



**GROUNDWATER EVALUATION,
PALMS COVE SUBDIVISION WITHIN
W.1/2-34-39-2-W5M**

Prepared by:
Stantec Consulting Ltd.
600, 4808 Ross Street
Red Deer, AB T4N 1X5

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Executive Summary

Qualico Developments proposed Palms Cove Subdivision is located within W1/2-34-39-2-W.5, a short distance north of Sunbreaker Cove on Sylvan Lake. Stantec was retained to conduct a groundwater evaluation study of the Palms Cove Subdivision to ensure adequate quantities of ground water are available to support the additional future growth around Sylvan Lake prior to development of the property.

As required under the Alberta Groundwater Evaluation Guidelines, two wells were drilled into the Paskapoo Formation, Dalehurst member on February 10 and 11, 2010. These wells have been identified as PW1 and OB1. Both wells were drilled to 48.8 meters below the land surface.

Hydrogeologically, a sandstone aquifer was encountered in PW1 at a depth of 36.9 meters below the land surface that could be developed for the Palms Cove Subdivision. The sandstone aquifer is capped by 4.9 to 5.8 meters of shale. The static non-pumping water level in the pumping well prior to pumping was 3.98 to 4.61 meters above the top of the sandstone aquifer. Thus the sandstone aquifer is under artesian pressure.

The aquifer tested is at 932.21 to 924.31 m elevation, and the nonpumping water level prior to pumping was at 936.19 m, or 0.47 m lower in elevation than the lake outlet level of 936.66 m, and 3.98 m above the top of the aquifer. This unusual situation results in a nonpumping water level in the well which is artesian, yet slightly below lake surface level, at 585 m distance to the southwest. No other production from this aquifer, other than purely minor domestic use, is present at this time within the immediate area. Sylvan Lake receives groundwater discharge from the northwest and southwest, and there is a flow-through toward the northeast and southeast.

A step test was conducted on PW1 prior to conducting the 71.7 hours aquifer pumping test. This was done to determine the PW1 well efficiency and pumping rate for the 71.7 hour pump test. Based on the step test, PW1 was pumped during the test of 71.7 hours at 445 cubic meters per day, followed by 63.2 hours of recovery, at which time recovery was complete.

The Double Porosity Method developed by Warren and Root was used to calculate the hydraulic characteristics of the fractured bedrock. This data suggest the transmissivity of the sandstone aquifer is in the range of 1110 square meters/day with a storativity of 0.00017.

The Moell method for estimating long-term sustainable groundwater yield shows that the production well is theoretically capable of pumping about 695 cubic meters per day

The theoretical interference caused by this diversion for 20 years would be about 42 to 52 cm in the vicinity of the nearest other well-owners whose wells are completed in the same aquifer.

This interference would have a minimal affect on other water supply wells developed in the same sandstone aquifer as the Palms Cove Subdivision.

The groundwater evaluation also suggests that there is adequate recharge to meet the needs of this planned subdivision, and that the supply well will not induce infiltration from the lake above the natural flow-through amount, or affect the safe yield of the sandstone aquifer. As a result, the data suggest that the sandstone aquifer tested for this project is not under the influence of surface water associated with Sylvan Lake.

Groundwater samples were obtained from the production well and tested according to Alberta Drinking Water Guidelines. The samples were analyzed for routine metals and bacterial parameters. All chemical parameters are within the Guidelines for Canadian Drinking Water Quality.

Based on this study, there is adequate groundwater of an acceptable water quality for development at the Palms Cove Subdivision. The sustainable yield of 445 m³/day is sufficient for 1986 persons or 794 homes.

Within the context of this study, Qualico can therefore proceed to apply for a groundwater diversion license at this site from Alberta Environment. It is recommended that Qualico maintain monthly water production records for the production well. In addition, monthly water level records should also be maintained for the pumping and observation well. This data should be submitted in an annual report to Alberta Environment to ensure good management practices within the Sylvan Lake watershed.

Because of the substantial proposed diversion, it is recommended that a professional hydrogeologist carry out an annual review of the water levels and water production at the end of each of the first two years of production. Further water monitoring should continue for the life of the diversion, but future annual reporting needs can be evaluated at the end of the first two years.

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1.0 Introduction

Qualico Developments West Ltd. (Qualico) owns a property located at the northwest end of Sylvan Lake, in the West ½ of 34-39-2-W.5. Presently, Qualico Developments wishes to develop the property for residential use.

1.1 SITE LOCATION AND SETTING

Figure 1 was developed from the Sylvan Lake Alberta, Topographic Quadrangle map of the area. The map depicts the location of the property with respect to important geographic features. Based the map, the site consists of agricultural land. Access to the site is from Rainy Creek Road.

Topographically, the area is characterized by a typical dendritic drainage pattern. Major streams in the area are the Blindman River to the northeast and Medicine River southwest of Sylvan Lake. The lake is characterized by a tight local self-contained drainage basin between the rivers. There is an intermittent small drainage to Cygnet Lake from the southeast side of Sylvan Lake. Surface drainage from the Qualico Development's Palm Cove site will flow toward Sylvan Lake.

Surface elevation across the area ranges from 1005 Meters above mean sea level on the hilltops to approximately 940 Meters above sea level in the valleys. Thus, the total topographic relief across the region is approximately 65 meters. The normal pool level of the lake is approximately 937 meters above sea level.

1.2 GEOLOGIC SETTING OF THE PASKAPOO FORMATION

Geologically, the bedrock is overlain by unconsolidated Pleistocene till deposits. These consist of a mixture of blue and brown clay, silt, sand and gravel with some boulders. These deposits are generally less than 10 m thick, and are draped over the underlying bedrock strata. This area is characterized by numerous flutes and drumlins aligned in a parallel manner from northeast to southwest (Shetsen, 1990). The Pleistocene materials thin somewhat in higher topographic areas.

Bedrock below the till is composed of the Paleocene Paskapoo Formation, which consists of grey to greenish grey thick-bedded calcareous cherty sandstone, grey and green siltstone and mudstone, minor conglomerate, thin limestone, and coal beds. The formation was deposited in a non-marine fluvial-deltaic environment (Hamilton, et al, 1999).



REGIONAL SITE PLAN
PALMS COVE SUBDIVISION
FIGURE 1.0

QUALICO DEVELOPMENT - SYLVAN LAKE

Stantec Consulting Ltd.
600, 4808 Ross Street
Red Deer AB Canada
T4N 1X5
Tel: 403.341.3320
Fax: 403.342.0969
www.stantec.com

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The Paskapoo Formation has been subdivided by Demchuk and Hills (1991) into three (3) members:

- (1) Dalehurst Upper Member
- (2) Lacombe Middle Member
- (3) Haynes Lower Member

The Dalehurst Member sediments compose the bedrock sediments near the surface and under the Sylvan Lake region. These sediments consist of inter-bedded sandstone, siltstone, mudstone, shale and coal. The sandstones have a light gray to yellow-brown color. They are predominantly massive or planar bedded with minor planar cross-bedding and wavy-disturbed bedding. Carbonaceous (coaly) laminas are common, siderite staining is common, and plant fragments and rooting are rare. The siltstones, mudstones and shales are light grey to black or olive-green, with few primary sedimentary structures, except for minor planar or wavy-disturbed laminations. There are at least five coal seams in this member ranging from 1.3 to 6.1 m in thickness. The strata are almost flat-lying, dipping westward at about 4 m per km.

1.3 HYDROGEOLOGIC SETTING OF THE PASKAPOO FORMATION

A regional groundwater study including the Sylvan Lake area was carried out by Orest Tokarsky, Alberta Research Council, in 1970 of the Rocky Mountain House map sheet, at a scale of 1:250,000. Based on the study, the Paskapoo Dalehurst member in the vicinity of Sylvan Lake has the potential to produce between 25 to 100 gallons per minute (160 to 650 cubic meters per day) of water from a single properly designed well.

The hydrogeologic setting of Sylvan Lake is unusual, in that there is both groundwater contribution to the lake and also simultaneous groundwater outflow from the lake. Baker (2003) discusses this and shows in her Figure E (p. 21) that groundwater flows into the lake from the northwest and from the southwest. However, there is also flow-through at the same time to the northeast toward Blindman River and to the southeast to Cygnet Lake. AXYS Environmental Consulting Ltd. (2005, sec. B.2.1.2)) further elaborates on this unusual situation, as follows:

"Baker (2003) shows that groundwater discharges into Sylvan Lake. The thesis also suggests there is significant groundwater flow-through in Sylvan Lake. Specifically, it is postulated that groundwater discharges into Sylvan Lake from the northwest and southwest sides, and that the lake recharges groundwater on the northeast and southeast sides. It is suggested that there is a possibility that a highly conductive layer of sandstone exists at and below the elevation of Sylvan Lake with significant quantities of groundwater flowing through it."

There is an unconfined aquifer located northeast of the lake, which was penetrated and tested by means of the wells of the adjacent Skyy Country Subdivision. The wells tested in Palms Cove Subdivision penetrated and tested the deeper confined and highly conductive layer of sandstone, mentioned above in the quote from AXYS.

1.4 GROUNDWATER QUALITY IN THE PASKAPOO FORMATION

Based on the study by Orest Tokarksy, the groundwater is characterized predominantly by sodium bicarbonate dissolved in the groundwater. Generally, the groundwater quality is within acceptable Canadian Drinking Water Guideline standards. Fluoride content should be within acceptable limits.

The more recent groundwater evaluation carried out for Lacombe County in 2001, contains 31 years of additional data, indicating that individual wells can yield between 100 and 300 cubic meters per day, and that the water would be mainly of a sodium bicarbonate type. Total dissolved solids range from under 400 to 600 mg/L, sulfate mainly between 10 and 50 mg/L, and chloride under 10 mg/L. The depth to the base of groundwater protection is considered to be about 350 m depth. This is the depth at which groundwater attains a total dissolved solids level of 4000 mg/L, and is hence considered unfit for human consumption.

1.5 CONSULTING REPORTS COMPLETED IN THE SYLVAN LAKE AREA

For a rural subdivision to obtain a right to divert surface water or groundwater, it must apply to Alberta Environment for a license to divert water. This application must be supported by a technical report which demonstrates:

- The quantity of water available on a sustainable basis, based on a rigorous testing program, and that this quantity is sufficient to meet anticipated needs,
- The quality of water available and that it is adequate for human consumption, with or without treatment,
- The impact that the proposed diversion will have on other pre-existing well owners in the area,
- The impact that the proposed diversion will have on the environment, ie, fauna, wetlands, etc.

Several detailed consulting reports have been prepared previously for other subdivisions in the immediate area. These include:

- DeGroat Subdivision February, 2004 G.E.R.L.
- Westend Landing May, 2006 Stantec Consulting Ltd.
- Eagles Quay July, 2006 Stantec Consulting Ltd.
- Westside Estates August, 2006 Stantec Consulting Ltd.
- Westside Estates, Part 2 February, 2007 Stantec Consulting Ltd.
- Eagles Quay, Part 2 April, 2007 Stantec Consulting Ltd.
- Skyy Country May, 2008 Stantec Consulting Ltd.

Thus, a considerable amount of technical data on groundwater supply has been obtained in the last five years within the immediate area. In every case, these consulting reports were prepared

for the purpose of obtaining a license to divert water from a central well or wells for subsequent distribution to individual lots within the subdivision. These reports include drilling information on the water supply wells tested, testing data for each well, water quality analyses, and a calculation of the sustainable production rate of each well and its impact on neighboring wells.

The information in consulting reports, once submitted to Alberta Environment, becomes public information, unless there is some special reason to maintain confidentiality for a finite period of time. All the subdivisions listed above are now licensed or in the process of doing so. The information in these reports includes detailed records of the wells drilled, results of aquifer testing, calculated sustainable yield of the wells, quality of groundwater, impact of pumping on other groundwater users, and possible impacts on the environment and on Sylvan Lake.

2.0 Methods of the Investigation

Prior to implementing this project, the Alberta Groundwater Evaluation Guidelines were consulted. In addition, standard engineering practices were used to conduct all field work and data analysis.

2.1 EXISTING LICENSED DIVERSIONS

Traditional Agricultural Registrations (TAR's) are diversions which were not licensed at the time of drilling, because there was no requirement to do so at that time. However it became possible later on to register them up to a cutoff date in 1999, with their priority of use dating from the year of first use. This was done by means of a simple application only, and protects older traditional users of water for stock-watering and pesticide applications, by means of a grandfathering clause.

A license, on the other hand, is obtained through a formal technical study such as this one, which must be prepared by a qualified groundwater specialist who is a member of the Association of Professional Engineers, Geologists and Geophysicists of Alberta. This study must show that the desired amount of water is available for a minimum of 20 years, and that the diversion of this water will not harm any other water well owners in the immediate area. In the future, If the license holder no longer uses or needs his allocation, the license may be cancelled, so that the water will become available to other applicants. The Water well drilling reports for neighboring wells can be found in Appendix A.

2.2 FIELD VERIFIED SURVEY

Stantec Consulting Ltd. prepared a questionnaire to be used for a field verified survey, and carried out a survey of all owners who could be contacted within a 1 km radius of the well. Because the area is largely used for summer cottages, many well-owners were not at home and could not be contacted. Nevertheless, these data can be found in Appendix B.

2.3 WELL COMPLETION DETAILS

The Pumping Well and the adjacent Observation Well were drilled on February 10 and 11, 2010 respectively by Alken Basin Drilling Ltd., Bentley, Alberta. Figure 2 shows the locations of the two wells drilled for this project. Figures 3 and 4 are well completion diagrams showing the details of how each of the wells was completed in the subsurface.



SITE PLAN SHOWING PW1 & OB1
WELL DRILLING LOCATIONS
FIGURE 2.0

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Stantec Consulting Ltd.
600, 4808 Ross Street
Red Deer AB Canada
T4N 1X5
Tel: 403.341.3320
Fax: 403.342.0969
www.stantec.com



Table 1 shows the surveyed coordinates of the two wells used in the test.

Table 1
Coordinates of PW1 and OB1 Wells

Well	Northing	Easting	Casing Stickup(m)	S.W.L. Feb. 10, 2010 (m)	Casing Elevation msl (m)	Ground Elevation msl (m)
PW1	5809866	689957	0.91	33.83	970.024	969.114
OB1	5809864	689902	0.91	31.70	968.150	967.240

The driller's reports for the two (2) wells are in Appendix C.

Upon completion of the drilling and well construction, each well was tested for 2 hours pumping and recovery to determine the pumping rate on a preliminary basis. Production well PW1 produced approximately 262 cubic meters per day with approximately 0.838 meters of drawdown. The estimated specific capacity of the pumping well PW1 was determined in this short test to be 312.6 cubic meters per day per meter of drawdown.

The pumping rate in the observation well OB1 was approximately 282 cubic meters per day with 7.88 meters of drawdown. Thus the preliminary specific capacity of the well was 35.8 cubic meters per day per meter of drawdown.

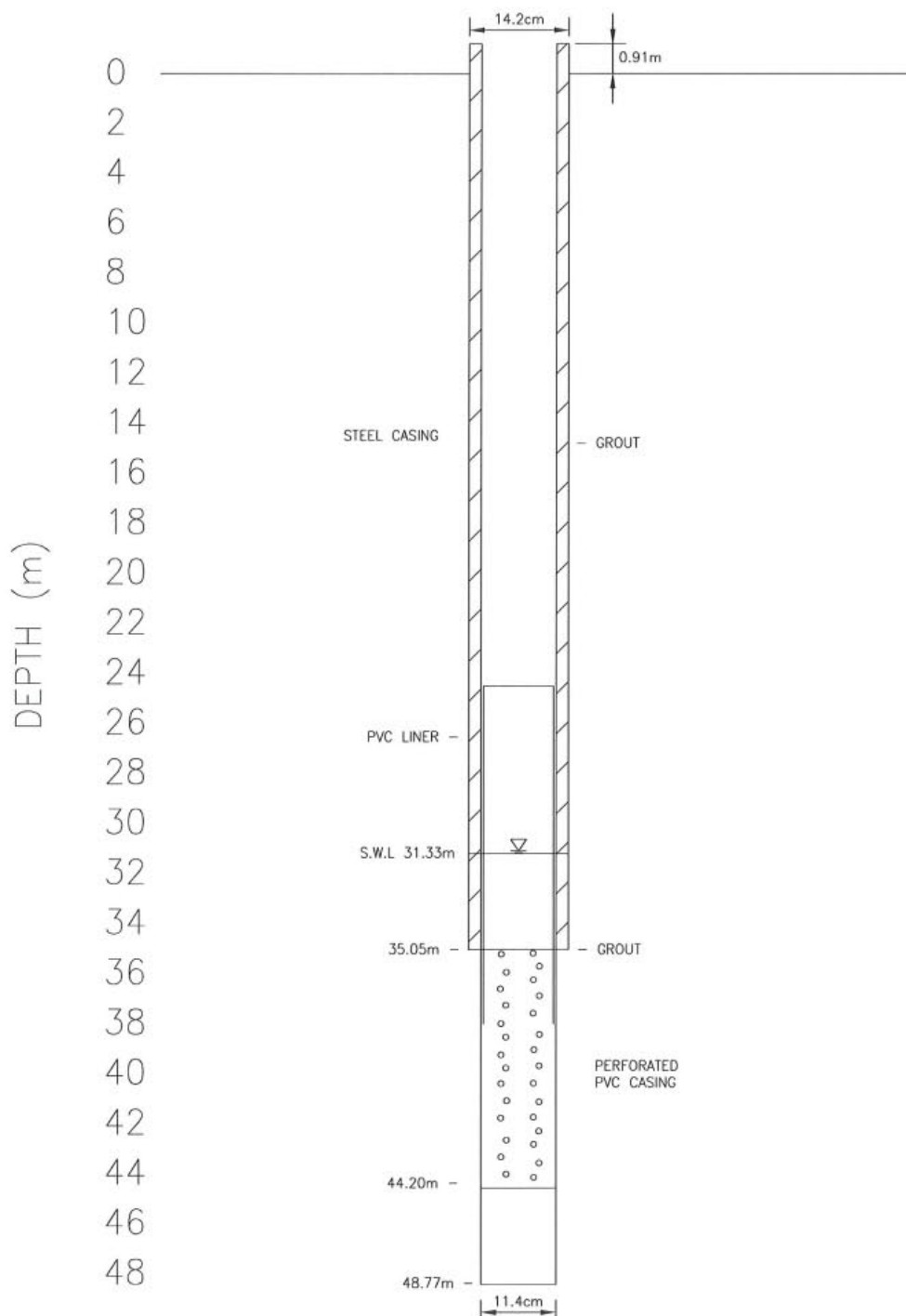
Based on the preliminary testing of the wells, it was decided to conduct a step test on PW1 to determine the desirable pumping rate for the 72-hour pumping test.

