see over...)



**INTERPRETATION OF THE REPORT (continued)**

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of persons providing information.

**6. RISK LIMITATION**

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us and our directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

**7. SERVICES OF SUBCONSULTANTS AND CONTRACTORS**

The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Client's benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such things to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, in those cases where conditions apply to the use of drilling, excavation and laboratory testing services.

**8. CONTROL OF WORK AND JOBSITE SAFETY**

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. These procedures may well involve additional costs outside of any budgets previously agreed to. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

**9. INDEPENDENT JUDGEMENTS OF CLIENT**

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes decisions made to either purchase or sell land.

## REFERENCES

- Trettin, H.P., Roddick, J.A., Bedrock Geology Cortes Island, Strait of Georgia, British Columbia, Geological Survey of Canada, Open File 4303, 2002
- Roddick, J.A. Notes on the Stratified Rocks of Bute Inlet Map-Area, Geological Survey of Canada, Open File 480, 1976
- Clague, J.J., Quadra Sand: A Study or the Late Pleistocene Geology and Geomorphic History of Coastal Southwest British Columbia, Geological Survey of Canada, Paper 77-17, 1977
- Thompson, B. 1:50,000 Surficial Geology Terrain Map 92K/2, BC Ministry of Environment, 1980
- Ground Water Data Base System (Internet Based), BC Ministry of Water, Land & Air Protection, 2004

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# SITE LOCATION PLAN

Not to Scale

FIGURE 1