2.3.1 STEP DRAWDOWN TEST METHODS

The step test was done by pumping PW1 well at increasing rates to stress the well as much as possible. Pumping rates from PW1 were increased at 131 cubic meters per day intervals. The pumping rates for the step test were 131, 262, 393 and 445 cubic meters per day. Based on the step test data, a pumping rate for the 71.7 hour pump test was set at 445 cubic meters per day.

2.3.2 72-HOUR PUMP TEST METHODS

The well drilling contractor, Alken Basin Drilling Ltd., supplied the electric generator and submersible pump for the test, which took place on February 16 to February 22, 2010. The discharge from the PW1 Well was set at 445 cubic meters per day for the purpose of the aquifer test, with levels being measured in both wells. Water levels were recorded by Alken Basin using data loggers during the time-drawdown period of the test of 71.7 hours pumping and the recovery period of 63.2 hours, when recovery was complete. Discharge from the well was verified several times during the test by means of checking the time to fill a 20 liter container. Aquifer testing data can be found in Appendix D.



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Stantec Consulting Ltd.

600, 4808 Ross Street
Red Deer AB Canada
T4N 1X5

Tel. 403.341.3320

Fax. 403.342.0969

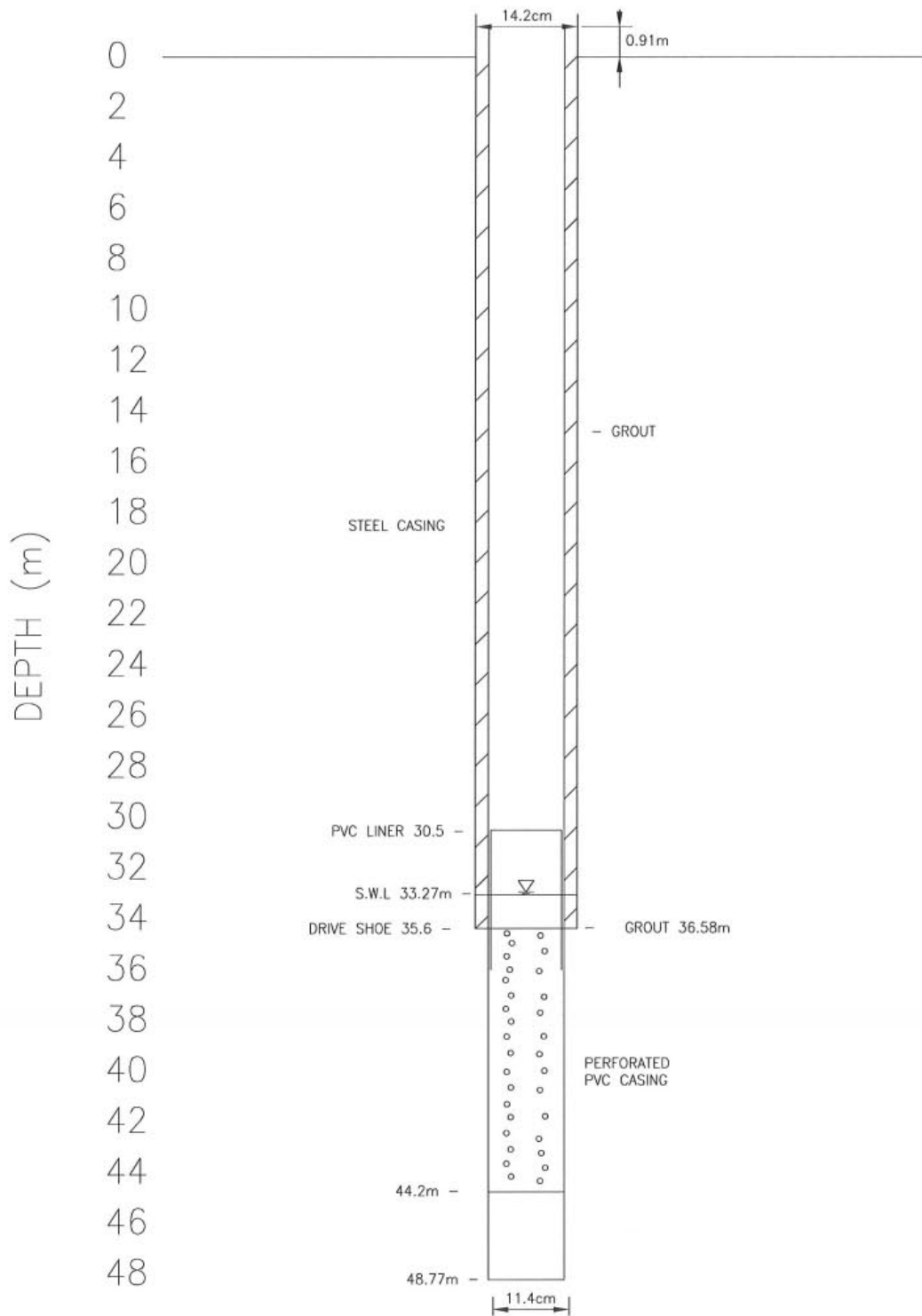
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**SCHEMATIC OF
OB-1**

Figure No.

3



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600, 4808 Ross Street
Red Deer AB Canada
T4N 1X5
Tel. 403.341.3320
Fax. 403.342.0969
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**SCHEMATIC OF
PW-1**

Figure No.

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2.3.3 72-HOUR AQUIFER TEST ANALYSIS METHODS

All the time-drawdown and time-recovery data for both the pumping and observation wells were analyzed using AquiferTest Pro 4.2, a software program developed by Waterloo Hydrogeologic (2008). This software enables the specialist to select the most appropriate aquifer analytical method and to adapt the software to confined, leaky or unconfined aquifers and to calculate the transmissive capacity, storativity and hydraulic conductivity. These parameters are the basis for predicting the future behavior of the aquifer under different conditions and times.

2.4 LABORATORY TESTING PROCEDURES FOR PALMS COVE GROUND WATER SUPPLY

Shortly before terminating the aquifer test of the PW1 Well on February 18, 2010, samples of the water were taken for routine analysis, metals and bacteriological analysis. The samples were refrigerated and sent to WSH Labs (1992) Ltd, Calgary. Laboratory results are found in Appendix E.

2.5 20-YEAR GROUND WATER YIELD CALCULATION METHODS

The theoretical long-term safe yield of the production well may be calculated by two main methods, the Farvolden Method and the Moell Method, based upon results of the aquifer testing.

The Farvolden Method is expressed as follows:

$$Q_{20} = (0.68)(T)(H_A)(0.7), \text{ in which}$$

Q_{20} = calculated safe yield for 20 years continuous pumping, in m^3/day

T = transmissive capacity, in m^2/day

H_A = available head, the difference between nonpumping water level and the top of the completion interval of the well, in m.

0.7 = a safety factor, to compensate for unknown limiting factors

The Farvolden Method is suitable when there is little or no well loss in the initial minutes of the test, but in most cases, the well loss is appreciable and must be taken into account. For this reason the Moell Method is usually preferable. It provides a more conservative and more realistic result. Only calculations based on the Moell Method will be used in this report for that reason.

The Moell Method is expressed as follows:

$$Q_{20} = \frac{(Q)(H_A)(0.7)}{s_{100} + 5\Delta s}, \text{ in which}$$

Q_{20} = calculated safe yield for 20 years continuous pumping, in m³/day

Q = pumping rate used during the aquifer test, in m³/day

H_A = available head, the difference between nonpumping water level and the top of the completion interval of the well, in m.

0.7 = a safety factor to compensate for unknown limiting factors

s_{100} = the observed drawdown after 100 minutes pumping, in m

Δs = the drawdown per log cycle, in m.

2.6 METHOD FOR DETERMINING LOCAL IMPACT ON NEARBY WATER WELLS

The impact, or interference, at different times and distances from the pumping well is calculated from two basic equations:

$$U = r^2 S / 4Tt, \text{ or } 7.98 E-9 r^2$$

$$S = QW(u) / 4\pi T, \text{ or } 0.0703 W(u)$$

Since the calculations using these formulae are somewhat laborious for each time and/or distance increment, the computer program **WELLz** was used. It is based on the same mathematical processes described above and accomplishes the same results much more rapidly.

2.7 METHOD FOR DETERMINING IMPACT ON SYLVAN LAKE WATER LEVELS

Alberta Environment maintained a network of 20 observation wells around the west end of Sylvan Lake for varying periods of 5.25 to 12.8 years. Several of these observation wells were located less than 1 km immediately west of the proposed Palms Cove Subdivision. None are still in use at present, as all measurements terminated in late 1997. Several were located in the ditch west of Range Road 2-4, and have been destroyed because of widening of this road.

In work done in a previous study, the hydrographs of these observation wells were analyzed by Stantec Consulting Ltd. to determine their long-term behavior and to estimate the recharge in this area. Each rise in water level in each hydrograph was assumed to represent a recharge event. Since measurements were taken only monthly, there are likely additional minor recharge events which are not evident in this analysis. The individual hydrographs are located in Appendix F.

3.0 Results of the Investigation

The sections that follow define the important facts and trends in the data that have been obtained from the public records, field and laboratory data.

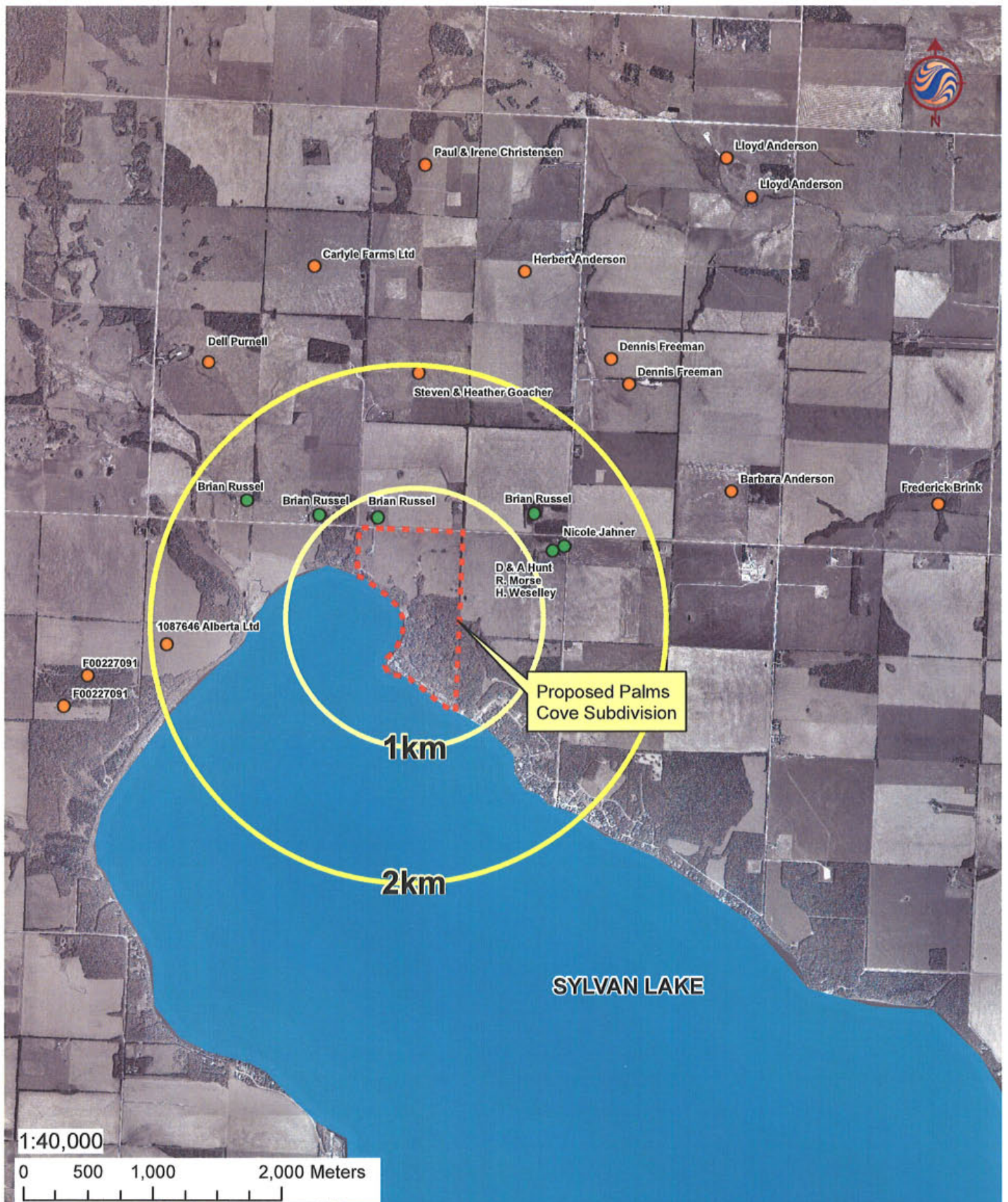
3.1 EXISTING LICENSED DIVERSIONS WITHIN 2-KILOMETERS OF PALMS COVE SUBDIVISION

Figure 5 shows the locations of the wells identified as existing in the immediate vicinity (within a 2 km radius), based on information in the Alberta Environment database

The authorized diversions shown in Table 2 are not necessarily the amount being diverted, but rather the maximum amount that the owner may divert in a year. Generally the actual diversion is lower than the authorized volume, although it normally varies from one year to the next.

Table 2
Licenses and Registrations Near Palms Cove Subdivision

Location	Owner	Approval ID	Interim License #	Type	Quantity (m ³ /year)	Effective Date	Expiry Date	Aquifer Interval (m)
SE-10-40-2-W.5	Herbert Anderson	00167931-00-00	00167961 00 00	REG	535	14-Mar-02		61 - ?
SE-1-40-2-W.5	Frederick Brink	00167997-00-00	00167997 00 00	REG	2,751	15-Mar-02		? - 18.3
NW-10-40-2-W.5	Paul & Irene Christensen	00170501-00-00	00170501 00 00	REG	165	20-Mar-02		? - 27.4
SE-9-40-2-W.5	Carlyle Farms Ltd	00175140-00-00	00175140 00 00	REG	740	28-Feb-06		? - 53
NE-11-40-2-W.5	Lloyd Anderson	00177149-00-00	00177149 00 00	REG	44	14-Mar-02		? - 27.4
NE-11-40-2-W.5	Lloyd Anderson	00177149-00-00	00177149 00 00	REG	1,025	14-Mar-02		? - 27.4
SE-2-40-2-W.5	Barbara Anderson	00178614-00-00	00178614 00 00	REG	200	15-Mar-02		? - ?
NW-2-40-2-W.5	Dennis Freeman	00184061-00-00	00184061 00 00	STOCK	797	26-Aug-03	25-Aug-28	48.7 - 61
NW-2-40-2-W.5	Dennis Freeman	00184061-00-00	00184061 00 00	STOCK	797	26-Aug-03	25-Aug-28	57.9 - 70.1
NW-4-40-2-W.5	Dell Purnell	00190732-00-00	00190732 00 00	STOCK	1,145	30-Jan-03	31-Jan-28	21 - 38
SW-33-39-2-W.5	1087646 Alberta Ltd	00206640-00-00	00206640 00 00	SUBDIV	35,856	16-Nov-05	15-Nov-30	28.9 - 38.1
NW-3-40-2-W.5	Steven & Heather Goacher	00207642-00-00	00207642 00 00	STOCK	353	15-Feb-06	14-Feb-31	61 - 67.1
SE-32-39-2-W.5	F00227091	00227091-00-00	00227091 00 00	SUBDIV	41,168	26-Sep-06	25-Sep-31	27.4 - 36.6
SE-32-39-2-W.5	F00227091	00227091-00-00	00227091 00 00	SUBDIV	41,168	26-Sep-06	25-Sep-31	27.4 - 36.6
TOTAL					126,744			



SITE PLAN SHOWING LICENSED DIVERSIONS
AND FIELD SURVEY WELLS WITHIN A 2KM
RADIUS OF PALMS COVE DEVELOPMENT

FIGURE 5.0

QUALICO DEVELOPMENT - SYLVAN LAKE

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3.2 FIELD VERIFIED SURVEY WITHIN 1-KILOMETER OF PALMS COVE SUBDIVISION

Table 3 summarizes the information available on the wells which could be identified based on information from their owners. These data indicate that there are approximately eight (8) wells within one kilometer of the Palms Cove Subdivision.

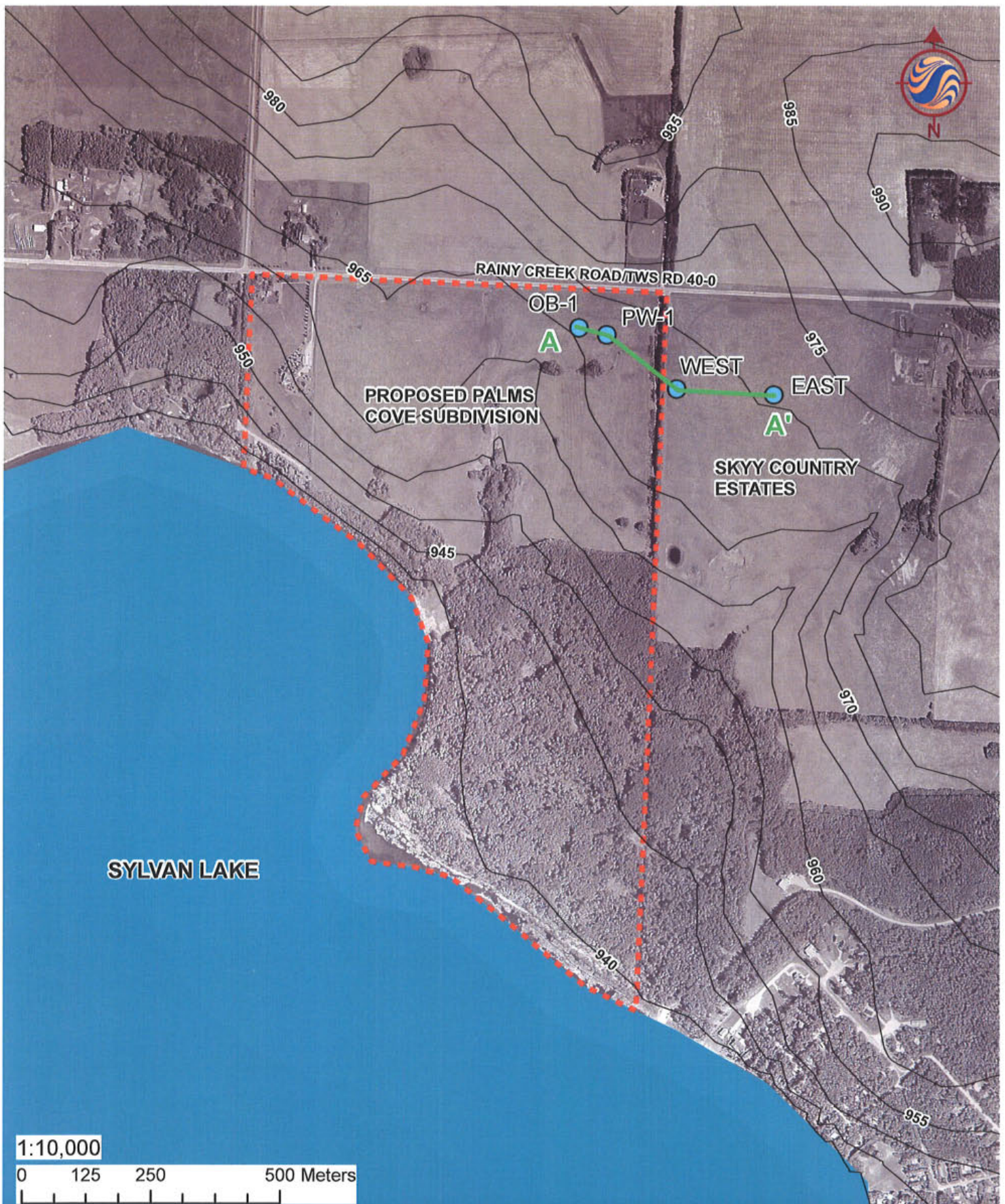
Table 3
Field Verified Water Well Survey

Name	Location	GPS Location	Year Drilled	Total Depth (ft)	Use
Nicole Jahner	NE-34-39-2 W.5	11U0690800 UTM5809844			Domestic
D. & A Hunt, R. Morse, H. Weselley	NE-34-39-2 W.5	11U0690770 UTM5809859			Domestic, Livestock (~30)
Brian Russel	SW-4-40-2 W.5	11U0688289 UTM5810055	1980	300'	Domestic
Brian Russel	SW-4-40-2 W.5	11U0688289 UTM5810055	1970		Livestock
Brian Russel	SE-4-40-2 W.5	11U0688881 UTM5809990	~1940		Domestic
Brian Russel	SE-4-40-2 W.5	11U0688881 UTM5809990			Livestock
Ralph Nores	SW-3-40-2 W.5	11U0689351 UTM5810009	~1982	130'	Domestic
Randy Screpnok	SE-3-40-2 W.5	11U0690599 UTM5810144		280'	Domestic

3.3 PALMS COVE SITE HYDROGEOLOGIC SETTING

Figure 6 is a site plan that shows the location of the cross section drawn through the production and the observation wells drilled on the Palms Cove Subdivision Property. Figure 7 depicts the stratigraphic section for the Paskapoo Formation, Dalehurst Member sediments encountered in the subsurface under the Palms Cove Subdivision Property. Based on the drilling the following results are presented for review:

- (1) Approximately 43.6 meters of alternating sandstone and shale were encountered during the drilling of PW1 and OB1 wells
- (2) A water bearing sandstone was encountered at a depth of approximately 36.9 meters below the land surface in PW1 and about 35.4 meters below the land surface in OB1.
- (3) The thickness of the sandstone varies from 7.9 to 10.4 meters.
- (4) An impermeable shale bed is located above the sandstone. The shale is 4.9 to 5.8 meters in thickness.

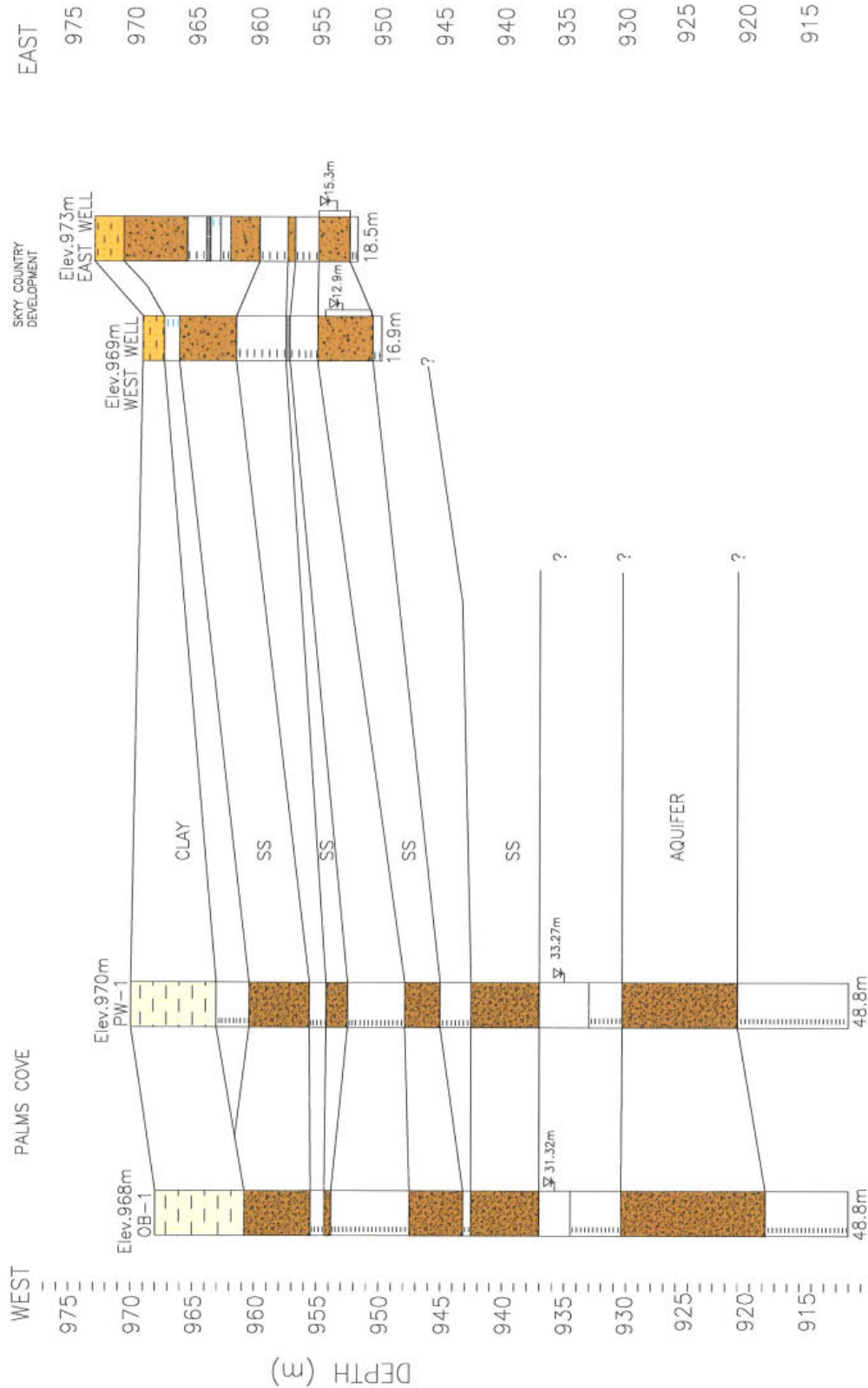


HYDROGEOLOGIC CROSS
SECTION A - A'
FIGURE 6.0

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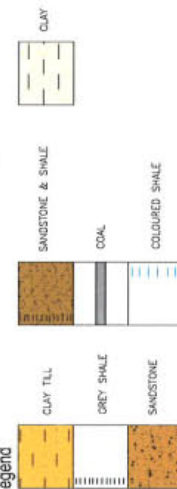


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ORIGINAL SHEET - LEGAL

Legend



NOTES:
 VERTICAL SCALE 1:10
 HORIZONTAL SCALE 1:30
 VERTICAL EXAGGERATION 3X

Project: PALMS COVE ESTATES 7

Figure No. 7
 Title EAST-WEST HYDROGEOLOGIC PROFILE

March - 2010
 113525190

- (5) The initial non-pumping groundwater level was at 33.83 meters in PW1 and 31.70 meters below the land surface in OB1.
- (6) Water levels in PW1 and OB1 are 3.98 to 4.61 meters above the top of the water bearing sandstone respectively, indicating that the water is under artesian pressure.

3.4 AQUIFER TESTING RESULTS FOR PALMS COVE SITE

The aquifer test results have been subdivided into three (3) sections which describe the step test results, the 71.7 hour pump test results, and the 20-year groundwater safe yield calculation used to determine the impact of groundwater development by the Palms Cove Subdivision on nearby wells and Sylvan Lake.

3.4.1 STEP TEST RESULTS

Figures 8 and 9 show the data results for the step test for the pumping and observation wells. These data show that the drawdown in the pumping well was nil at 121 cubic meters/day. The drawdown at 261 and 372 cubic meters per day was more pronounced. When the pumping rate increased to 445 cubic meters per day, there was almost no significant increase in the drawdown of the pumping well or observation well.

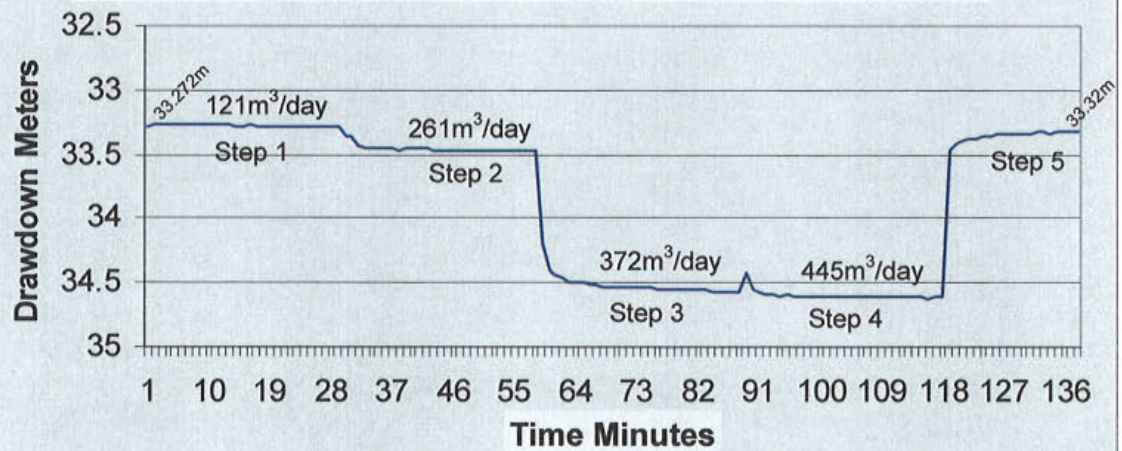
3.4.2 72-HOUR PUMP TEST RESULTS

Figures 10 to 18 show the time-drawdown and time-recovery plots and calculations of transmissive capacity during the testing, beginning February 16, and ending February 22, 2010. For the both wells, the Double Porosity analysis was used, which takes into account the divergence in porosity of the fractured bedrock and the pore space in bedrock.

At the end of 71.7 hours of pumping, the total drawdown in PW1 was 1.488 m. There was very little drawdown in the well due to its excellent hydraulic characteristics. The time-drawdown and time-recovery data from the Observation well were also analyzed using the Double Porosity procedure. In the recovery, water levels rose higher than the initial non-pumping level prior to pumping, probably due to barometric changes during the test. This resulted in negative values which could not be plotted on the time-drawdown and time-recovery curves. For this reason, a small correction factor was added, in order to eliminate the negative values. It was not used however in the calculations of sustainable yield. Most of the changes in levels in the recovery data, especially in OB1, were only in the order of millimeters, and thus are of minor significance.

The aquifer parameters were calculated for both the pumping and recovery portions of the test for the pumping well. Table 4 summarizes the results for PW1. Table 5 summarizes the results for the OB1. In selecting the parameters to be used for the further evaluation of aquifer behavior, those values considered to be unrepresentative or invalid were discarded, and only valid parameters were used.

**Figure 8 Palms Cove Aquifer Step Test
Production Well Pumping Rates of 20, 40, 60, and
68 IGPM**



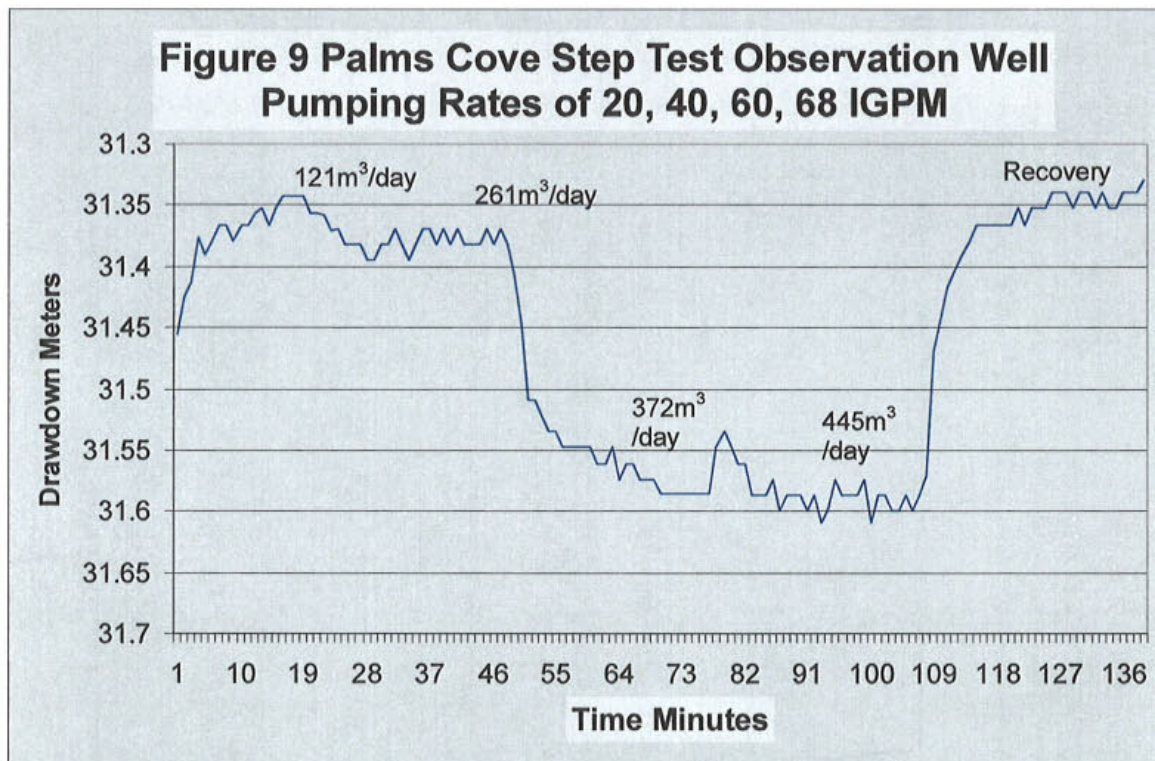
STEP DRAWDOWN TEST
FOR PW1 WELL
FIGURE 8.0

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**Figure 9 Palms Cove Step Test Observation Well
Pumping Rates of 20, 40, 60, 68 IGPM**



113929190

STEP DRAWDOWN TEST
FOR OB1 WELL
FIGURE 9.0

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Client: Qualico Developments

Discharge: variable, average rate 454.89 [m³/d]

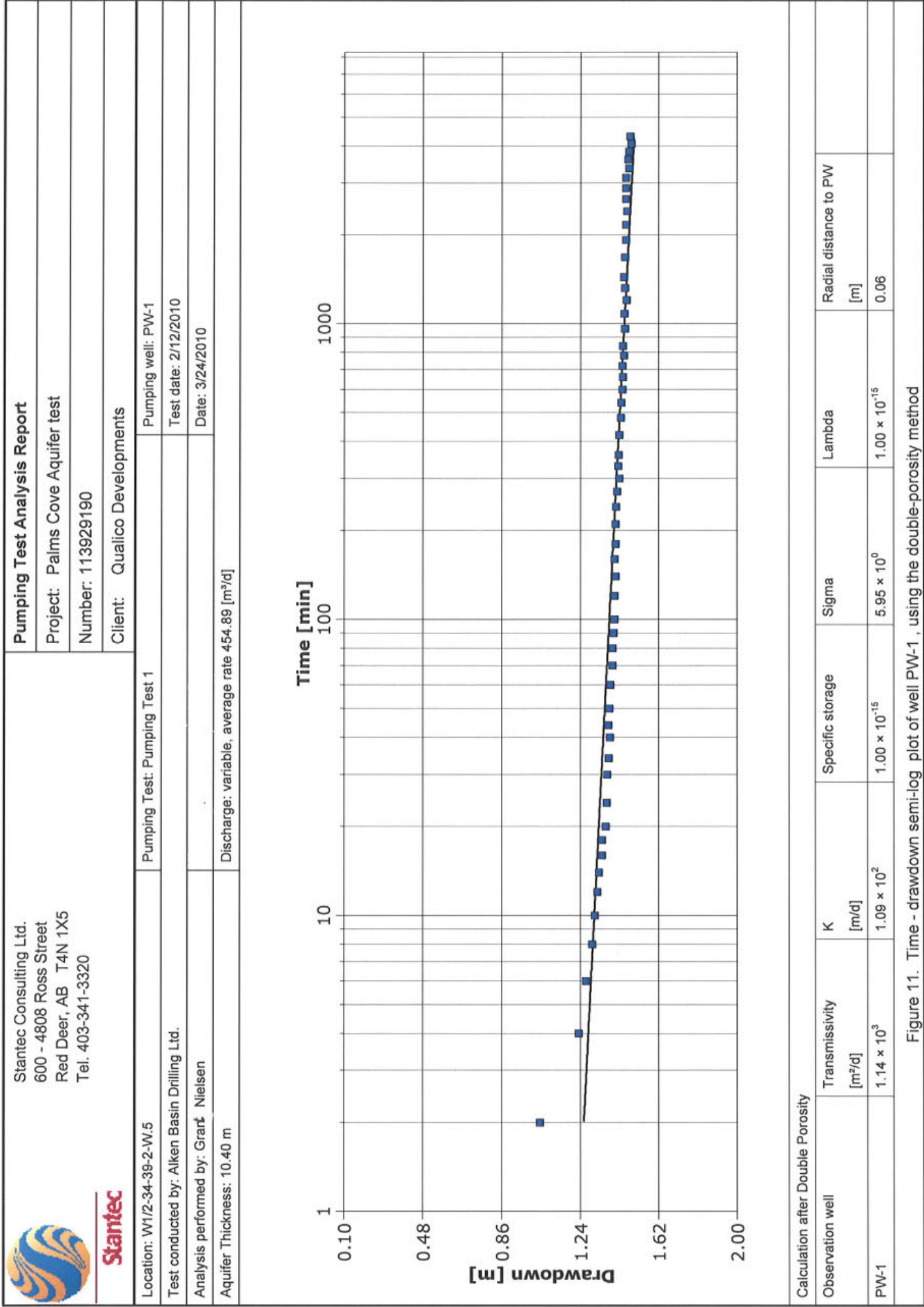
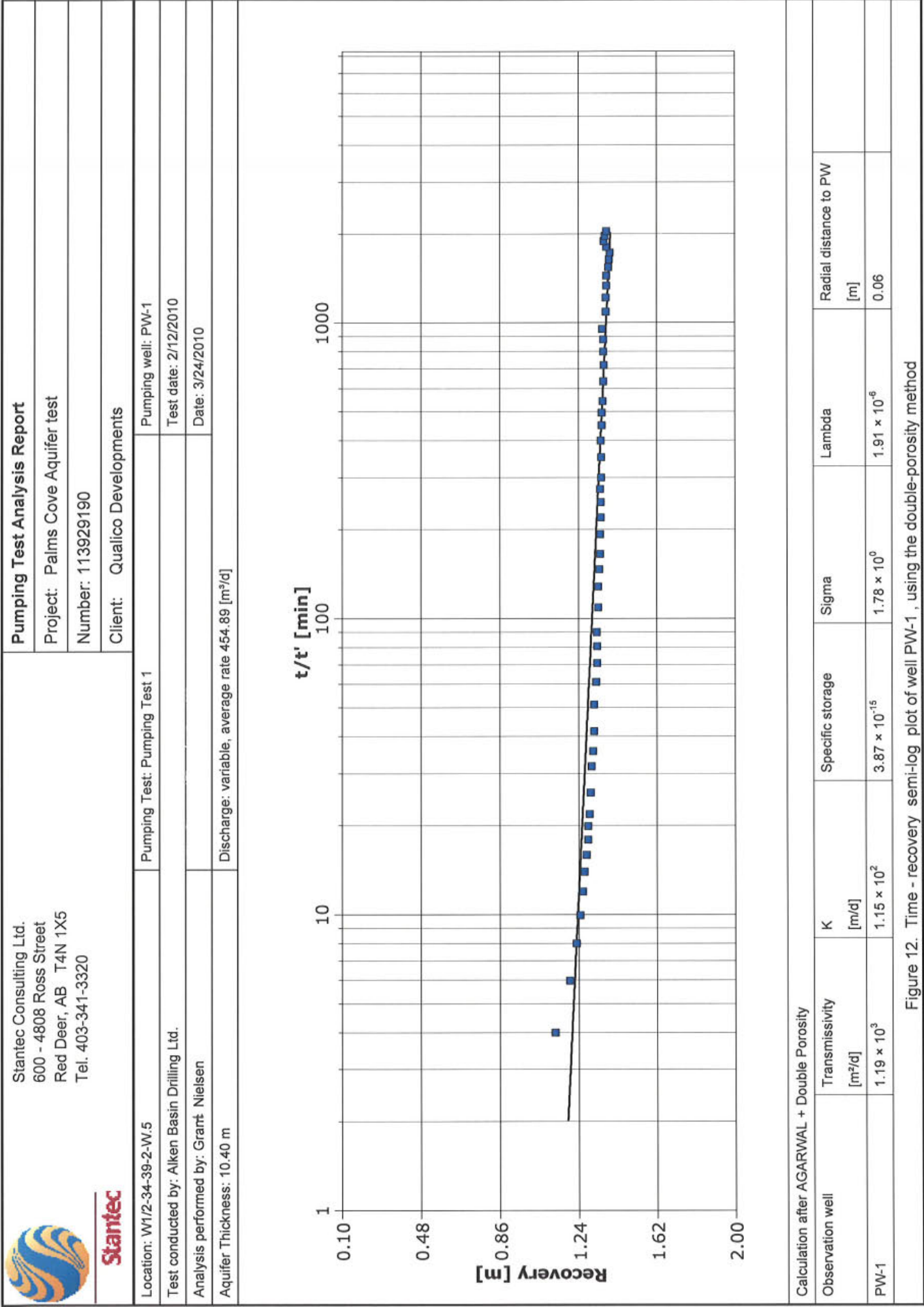


Figure 11. Time - drawdown semi-log plot of well PW-1, using the double-porosity method



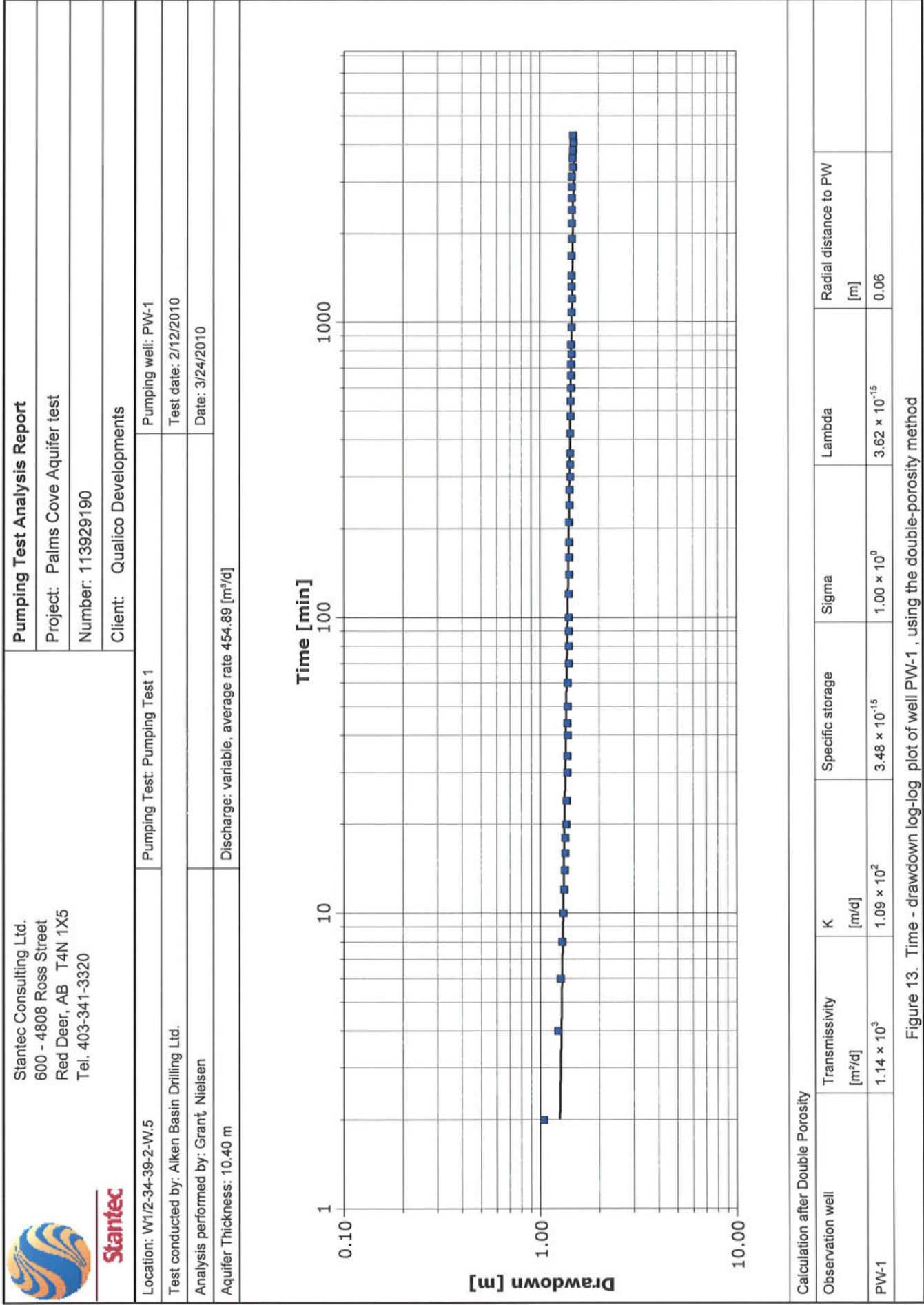
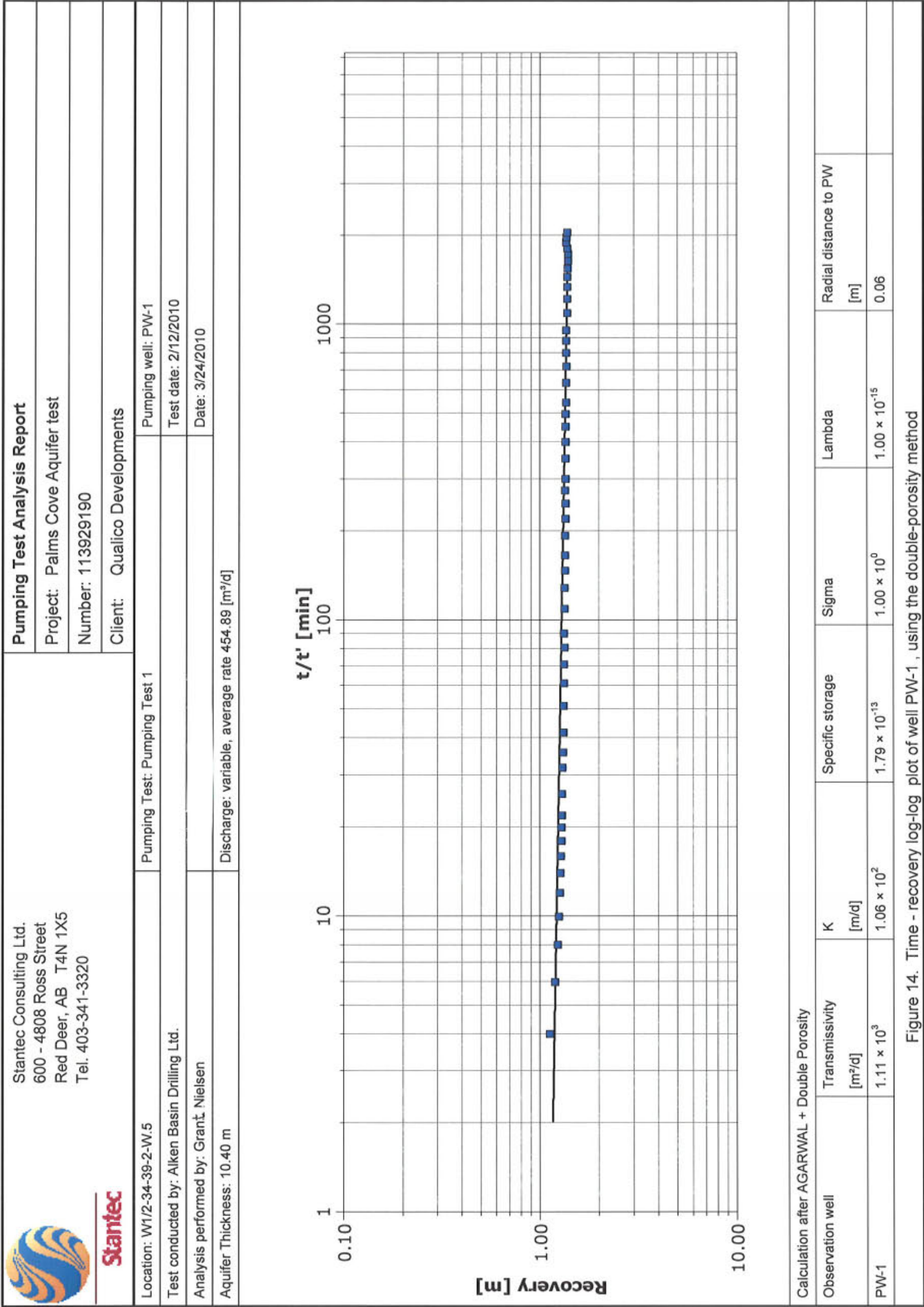


Figure 13. Time - drawdown log-log plot of well PW-1 , using the double-porosity method



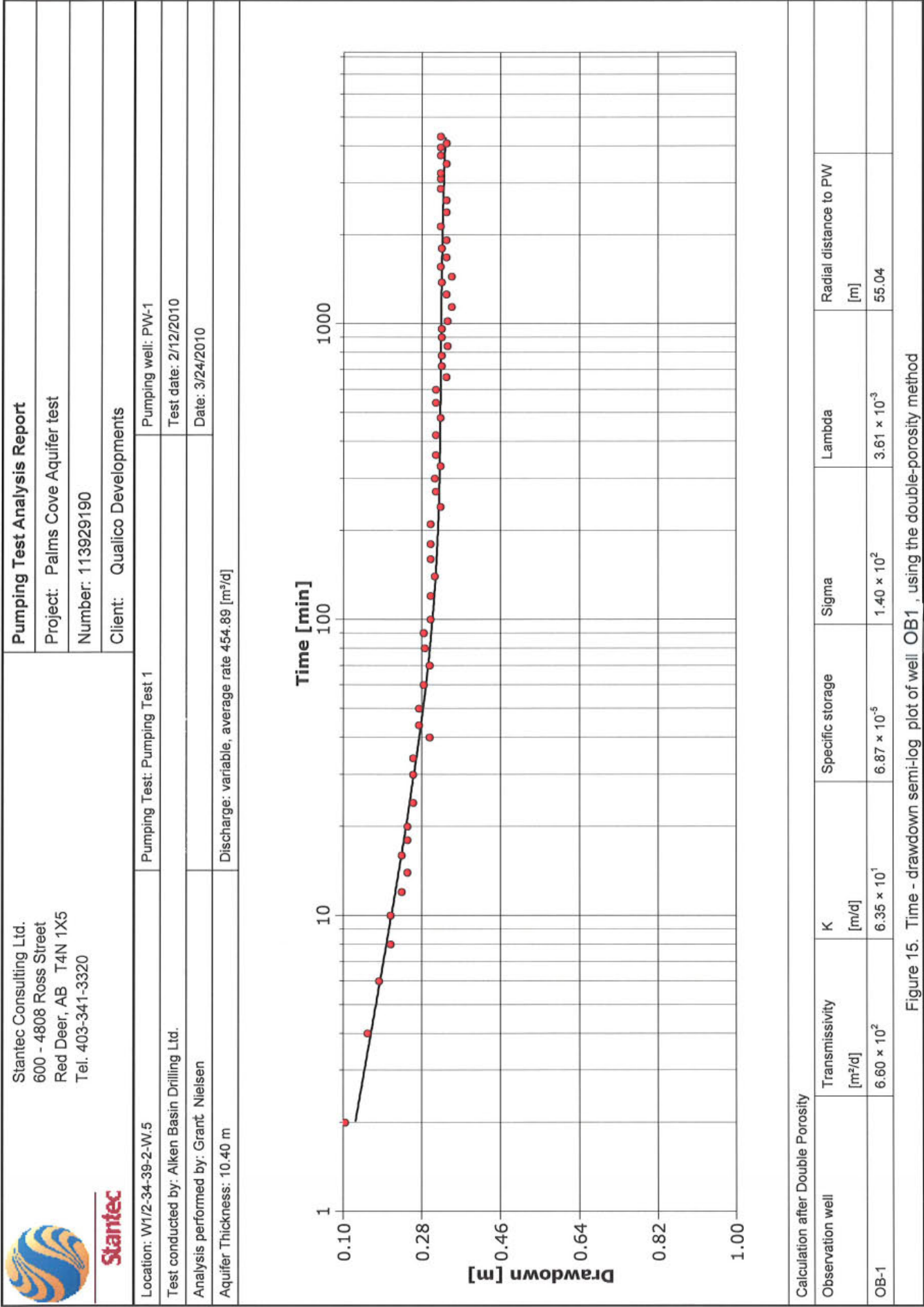


Figure 15. Time - drawdown semi-log plot of well OB1 , using the double-porosity method



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Tel. 403-341-3320

Stantec

Pumping Test Analysis Report

Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

Location: W1/2-34-39-2-W.5

Pumping Test: Pumping Test 1

Pumping well: PW-1

Test conducted by: Alken Basin Drilling Ltd.

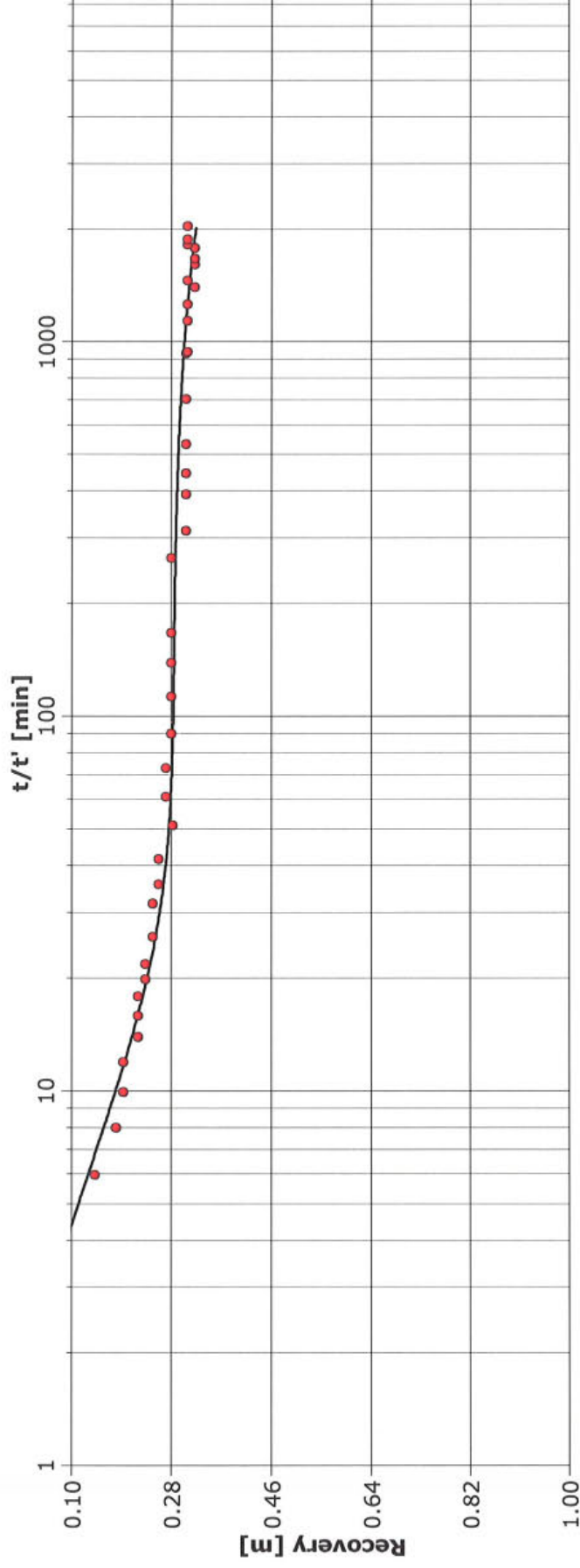
Test date: 2/12/2010

Analysis performed by: Grant Nielsen

Date: 3/24/2010

Aquifer Thickness: 10.40 m

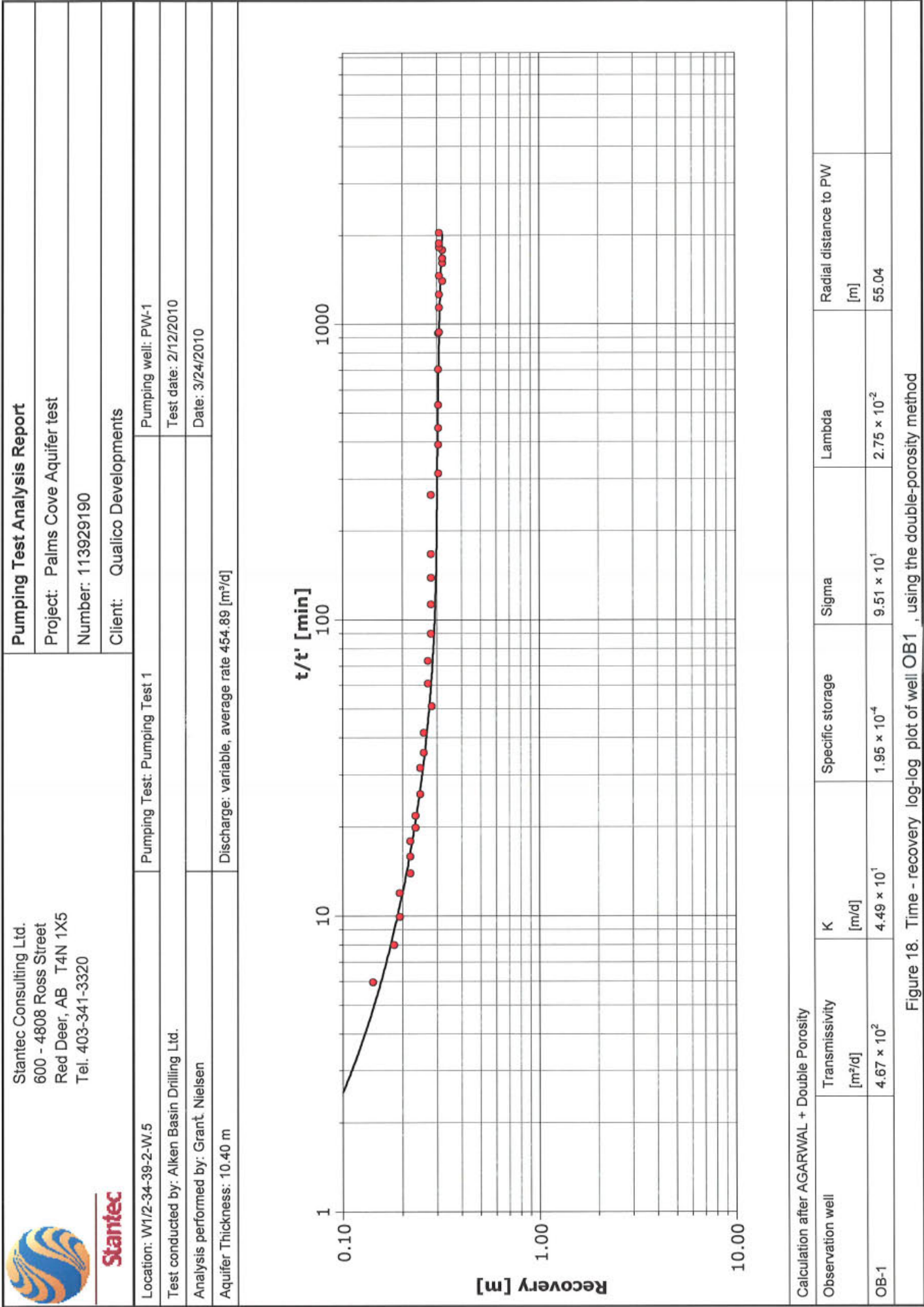
Discharge: variable, average rate 454.89 [m³/d]



Calculation after AGARWAL + Double Porosity

Observation well	Transmissivity [m ² /d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]
OB-1	2.08×10^2	2.00×10^1	3.69×10^{-4}	2.62×10^2	3.33×10^{-1}	55.04

Figure 16. Time - recovery semi-log plot of well OB1 , using the double-porosity method



A transmissive capacity of 1110 m²/day was selected for PW1. Storativity was calculated to be 0.00017, the average from the different analytical procedures.

The specific capacity of a well is given by the productive capacity of a well divided by its drawdown. In the case of the Production Well, the discharge during the test was 445 m³/day, and the maximum drawdown after 71.7 hours pumping was 1.488 m. Thus the specific capacity of the well is 445/1.498 = 299.1 cubic meters per day per meter of drawdown.

Table 4
Aquifer Hydraulic Characteristics for PW1

Well	Test	Analysis	Drawdown (m)	Discharge m ³ /day	Transmissivity m ² /day	Spec. Cap. m ³ /day/m
PW1	Drawdown Semi-Log Plot	Double Porosity Warren Root Method	1.488	445	1140	299.1
PW1	Drawdown Log-Log Plot	Double Porosity Warren Root Method	1.488	445	1140	299.1
PW1	Recovery Semi-Log Plot	Double Porosity Warren Root Method	-	0	1190	-
PW1	Recovery Log-Log Plot	Double Porosity Warren Root Method	-	0	1110	-

Table 5
Aquifer Hydraulic Characteristics for OB1

Well	Test	Analysis	Drawdown (m)	Discharge m ³ /day	Transmissivity m ² /day	Spec. Storage Dimensionless
OB1	Drawdown Semi-Log Plot	Double Porosity Warren Root Method	0.293	0	660	0.0000687
OB1	Drawdown Log-Log Plot	Double Porosity Warren Root Method	0.293	0	705	0.0000577
OB1	Recovery Semi-Log Plot	Double Porosity Warren Root Method	-	0	660	0.000369
OB1	Recovery Log-Log Plot	Double Porosity Warren Root Method	-	0	467	0.000195

3.4.3 20-year ground water yield Calculation Results for Palms Cove Development

The 20 year sustainable yield of the West Well, as calculated by the Moell Method is as follows:

$$Q_{20} = \frac{(445)(3.98)(0.7)}{1.39 + (5)(.079)}$$

$$= 695 \text{ m}^3/\text{day}.$$

3.5 RESULTS REGARDING IMPACT ON WATER LEVELS NEAR THE PALMS COVE DEVELOPMENT

It was observed that the nonpumping water level in PW1 was at 936.19 m elevation, which is 0.47 m lower than the level of Sylvan Lake outlet at 936.66 m. The aquifer is at 932.21 to 924.31 m elevation. This is a very unusual situation, in that the nonpumping level under natural conditions is lower in elevation than the level of the lake, located about 585 m to the southwest. It was decided to check the elevation of the nonpumping levels in other wells of the immediate area to determine whether PW1 is an isolated case. It was discovered, as shown in the accompanying table, that there are at least five other wells in the immediate area whose original nonpumping level was below lake level. These were all domestic farm wells. None from Sunbreaker Cove, or others with uncertain location, were considered, because of the difficulty in determining their precise location and hence their elevation. Elevations were extrapolated from a detailed contour map with 5 metre contours. Thus the well elevations will not be in error by more than 1 or 2 metres, and show a consistent pattern.

Table 6
Wells with nonpumping levels below lake level

Well ID	Owner	Land Location	Year Drilled	Surface Elev. (m)	Aquifer Interval(m)	Nonpumping Water level m	Lake Level m
437633	Buit Bros.	SW-3-40-2	?	966	925-917	924	936.66
362710	R. Hicks	SW-34-39-2	1981	939	911-902	931	936.66
467432	E. Haack	SW-34-39-2	1997	939	915-905	927	936.66
362722	P. Carlson	NE-34-39-2	1978	980	910-902	934	936.66
362718	W. Reid	NW-34-39-2	1981	955	918-909	932	936.66

As mentioned earlier, Sylvan Lake is unusual in that there is groundwater inflow from the northwest and the southwest from areas of higher elevation and higher piezometric surface. At the same time however there is groundwater through-flow out of the lake to the northeast and

the southeast. The wells constructed in a neighboring property were completed in an unconfined aquifer above the confined sandstone aquifer used in the Palms Cove subdivision. Although the Palms Cove wells have a piezometric surface above the aquifer and hence are confined, the water level is still slightly lower than that of Sylvan Lake. The base level for through-flow appears to be the lower elevation of Blindman River to the northeast and to a lesser extent, Cygnet Lake to the southeast. The aquifer tested appears to be the highly conductive layer of sandstone at and below the elevation of Sylvan Lake, which was postulated by AXYS Environmental Consulting Ltd. (Section B-2.1.2).

The aquifers of Alberta are known to be generally discontinuous, lenticular, anisotropic and heterogeneous in their configuration. This gives rise to a number of concerns that must be considered in the calculation of long-term pumping rates and the design of water systems. Among these concerns are the following;

- Transmissive capacity is not constant everywhere in an aquifer, nor in time. The hydrogeologic cross-section (Figure 7) shows the extent to which unit thickness and hence transmissive capacity may vary, even in short distances (although part of the variability may result from differences in driller interpretation). Even within the same lithostratigraphic unit, there are significant variations in thickness, permeability, degree of fracturing, variation in cementation, etc. All these factors contribute to create a wide range of transmissive capacity.
- Because of the lenticular nature of most aquifers in Alberta, even neighboring wells are often completed in different and distinct water-bearing strata. Therefore one cannot necessarily assume that adjacent wells are connected hydraulically to each other.
- Nor is it likely, as the above analysis assumes that a well will be pumped on a continuous basis over its lifetime. There are always periods of lower or no pumping during well maintenance, or when the owner is absent. In this case, the wells will not be pumped, or very little, outside the summer season.
- The basic assumptions behind the Theis analytical procedures for calculating transmissive capacity are that the aquifer is horizontal, of infinite extent, homogeneous and isotropic, and that the wellbore is of infinitesimal diameter. In reality, none of these assumptions is strictly true. The variations from the ideal can usually be recognized however and corrections made.

To calculate the degree of interference at different distances from the pumping wells and at different times, the following parameters have been used, as derived from the aquifer test. Since only the pumping well will be pumped, the local impact is calculated as the sum of the impact of the well over time. The inhomogeneities of the aquifer, as noted in the previous sections, will modify the real-life results to some extent, of course.

Pumping Rate = 445 cubic metres per day
Transmissive capacity = $1110 \text{ m}^2/\text{day}$
Storativity = 0.00017(dimensionless)

The calculations of interference shown in Table 7 are based on the assumption that the wells will pump without stopping for 20 years, and that there will be no recharge to the aquifers during

that time. Obviously, both assumptions are incorrect, as there will certainly be interruptions of the pumping time, especially outside the vacation season, and there will also be recharge to the aquifer from infiltration of snowmelt and rainfall. This item will be discussed in detail further below. Thus the table shows only a "worst case scenario" of what might happen. In reality, because of the recharge, the aquifer will exhibit even less drawdown and interference than these calculations would indicate. This recharge effect has been quantified and will be discussed later in this report.

In addition, the maximum interference indicated below would take place only in wells which are completed in the same aquifer interval. Wells which are completed in shallower or deeper zones would probably show little or no interference.

Table 7
Interference caused by pumping of Palms Cove Wells

Distance(m)	1 Year	2 Years	5 Years	10 Years	20 Years
100	.42	.44	.47	.49	.52
200	.38	.40	.43	.45	.47
500	.32	.34	.37	.39	.41
750	.29	.31	.34	.37	.39

3.6 GROUND WATER LABORATORY RESULTS

The chemical results are shown below in Table 8. As predicted in the Lacombe County groundwater report, the water is a sodium-bicarbonate type, as would be expected.

None of the parameters exceed the Canadian Drinking Water Quality Guideline. A shock chlorination and routine chlorination of the well during operation will protect the well from bacterial contamination. No E.coli bacteria were present. The water meets all chemical guidelines for human use, with only the minimal statutory chlorination required. No chemical parameters in the routine analysis exceeded the Canadian Drinking Water Quality Guidelines.

GROUNDWATER EVALUATION, PALMS COVE SUBDIVISION WITHIN W.1/2-34-39-2-W5M

Results of the Investigation

March 2010

Table 8
Groundwater Quality Results

Parameter	Units	Pumping Well	Drinking Water Guidelines
Date		03/01/2010	
Calcium	mg/L	12.5	No Guidelines
Iron	mg/L	0.04	0.3
Magnesium	mg/L	4.7	No Guidelines
Manganese	mg/L	0.02	0.05
Potassium	mg/L	1.2	No Guidelines
Sodium	mg/L	175	200
Bicarbonates	mg/L	432	No Guidelines
Bromides	mg/L	<0.1	No Guidelines
Carbonates	mg/L	12	No Guidelines
Chlorides	mg/L	0.8	250
Fluorides	mg/L	0.50	1.5
Nitrates as N	mg/L	<0.02	10
Nitrites as N	mg/L	<0.02	No Guidelines
NO ₃ +NO ₂	mg/L	<0.02	0.1
Sulfates	mg/L	61	500
Electrical Conductivity	µS/cm	723	No Guidelines
pH	pH units	8.11	6.5-8.5
Hardness	mg/L	51	No Guidelines
Total alkalinity	mg/L	378	No Guidelines
P-alkalinity	mg/L	6	No Guidelines
Hydroxide	mg/L	0	No Guidelines
Total dissolved solids	mg/L	483	500
Total coliforms	CFU/100 mL	0	0
E-coli	CFU/100 mL	0	0
Boron	µg/L	222	5000
Aluminum	µg/L	20.2	100
Chromium	µg/L	<0.1	50
Copper	µg/L	<0.08	1000
Zinc	µg/L	60.2	5000
Arsenic	µg/L	0.88	10
Selenium	µg/L	0.06	10
Cadmium	µg/L	<0.05	5
Antimony	µg/L	0.3	6
Barium	µg/L	31.6	1000
Mercury	µg/L	<0.05	1
Lead	µg/L	<0.1	10
Uranium	µg/L	<0.04	20

3.7 RESULTS REGARDING SYLVAN LAKE SURFACE AND GROUNDWATER LEVELS

Alberta Environment has recognized that Sylvan Lake is maintained largely by flow from springs and diffused groundwater discharge from the northwest and southwest. For this reason, they are concerned with any activity which might modify the natural groundwater flow. It is considered undesirable that pumping increase to the point at which the cones of depression of the wells would extend to the lakeshore, and thus begin to divert water from the lake to the water supply wells.

There has been considerable concern expressed by those who live near and who use the lake for recreation that the continued development of groundwater resources is impacting discharge to the lake. This reduction of discharge into Sylvan Lake could cause the level to drop and thus would also contribute to deterioration of lake water quality.

The level at which there is surface discharge from the lake is 936.66 m. A few scattered measurements of water levels of Sylvan Lake began starting in 1918 and continued until 1930. One single level was read in each of 1939 and 1940. Systematic readings began again in 1956 and continue to the present, with several readings daily during the season when the lake is not frozen, ie, about May 1 to November 30 of each year.

In an unpublished document prepared by Stantec Consulting Ltd., it was shown that in 69 years of records (updated through 2009), there were 40 years with at least some documented discharge from the lake, and 29 years with no discharge. Years 2004 to 2006 had no discharge. However, 2007 to 2009 experienced levels above the discharge outlet during almost the entire ice-free season, ie, from about May 1 until freeze-up in late October. 2007 was a year with almost no beach exposed because of high water. As 2009 has been the year of maximum subdivision development and groundwater use to date, it is evident that no harm has been done to date to lake levels due to groundwater production around the lake. In addition, the six months of discharge from the lake and flow-through of groundwater would certainly flush out accumulated water from previous years and lake water quality would reflect to a large degree the quality of the surface water and groundwater entering into the lake during 2009.

Table 8 was developed to show historic ground water levels near Sylvan Lake. A trend indicated as "Level" does not mean that there is no change in the water level in this hydrograph. It means rather that the long-term trend over the life of the record is approximately level, with no evident long-term downward or upward trend. It may be seen that there are only two hydrographs with a downward trend, and the other 18 were either level or gradually rising. This suggests that due to the amount of recharge in the immediate area, there is no immediate danger of over-exploiting the aquifers adjacent to Sylvan Lake.

AXYS Environmental Consulting, quoted in the Stantec Consulting Ltd. report, calculated average annual recharge at about 4.75 mm/year in low-lying areas, increasing to as much as 50 mm in upland areas (Stantec Consulting Ltd., 2006, p. 4.4), where there is little till cover on the

Paskapoo Formation bedrock. Without groundwater pumping, they estimated total groundwater recharge at 15,727 cubic meters/day or 5,740,355 m³/year within the drainage basin of Sylvan Lake.

It appears that the production of water from this location is primarily from the interception of groundwater which is already flowing through northeastward toward Blindman River. The principal impact on the hydrological regime would be a slightly decreased diffused discharge along sand into the Blindman River to the northeast.

AXYS evaluated the groundwater regime, using a Modflow simulation in 2005. Using the year 2003 groundwater production at the Town of Sylvan Lake (79 % of total diversion) they concluded: *"Comparing this distribution to the distribution shown on Figure B-15 shows that the Town's groundwater production would have little effect on the hydraulic head distribution."* All other diversions are minor in comparison with that of the Town.

GROUNDWATER EVALUATION, PALMS COVE SUBDIVISION WITHIN W.1/2-34-39-2-W5M

Results of the Investigation

March 2010

Table 9
Historic Groundwater Levels – Sylvan Lake Area

Well Location*	Well Ref. No.	Years of Record	Total well depth (m)	Confined/ Unconfined Aquifer	Annual Recharge(m m)	Trend of Hydrograph
1-32-39-2	2623E	12.8	32.9	C	3.0	Down
1-32-39-2	2604E	12	33.8	C	2.5	Up
1-32-39-2	2605E	13	19.2	C	1.9	Level
1-32-39-2	2606E	13	6.4	C	4.7	Level
1-19-39-2	2609E	7	25.9	C	3.4	Up
1-19-39-2	2610E	7	11.6	C	2.4	Level
1-19-39-2	2611E	7	6.4	U	15.4	Level
14-9-39-2	2613E	7	30.0	C	4.4	Up
13-26-39-2	2616E	7	42.3	C	2.2	Up
13-26-39-2	2617E	7	24.0	C	3.0	Up
13-26-39-2	2618E	7	5.7	U	11.2	Level
1-25-39-2	2619E	7	51.2	C	3.2	Up
1-25-39-2	2620E	7	40.5	C	2.5	Up
1-25-39-2	2621E	5.25	5.0	U	2.9	Level?
15-9-39-1	2622E	7	36.3	C	2.2	Up
8-10-39-2	2693E	5.25	0.7 ?	U	3.1	Up
8-10-39-2	2694E	5.25	0.64?	C	5.2	Down
9-1-39-2	2696E	5.25	0.68?	C	4.7	Up
9-1-39-2	2697E	5.25	0.63?	C	7.6	Level
9-1-39-2	2698E	5.25	0.54?	U	7.0	Level
Average recharge, Confined					3.5	
Average recharge, Unconfined					9.1	
Average, all aquifers					4.62	

*All locations are west of 5th Meridian

4.0 General Conclusions for Palms Cove Development

4.1 CONCLUSIONS REGARDING HYDROGEOLOGY OF THE PALMS COVE DEVELOPMENT

- The two wells which were drilled for this project, PW1 and OB1 were completed in the consolidated sandstone aquifer of the Paskapoo Formation, Dalehurst Member.
- This Production Well PW1 was tested at a constant rate of 445 cubic meters per day for almost seventy-two hours, followed by another sixty-three hours of recovery, at which point recovery was complete.
- The aquifer has a transmissive capacity at this location of about 1110 m² /day, a storativity of 0.00017 was calculated, with a specific capacity of 299.1 m³/day/m in the Production Well, PW1.
- The Production Well PW1 is shown to be capable theoretically of producing a discharge of about 695 cubic meters per day, by the Moell calculation.
- The wells tested in this subdivision are under artesian pressure, yet the nonpumping water level is below the base level of discharge of Sylvan Lake at 936.66 m amsl.
- Based on the data obtained and interpreted according to accepted standards, the well and aquifer at this location are adequate for a sustainable supply of 445 cubic metres per day. The per capita daily consumption of water in Edmonton, AB is documented to be 224 L/day/person, or 0.224 m³/day/person. Extrapolating this to Palms Cove and assuming 2.5 persons per family (Canada Census, 2006), this supply is adequate for $445/0.224 = 1986$ persons, or $1986/2.5 = 794$ homes.

4.2 CONCLUSIONS REGARDING THE GROUNDWATER QUALITY

- Based on the laboratory analytical data, all groundwater parameters tested were below the Guidelines for Canadian Drinking Water Quality.
- No coliform or fecal coliform bacteria were present in the water from PW1, but as a precaution the water should be chlorinated on a routine basis as a public health precaution.

4.3 CONCLUSIONS REGARDING THE LOCAL IMPACT ON NEARBY WATER LEVELS

- Based on the data obtained for this project, it has been concluded that Palms Cove development would have little to no impact on nearby water well owners. This analysis assumes that pumping of the Palms Cove Subdivision well will be continuous for 20 years. With no recharge and constant pumping, the maximum impact on any other existing user would be about 42 to 52 cm after 20 years, if these users have wells completed in the same horizon.

- There is sufficient recharge to meet the requirements for the Palms Cove Subdivision, and this production will not induce additional infiltration from Sylvan Lake above the existing through-flow.
- The County of Lacombe and Alberta Environment are considering the feasibility of water and waste water pipelines around Sylvan Lake. If they are constructed, the diversion evaluated in this report will no longer be necessary, and the groundwater diversion license could be cancelled at that time.

4.4 CONCLUSIONS REGARDING IMPACT ON SYLVAN LAKE WATER LEVELS

The non-pumping water level in the Production Well PW1 was at 936.19 m at the time of the test. Pumping could reduce the regional static groundwater levels by about 0.4 to 0.5 m over 20-year period, which is slightly below lake level. In conclusion, since the Palms Cove Aquifer is under artesian pressure, the aquifer is capable of meeting the needs of this subdivision without exceeding the natural recharge rate and through-flow rate of the area or affecting the natural lake levels.

The level of Sylvan Lake is maintained by a complex interrelationship of groundwater inflow from the southwest and northwest, groundwater flow-through outward to the northeast and southeast, surface runoff into the lake, and evaporation from the lake. Imposed on this relationship is the diversion of groundwater

4.5 GWUDI EVALUATION

All groundwater supplies destined for municipal consumption must be evaluated to determine if they are under the influence of surface water. If so, this triggers a much more complex treatment process than would otherwise be required. This supply has been evaluated according to the GWUDI flowchart and screening process prepared by Alberta Environment (Jan., 2006).

Phase 1

- (1) Sensitive setting – the source does not fall within any of the four categories listed.
- (2) Proximity to surface water – the source is not within 100 m of any surface water body. It is about 585 m northeast of Sylvan Lake.
- (3) Well construction – The source well meets the requirements of the current version of the Water (Ministerial) Regulation. It has a surface seal of cement grout down to the aquifer at over 30 m depth. The wellhead extends 0.91 m above natural ground level, and hence no surface water will enter into the well.
- (4) Water quality – the water shows no evidence of contamination from surface water. Indeed, it meets all standards of the Guidelines for Canadian Drinking Water Quality, including the total absence of bacteria.

Since all criteria of Phase 1 are met, there is no need to proceed further with the analysis. It is therefore concluded that, based on the above criteria and the data already provided earlier in this report, that the groundwater is not GWUDI.

5.0 Recommendations

- It is recommended that the maximum daily discharge rate should not exceed 445 cubic meters per day, which was the discharge during the test.
- It is recommended that the owner measure and record the dynamic water level weekly in both the Production and Observation wells.
- It is recommended that an inline cumulative water meter be installed at or near the wellhead of the production well, and that cumulative discharge be recorded each month. This should be done preferably at the same time as the water level readings.
- It is recommended that an annual summary of monthly water levels and water production be sent to Alberta Environment shortly after the end of each calendar year.
- The well water should be chlorinated on a continuous basis starting at the time when the facility opens to the public.
- It is recommended that an annual review of production and water levels be carried out by a professional hydrogeologist at the end of each of the first two years to ensure that aquifer performance is as expected. Further reviews thereafter will depend on results of the first two years.

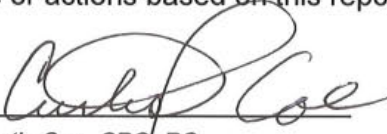
6.0 References

- Alberta Environment, 2003, Groundwater Evaluation Guideline; Government guideline for licensing requirements, revised Feb., 2003.
- Alberta Environment, 2006, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems; Drinking Water Branch, Environmental Policy Branch, Environmental Assurance Division, Jan., 2006.
- AXYS Environmental Consulting Ltd., 2005, Sylvan Lake water quality assessment and watershed management considerations; Consulting report dated July, 2005, Calgary.
- Baker, Jenette Lynn, 2003, Sylvan Lake – groundwater interaction; B.Sc. thesis, University of Calgary, April, 2003.
- Demchuk, Thomas D. and Hills, L.V., 1991, A Re-examination of the Paskapoo Formation in the Central Alberta Plains: the designation of three new members; Bul. Can. Pet. Geology, vol. 39, No. 3, Sept, 1991, pp. 270-282.
- Nielsen, Grant L., 2007, Review of water levels of Sylvan Lake; unpublished report, Stantec Consulting Ltd.
- Hamilton, W. N., Price, M.C., and Langenberg, C.W. (compilers), 1999, Geological Map of Alberta; Geological Survey of Alberta, Alberta Energy and Utilities Board, Map 236, Edmonton.
- Health Canada, 2004, Summary of Guidelines on Canadian Drinking Water quality; prepared by the federal-provincial-territorial committee on drinking water, Ottawa.
- PFRA, 2001, Regional Groundwater Assessment, Lacombe County; January, 2001
- Shetsen, I., 1990, Quaternary Geology, Central Alberta; Alberta Geological Survey, Alberta Energy and Utilities Board, Edmonton.
- Stantec Consulting Ltd., 2006, Sylvan Lake Regional Partnership Initiative, Regional Water/Wastewater Feasibility Study; Project 112871543, March, 2006, Red Deer.
- Tokarsky, Orest, 1970, Hydrogeology of the Rocky Mountain House Map Sheet, Alberta; Alberta Research Council, Edmonton
- Waterloo Hydrogeologic, 2008, AquiferTest Pro 4.2; Waterloo, Ontario.
- Waterloo Hydrogeologic, 2006, AquaChem v. 5.1, User's Manual; Waterloo, Ontario

7.0 Corporate Authorization

This document entitled “**Groundwater Evaluation, Palms Cove Subdivision within W1/2-34-39-2-W5M**” was prepared by Stantec Consulting Ltd. for Qualico Developments West Ltd. The material in it reflects Stantec Consulting Ltd.’s best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

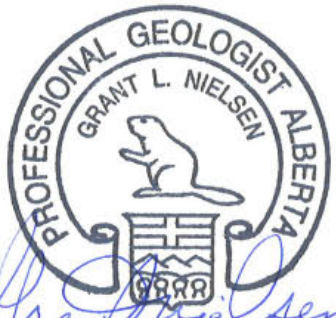
Prepared by:


Curtis Coe, CPG, PG

Reviewed by:


Grant Nielsen, P.Geol (AB), P.Geo (BC), Ph.D.

PERMIT TO PRACTICE STANTEC CONSULTING LTD.
Signature 
Date <u>June 9, 2010</u>
PERMIT NUMBER: P 0258
The Association of Professional Engineers, Geologists and Geophysicists of Alberta
CORPORATE AUTHORIZATION

  <u>June 8, 2010</u>
RESPONSIBLE ENGINEER

APPENDIX A



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0406356
 Map Verified: Not Verified
 Date Report: 1995/06/26
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information			2. Well Location		
Company Name: ALKEN BASIN DRILLING LTD.		Drilling Company Approval No.: 38394	1/4 or Sec Twp Rge West of LSD NW 33 039 02 5		
Mailing Address: BOX 47	City or Town: BENTLEY AB CANADA	Postal Code: T0C 0J0	Location in Quarter 0 M from Boundary 0 M from Boundary		
Well Owner's Name: SABADOS, ALEX	Well Location Identifier:		Lot Block Plan		
P.O. Box Number:	Mailing Address: 42 MALIBU RD SW, CALGARY	Postal Code: T2V 1W8	Well Elev: How Obtain: M Not Obtain		
City:	Province:	Country:			
3. Drilling Information			6. Well Yield		
Type of Work: New Well	Reclaimed Well:	Proposed well use: Domestic	Test Date Start Time: (yyyy/mm/dd): 1995/06/08 11:00 AM		
Date Reclaimed:	Materials Used:	Anticipated Water Requirements/day 1324.89 Liters	Test Method: Air		
Method of Drilling: Rotary	Flowing Well: No	Rate: Liters	Non pumping static level:		
Gas Present: No	Oil Present: No		Rate of water removal: 151.42 Liters/Min		
4. Formation Log			5. Well Completion		
Depth from ground level (meters)	Lithology Description	Date Started (yyyy/mm/dd): 1995/06/08	Date Completed (yyyy/mm/dd): 1995/06/08	Depth of pump intake: 19.2 M	
3.05	Brown Clay & Rocks	Well Depth: 19.2 M	Borehole Diameter: 0 CM	Water level at end of pumping: 19.2 M	
7.62	Brown Sandstone	Casing Type: Steel	Liner Type: Plastic	Distance from top of CM casing to ground level:	
11.58	Gray Shale	Size OD: 13.97 CM	Size OD: 11.43 CM	Depth To water level (meters) Elapsed Time	
17.98	Brown Sandstone	Wall Thickness: 0.62 CM	Wall Thickness: 0.6 CM	Drawdown Minutes: Sec Recovery	
19.2	Gray Sandstone	Bottom at: 10.36 M	Top: 7.01 M Bottom: 19.2 M	2:00 19.2	
		Perforations from: 10.36 M to: 19.2 M	Perforations Size: 0.95 CM x 0.95 CM	3:00 14.63	
		from: 0 M to: 0 M	0 CM x 0 CM	4:00 10.97	
		from: 0 M to: 0 M	0 CM x 0 CM	5:00 8.23	
		Perforated by: Hand Drill		7:00 8.23	
		Seal: Drive Shoe		12:00 8.23	
		from: 0 M to: 10.36 M		30:00 8.23	
		Seal:		60:00 8.23	
		from: 0 M to: 0 M		120:00 8.23	
		Seal:		Total Drawdown: 10.97 M	
		from: 0 M to: 0 M		If water removal was less than 2 hr duration, reason why:	
		Screen Type:	Screen ID: 0 CM		
		from: 0 M to: 0 M	Slot Size: 0 CM		
		Screen Type:	Screen ID: 0 CM		
		from: 0 M to: 0 M	Slot Size: 0 CM		
		Screen Installation Method:			
		Fittings			
		Top:	Bottom:		
		Pack:		Recommended pumping rate: 37.85 Liters/Min	
		Grain Size:	Amount:	Recommended pump intake: 13.72 M	
		Geophysical Log Taken:		Type Pump installed	
		Retained on Files:		Pump Type:	
		Additional Test and/or Pump Data		Pump Model:	
		Chemistries taken By Driller: No		H.P.:	
		Held: 0 Documents Held: 1		Any further pump test information?	
		Pitless Adapter Type:			
		Drop Pipe Type:			
		Length: M Diameter: CM			
		Comments:			
		DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 2'			
7. Contractor Certification					
Driller's Name:		UNKNOWN DRILLER			
Certification No.:		5881AD			
This well was constructed in accordance with the Water					



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362678
 Map Verified: Not Verified
 Date Report: 1976/05/28
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: TOLSON, SUSAN Well Location Identifier:
 P.O. Box Number: 286 Mailing Address: ECKVILLE Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NE 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 949.45 M How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd):
 1976/05/13 11:00 AM
 Test Method: Pump
 Non pumping
 static level: 18.29 M

4. Formation Log

Depth from ground level (meters)
Lithology Description
 12.19 Sandy Clay & Rocks
 21.34 Brown Shale
 25.91 Black Shale
 42.67 Gray Shale & Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1976/05/12 Date Completed (yyyy/mm/dd): 1976/05/13
 Well Depth: 42.67 M Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel Liner Type:
 Size OD: 11.43 CM Size OD: 0 CM
 Wall Thickness: 0.36 CM Wall Thickness: 0 CM
 Bottom at: 39.62 M Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M Perforations Size: 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by:
 Seal: Driven from: 0 M to: 39.62 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 1 Documents Held: 2
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:

Rate of water removal: 31.82 Liters/Min
 Depth of pump intake: 27.43 M
 Water level at end of pumping: 27.43 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362666
 Map Verified: Not Verified
 Date Report: 1971/10/25
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: NELSON DRILLING & PLUMBING
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: PARNEY Well Location Identifier:
 P.O. Box Number: Mailing Address: COTTAGE @ N END OF SYLVAN LAKE, CALGARY Postal Code:
 City: Province: Country:

Drilling Company Approval No.:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan

Well Elev: 944.88 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd):
 1971/08/01 11:00 AM
 Test Method: Bailer
 Non pumping 8.23 M
 static level:
 Rate of water 45.46
 removal: Liters/Min

4. Formation Log

Depth from ground level (meters)
Lithology Description
 5.18 Brown Clay
 12.19 Brown Shale
 32 Blue Shale
 32.31 Sandstone Stringers
 34.14 Water Bearing Shale
 36.58 Blue Shale

5. Well Completion

Date Started(yyyy/mm/dd): Date Completed (yyyy/mm/dd):
 1971/08/01
 Well Depth: 36.58 M Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel Liner Type:
 Size OD: 5.08 CM Size OD: 0 CM
 Wall Thickness: 0 CM Wall Thickness: 0 CM
 Bottom at: 30.78 M Top: 0 M Bottom: 0 M
 Perforations Perforations Size:
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by:
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 SOFT WATER.

Depth of pump intake: 0 M
 Water level at 0 M
 end of pumping:
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 15.24 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0
 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362665
 Map Verified: Not Verified
 Date Report Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: NELSON DRILLING & PLUMBING
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: RANAGHAN
 P.O. Box Number: Mailing Address: CABIN N SIDE OF SYLVAN LAKE, CALGARY
 City: Province: Country:

Drilling Company Approval No.:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan

Well Elev: 944.88 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present: Rate: Liters
 Oil Present: 0 Liters

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1970/08/01
 Start Time: 11:00 AM
 Test Method: Pump
 Non pumping static level: 23.77 M
 Rate of water removal: 45.46 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 23.77 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)
 Lithology Description
 6.1 Brown Sandy Clay
 17.98 Brown Shale
 18.29 Sandstone Stringers
 20.12 Brown Shale
 20.42 Sandstone Stringers
 25.91 Brown Hard Shale
 28.96 Brown Shale
 42.67 Water Bearing Shale & Sandstone
 57.91 Blue Shale & Sandstone Ledges

5. Well Completion

Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd): 1970/08/01
 Well Depth: 57.91 M Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel
 Size OD: 5.08 CM
 Wall Thickness: 0 CM
 Bottom at: 30.48 M
 Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforated by:
 Seal: Driven
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 SOFT WATER.

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 30.48 M

Type Pump Installed
 Pump Type: HAND PUMP
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0341885
 Map Verified: Not Verified
 Date Report: 2002/11/29
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ALKEN BASIN DRILLING LTD.
 Mailing Address: BOX 47
 Well Owner's Name: DEGROAT, RICHARD
 P.O. Box Number:
 City:
 Province:
 Country:
 Drilling Company Approval No.: 38394
 City or Town: BENTLEY AB CANADA
 Postal Code: T0C 0J0
 Well Location Identifier:
 Mailing Address: 300 509 8 AVE SW, CALGARY
 Postal Code: T2P 1G1
 Rate: Liters
 Oil Present: No

2. Well Location

1/4 or Sec Twp Rge West of
 LSD SW 33 039 02 5 M
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: M
 How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present: No
 Proposed well use:
 Domestic
 Anticipated Water Requirements/day
 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 2002/11/13
 Start Time: 11:00 AM
 Test Method: Pump
 Non pumping static level: 9.6 M

4. Formation Log

Depth from ground level (meters)
 Lithology Description
 5.49 Brown Sandy Clay
 9.14 Brown Sandstone
 16.15 Brownish Gray Sandstone Stringers
 24.38 Gray Coarse Grained Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 2002/11/13
 Date Completed (yyyy/mm/dd): 2002/11/13
 Well Depth: 24.38 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type: Plastic
 Size OD: 14.12 CM
 Size OD: 11.43 CM
 Wall Thickness: 0.66 CM
 Wall Thickness: 0.54 CM
 Bottom at: 12.5 M
 Top: 6.1 M Bottom: 24.38 M
 Perforations from: 16.76 M to: 24.38 M
 Perforations Size: 0.95 CM x 0.95 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 Perforated by: Hand Drill
 Seal: Driven & Bentonite
 from: 0 M to: 16.76 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount:
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data:
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:

Rate of water removal: 340.95 Liters/Min
 Depth of pump intake: 19.81 M
 Water level at end of pumping: 11.28 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: 9.61
 Sec Recovery: 0:00
 11.26 1:00 9.63
 11.31 2:00 9.61
 11.34 3:00 9.61
 11.38 4:00 9.61
 11.39 5:00 9.61
 11.39 120:00 9.61
 Total Drawdown: 1.52 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 68.19 Liters/Min

Recommended pump intake: 18.29 M

Type Pump Installed

Pump Type:

Pump Model:

H.P.:

Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.: 40628A

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0355186
 Map Verified: Map
 Date Report: 1985/06/14
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: MEDICINE VALLEY WATER WELLS
 Mailing Address: RR 3
 City or Town: ECKVILLE AB CA
 Well Location Identifier:
 P.O. Box Number:
 Mailing Address: 5312 105 AVE, EDMONTON
 City:
 Province:
 Country:

Drilling Company Approval No.: 119346
 Postal Code: T0M 0X0

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NE 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 960.12 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present:
 Materials Used:
 Rate: Liters
 Oil Present:
 Proposed well use: Domestic & Stock
 Anticipated Water Requirements/day: 0 Liters

6. Well Yield

Test Date: 1982/05/12
 Start Time: 11:00 AM
 Test Method: Bailer
 Non pumping static level: 12.8 M

4. Formation Log

Depth from ground level (meters)
 Lithology Description
 4.27 Brown Clay
 9.14 Brown Shale
 13.11 Gray Shale Stringers
 18.29 Brown Sandy Shale
 27.43 Gray Sandstone
 32.92 Blue Gray Shale
 33.83 Gray Sandstone
 36.58 Gray Shale

5. Well Completion

Date Started (yyyy/mm/dd): 1982/05/10
 Date Completed (yyyy/mm/dd): 1982/05/12
 Well Depth: 36.58 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type:
 Size OD: 13.97 CM
 Size OD: 0 CM
 Wall Thickness: 0.62 CM
 Wall Thickness: 0 CM
 Bottom at: 29.57 M
 Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 Perforated by:
 Seal: Driven
 from: 0 M to: 29.57 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 Originally @ SW-33-39-2-W5.

Rate of water removal: 63.64 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 36.58 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 23.77 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M

Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362671
 Map Verified: Map
 Date Report Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: KINGSEP ROBERT Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: MOTTUS, W Well Location Identifier:
 P.O. Box Number: Mailing Address: ROCKY MTN HOUSE Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 11 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan

Well Elev: 960.12 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present: Rate: Liters
 Oil Present: 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1962/05/02
 Start Time: 11:00 AM
 Test Method: Unknown
 Non pumping static level: 8.23 M

4. Formation Log

Depth from ground level (meters)
Lithology Description
 3.05 Clay
 6.1 Brown Shale
 9.75 Blue Shale
 19.2 Brown Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd):
 1962/05/01
 Well Depth: 19.2 M Borehole Diameter: 0 CM
 Casing Type: Unknown Liner Type:
 Size OD: 12.7 CM Size OD: 0 CM
 Wall Thickness: 0 CM Wall Thickness: 0 CM
 Bottom at: 10.97 M Top: 0 M Bottom: 0 M

Rate of water removal: 113.56 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 0 M
 Distance from top of CM casing to ground level:

Perforations from: 0 M to: 0 M Perforations Size: 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM

Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 1.52 M
 If water removal was less than 2 hr duration, reason why:

Perforated by:

Seal: Driven
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M

Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM

Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

Screen Installation Method:

Fittings

Top: Bottom:

Pack:

Grain Size: Amount: 0

Geophysical Log Taken:

Retained on Files:

Additional Test and/or Pump Data

Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1

Pitless Adapter Type:

Drop Pipe Type:
 Length: M Diameter: CM

Comments:
 MEDIUM HARD WATER.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0362668
Map Verified:	Not Verified
Date Report Received:	1979/06/12
Measurements:	Metric

1. Contractor & Well Owner Information			2. Well Location		
Company Name: FORRESTER WATER WELL DRILLING (1981) LTD.		Drilling Company Approval No.:	1/4 or Sec Twp Rge Westof LSD M NW 33 039 02 5		
Mailing Address:		City or Town:	Postal Code:		
Well Owner's Name: URG, DEAN		Well Location Identifier:		Location in Quarter 0 M from Boundary 0 M from Boundary	
P.O. Box Number:		Mailing Address: RR2, RED DEER	Postal Code: T4N 5E2		Lot Block Plan
City:		Province:	Country:		Well Elev: 944.88 M How Obtain: Estimated
3. Drilling Information			6. Well Yield		
Type of Work: New Well		Proposed well use:	Test Date (yyyy/mm/dd):		Start Time:
Reclaimed Well		Domestic	1979/03/01		11:00 AM
Date Reclaimed:		Anticipated Water Requirements/day	Test Method: Bailer		
Method of Drilling: Cable Tool		0 Liters	Non pumping static level:		18.29 M
Flowing Well: No		Rate: Liters	Rate of water removal:		37.85 Liters/Min
Gas Present:		Oil Present:	Depth of pump intake:		30.48 M
4. Formation Log			5. Well Completion		
Depth from ground level (meters)		Lithology Description		Date Started (yyyy/mm/dd): 1979/02/26	
0.3 Topsoil				Date Completed (yyyy/mm/dd): 1979/03/01	
8.84 Light Brown Sandy Clay				Well Depth: 38.1 M	
10.06 Light Brown Hard Clay				Casing Type: Steel	
11.68 Brown Soft Sandstone				Borehole Diameter: 0 CM	
12.6 Gray Soft Shale & Coal				Liner Type:	
13.11 Gray Shale				Size OD: 13.97 CM	
13.72 Gray Hard Sandstone				Size OD: 0 CM	
15.24 Blue Shale				Wall Thickness: 0.66 CM	
19.2 Blue Bentonitic Sandstone				Wall Thickness: 0 CM	
19.81 Blue Gray Hard Sandstone				Bottom at: 32 M	
21.95 Blue Sticky Shale				Top: 0 M Bottom: 0 M	
26.52 Blue Gray Sandy Shale				Perforations	
28.35 Blue Gray Hard Shale				from: 0 M to: 0 M	
31.7 Dark Gray Sticky Shale				0 CM x 0 CM	
35.05 Dark Gray Water Bearing Sandstone				0 CM x 0 CM	
37.8 Bluish Green Water Bearing Sandstone				0 CM x 0 CM	
38.1 Greenish Gray Sandy Shale				Perforated by:	
				Seal: Driven	
				from: 0 M to: 32 M	
				Seal:	
				from: 0 M to: 0 M	
				Seal:	
				from: 0 M to: 0 M	
				Screen Type:	
				Screen ID: 0 CM	
				from: 0 M to: 0 M	
				Slot Size: 0 CM	
				Screen Type:	
				Screen ID: 0 CM	
				from: 0 M to: 0 M	
				Slot Size: 0 CM	
				Screen Installation Method:	
				Fittings	
				Top: Bottom:	
				Pack:	
				Grain Size: Amount: 0	
				Geophysical Log Taken:	
				Retained on Files:	
				Additional Test and/or Pump Data	
				Chemistries taken By Driller: Yes	
				Held: 0 Documents Held: 1	
				Pitless Adapter Type:	
				Drop Pipe Type:	
				Length: M Diameter: CM	
				Comments:	
				MEDIUM HARD WATER.	
7. Contractor Certification			Any further pump test information?		
Driller's Name: UNKNOWN DRILLER			Recommended pumping rate: 0 Liters/Min		
Certification No.:			Recommended pump intake: 0 M		
This well was constructed in accordance with the Water			Type Pump Installed		
			Pump Type:		
			Pump Model:		
			H.P.:		



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362669
 Map Verified: Map
 Date Report: 1984/10/02
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: MAGNUM DRLG
 Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: MOTTUS, WALLY
 Well Location Identifier:
 P.O. Box Number: 215
 Mailing Address: ECKVILLE
 Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 33 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 960.12 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present: No
 Rate: Liters
 Oil Present: No

6. Well Yield

Test Date: 1984/07/31
 Start Time: 11:00 AM
 Test Method: Bailer
 Non pumping static level: 7.62 M

4. Formation Log

Depth from ground level (meters)
Lithology Description
 4.57 Brown Sand
 9.14 Brown Clay & Sand
 18.29 Blue Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1984/07/31
 Date Completed (yyyy/mm/dd): 1984/07/31
 Well Depth: 18.29 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type: Steel
 Size OD: 11.43 CM
 Size OD: 7.62 CM
 Wall Thickness: 0.4 CM
 Wall Thickness: 0 CM
 Bottom at: 10.67 M
 Top: 9.14 M
 Bottom: 18.29 M
 Perforations from: 12.19 M to: 18.29 M
 Perforations Size: 2.54 CM x 30.48 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 Perforated by: Torch
 Seal: Driven
 from: 0 M to: 10.36 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: 7.92 M Diameter: 2.54 CM
 Comments:

Rate of water removal: 7.57
 Liters/Min
 Depth of pump intake: 10.36 M
 Water level at end of pumping: 9.14 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 1.52 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 11.36 Liters/Min

Recommended pump intake: 10.36 M

Type Pump Installed

Pump Type: SUB

Pump Model:

H.P.: .5

Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Certification No.:

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0437630
 Map Verified: Map
 Date Report: 1950/07/21
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: OWNER DRILLED		Drilling Company Approval No.:	
Mailing Address:		City or Town:	
Well Owner's Name: ANDERSON, A.		Well Location Identifier:	
P.O. Box Number:		Mailing Address: BENTLEY	
City:		Province:	
		Country:	
3. Drilling Information		6. Well Yield	
Type of Work: Federal Well Survey		Test Date (yyyy/mm/dd):	
Reclaimed Well		Start Time:	
Date Reclaimed:		Materials Used:	
Method of Drilling: Drilled		Proposed well use: Domestic & Stock	
Flowing Well: No		Anticipated Water Requirements/day	
Gas Present: No		0 Liters	
4. Formation Log		5. Well Completion	
Depth from ground level (meters)		Date Started (yyyy/mm/dd):	
Lithology Description		Date Completed (yyyy/mm/dd):	
		Well Depth: 70.1 M	
		Borehole Diameter: 0 CM	
		Casing Type: Unknown	
		Liner Type:	
		Size OD: 5.08 CM	
		Size OD: 0 CM	
		Wall Thickness: 0 CM	
		Wall Thickness: 0 CM	
		Bottom at: 0 M	
		Top: 0 M	
		Bottom: 0 M	
		Perforations from: 0 M to: 0 M	
		Perforations Size: 0 CM x 0 CM	
		from: 0 M to: 0 M	
		0 CM x 0 CM	
		from: 0 M to: 0 M	
		0 CM x 0 CM	
		Perforated by:	
		Seal:	
		from: 0 M to: 0 M	
		Seal:	
		from: 0 M to: 0 M	
		Seal:	
		from: 0 M to: 0 M	
		Screen Type:	
		Screen ID: 0 CM	
		from: 0 M to: 0 M	
		Slot Size: 0 CM	
		Screen Type:	
		Screen ID: 0 CM	
		from: 0 M to: 0 M	
		Slot Size: 0 CM	
		Screen Installation Method:	
		Fittings	
		Top:	
		Bottom:	
		Pack:	
		Grain Size:	
		Amount:	
		Geophysical Log Taken:	
		Retained on Files:	
		Additional Test and/or Pump Data	
		Chemistries taken By Driller: No	
		Held: 0	
		Documents Held: 1	
		Pitless Adapter Type:	
		Drop Pipe Type:	
		Length:	
		Diameter:	
		Comments:	
		DRILLED IN 1930. MED WATER @ 160' (SCALES KETTLE). NEVER PUMPED DRY, WATERS 120 HEAD OF STOCK.	
7. Contractor Certification			
Driller's Name:		UNKNOWN DRILLER	
Certification No.:			
This well was constructed in accordance with the Water			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0437631
 Map Verified: Map
 Date Report: 1988/10/19
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ALKEN BASIN DRILLING LTD. Drilling Company Approval No.: 38394
 Mailing Address: BOX 47 City or Town: BENTLEY AB CANADA Postal Code: T0C 0J0
 Well Owner's Name: SCREPNEK, RANDY Well Location Identifier:
 P.O. Box Number: Mailing Address: RR1, BENTLEY Postal Code: T0C 0J0
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge Westof
 LSD M
 SE 03 040 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: M How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Liters
 Gas Present: No Oil Present: No
 Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd): 1988/10/15 11:00 AM
 Test Method: Air
 Non pumping 51.82 M
 static level:

4. Formation Log

Depth from ground level (meters)
Lithology Description
 3.05 Clay
 9.14 Shale
 16.76 Sandstone
 18.9 Lost Circulation
 21.95 Shale
 73.15 Interbedded Shale & Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1988/08/15 Date Completed (yyyy/mm/dd): 1988/08/16
 Well Depth: 73.15 M Borehole Diameter: 0 CM
 Casing Type: Steel Liner Type: Plastic
 Size OD: 13.97 CM Size OD: 11.43 CM
 Wall Thickness: 0.62 CM Wall Thickness: 0.6 CM
 Bottom at: 60.96 M Top: 48.77 M Bottom: 73.15 M
 Perforations
 from: 60.96 M to: 73.15 M 0.95 CM x 0.95 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by: Machine
 Seal: Drive Shoe
 from: 0 M to: 60.96 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount:
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 1 Documents Held: 2
 Pitless Adapter Type: 230V
 Drop Pipe Type: GALV
 Length: 64.01 M Diameter: 2.54 CM
 Comments:

Rate of water removal: 90.92 Liters/Min
 Depth of pump intake: 73.15 M
 Water level at end of pumping: 73.15 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes:Sec Recovery
 Total Drawdown: 21.34 M
 If water removal was less than 2 hr duration, reason why:

Recommended pumping rate:
 68.19 Liters/Min

Recommended pump intake:
 67.06 M

Type Pump Installed
 Pump Type: GOULD
 Pump Model: 13 EM
 H.P.: 1.5

Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.: VA4790

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0437633
Map Verified: Map
Date Report
Received:
Measurements: Metric

1. Contractor & Well Owner Information			2. Well Location		
Company Name: LOUSANA WATER WELLS (1987) LTD.			Drilling Company Approval No.: 118963		
Mailing Address: BOX 88			City or Town: LOUSANA AB CA		
Well Owner's Name: BUIT BROS.			Postal Code: T0M 1K0		
P.O. Box Number:			Mailing Address: SYLVAN LAKE		
City:			Province:		
			Country:		
3. Drilling Information			6. Well Yield		
Type of Work: New Well			Test Date (yyyy/mm/dd): 1988/06/08		
Reclaimed Well			Start Time: 11:00 AM		
Date Reclaimed:			Test Method: Bailer		
Method of Drilling: Rotary			Non pumping static level: 41.76 M		
Flowing Well: No			Rate of water removal: 63.64 Liters/Min		
Gas Present: No			Depth of pump intake: 42.06 M		
4. Formation Log			Water level at end of pumping: 42.06 M		
Depth from ground level (meters)			Distance from top of CM casing to ground level:		
Lithology Description			Depth To water level (meters)		
0.91 Brown Clay			Elapsed Time		
3.66 Brown Fractured Shale			Drawdown Minutes: Sec Recovery		
6.71 Brown Sandstone			Total Drawdown: 0.3 M		
7.01 Hard Sandstone			If water removal was less than 2 hr duration, reason why:		
17.07 Brown Sandstone			Recommended pumping rate: 0 Liters/Min		
18.59 Brown Shale			Recommended pump intake: 45.72 M		
23.77 Brown Sandstone			Type Pump Installed		
24.69 Hard Sandstone			Pump Type:		
25.6 Brown Sandstone			Pump Model:		
26.52 Hard Sandstone			H.P.:		
33.22 Brown Sandstone			Any further pump test information?		
35.05 Gray Shale					
35.97 Gray Sandy Shale					
36.58 Gray Shale & Coal					
39.32 Gray Sandstone					
39.62 Shale & Coal					
40.23 Gray Shale					
48.77 Gray Sandstone					
5. Well Completion					
Date Started (yyyy/mm/dd):			Date Completed (yyyy/mm/dd): 1977/06/08		
Well Depth: 48.77 M			Borehole Diameter: 0 CM		
Casing Type: Steel			Liner Type: Steel		
Size OD: 14.12 CM			Size OD: 11.43 CM		
Wall Thickness: 0.48 CM			Wall Thickness: 0.64 CM		
Bottom at: 33.83 M			Top: 0 M Bottom: 48.77 M		
Perforations from: 41.15 M to: 48.77 M			Perforations Size: 0 CM x 0 CM		
from: 0 M to: 0 M			0 CM x 0 CM		
from: 0 M to: 0 M			0 CM x 0 CM		
Perforated by: Torch					
Seal: Driven					
from: 0 M to: 0 M					
Seal:					
from: 0 M to: 0 M					
Seal:					
from: 0 M to: 0 M					
Screen Type:			Screen ID: 0 CM		
from: 0 M to: 0 M			Slot Size: 0 CM		
Screen Type:			Screen ID: 0 CM		
from: 0 M to: 0 M			Slot Size: 0 CM		
Screen Installation Method:					
Fittings					
Top:			Bottom:		
Pack:					
Grain Size:			Amount:		
Geophysical Log Taken:					
Retained on Files:					
Additional Test and/or Pump Data					
Chemistries taken By Driller: Yes					
Held: 0			Documents Held: 1		
Pitless Adapter Type:					
Drop Pipe Type:					
Length: M			Diameter: CM		
Comments:					
DRILLER REPORTS HARD WATER.					
7. Contractor Certification					
Driller's Name: UNKNOWN DRILLER					
Certification No.:					
This well was constructed in accordance with the Water					



The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy. All information on this report will be retained in a public database.

1 Contractor & Well Owner Information				2 Well Location			
Company Name: ALKEN BASIN DRILLING LTD. Approval No.: 966				1/4 of L&D Sec: NE Twp: 34 Rge: 39 West of Township: 2 WS			
Mailing Address: Box 47 Bentley City or Town: Bentley Postal Code: T6C-0J0				Location or Distance: 1 mft from ☐ N ☐ S			
Well Owner's Name: FRANK. Wilson Well Owner has a copy of this report: ☐ Yes ☐ No				Location or Distance: 1 mft from ☐ E ☐ W			
Mailing Address: #8 - 10 street Sylvan lake City or Town: Sylvan lake Postal Code: T4S-2P3				Lat: 50 Long: 118 Elev: 3233			
3 Drilling Information				6 Well Yield EAST WELL			
Type of Work: ☐ Testhole ☒ New Well ☐ Reconstructed ☐ Deepened				Test W. No Day Start			
☐ Decommissioned				Date: 080327 Time: 1300			
Well ID (if applicable): _____ Date Completed: Yr Mo Day				Test method: ☐ Pump ☐ Baller ☒ Air			
Casing or liner removed (specify): _____				Art. measurements in metric or imperial? ☒			
Plugging Material: ☐ Cement ☐ High Solids Bentonite ☐ Hydrated Bentonite				Non pumping static water level: 38m			
Method of Drilling: ☐ Auger ☐ Boring ☐ Cable tool ☐ Backhoe ☐ Other: CHAMPAROUND				Rate of water removal: 32 gpm			
4 Formation Log				5 Well Completion			
Depth from ground level: _____ Lithology Description: _____				Date Started: 080327 Date Completed: 080327			
0-15 clay brn 4.6				Are measurements in metric or imperial? ☐			
15-50 SS brn 15.2				Casing Details:			
50-60 SH gr 18.3				Surface Seal: 17 Casing: 6 3/4 Liner/Casing: 5"			
60-61 SH gr 18.6				Diameter of borehole: _____			
61-65 SH gr 19.8				Casing type: STEEL PVC			
65-70 SH gr 21.3				Size OD: 5 9/16 4 1/2			
70-75 SH gr 22.9				Well thickness: .258 .237			
75-79 SH gr 24.7				Bottom at: 36.2 118. 146.42			
79-95 SH gr 29.0				Top at: 2 100			
95-106 SH gr 32.3				Annular Sealant: ☐ Cement ☐ Bentonite ☐ Shale Trap			
106-110 SH gr 33.8				From: 0 To: 118 From: 0 To: 118			
110-118 SH gr 42.4				Production Interval Details:			
118-139 SH gr 42.4				Perforations: from: 118 to 140			
139-140 SH gr 42.4				from: 36 to: 42.7			
Grouted w/ 12 sacks Bentonite grout.				Perforation size: 3/8 x 3/8			
				Perforated by: ☐ Saw ☐ Torch ☒ Machine ☐ Other: DRILL			
				Screen type: _____ Size OD: _____			
				Interval: _____			
				from: _____ to: _____ slot size: _____			
				from: _____ to: _____ slot size: _____			
				Installation: ☐ Attached to casing ☐ Telescoped			
				Fittings: Top ☐ Pecker Bottom ☐ Wash-down ☐ Coupler ☐ Ball ☐ Plug			
				Pack: ☐ Artificial/Mechanical ☐ Natural			
				Grain size: _____ Amount: _____			
6 Geophysical Log taken: ☐ Electric ☐ Gamma				7 Contractor Certification			
Did you encounter: ☐ Mineralized water more than 4000 ppm TDS ☐ Gas At what depth: _____				Driller's Name: Kris Schindel			
Remedial action taken: _____				Certification No.: 40628A			
Additional Comments: _____				This well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this report is true.			
				Signature: Kris Schindel Date: 080327			
				Recommended pumping rate: 100 gpm			
				Recommended pump intake: 130 ft			
				Pump installed ☐ Yes Depth: _____			
				Type: _____ Model: _____ H.P.: _____			



The data contained in this report is supplied by the Dftr. The province disclaims responsibility for its accuracy. All information on this report will be retained in a public database.

Yellowknife: Well Owner Pink copy: Contractor



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362714
 Map Verified: Not Verified
 Date Report: 1976/09/08
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: HANSEN DRLG Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: VAN BUKEL, JOHN Well Location Identifier:
 P.O. Box Number: Mailing Address: SYLVAN LAKE Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Cable Tool
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd):
 1976/08/05 11:00 AM
 Test Method: Bailer
 Non pumping
 static level: 7.32 M

4. Formation Log

Depth from ground level (meters)
Lithology Description
 8.23 Brown Clay
 13.11 Gray Clay
 18.59 Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1976/08/05 Date Completed (yyyy/mm/dd): 1976/08/05
 Well Depth: 18.59 M Borehole Diameter: 0 CM
 Casing Type: Steel Liner Type: Steel
 Size OD: 14.12 CM Size OD: 11.43 CM
 Wall Thickness: 0.4 CM Wall Thickness: 0 CM

Bottom at: 14.63 M Top: 0 M Bottom: 18.59 M

Perforations
 from: 15.24 M to: 18.29 M Perforations Size:
 from: 0 M to: 0 M 0.08 CM x 30.48 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM

Perforated by: Torch

Seal: Driven
 from: 0 M to: 0 M

Seal:
 from: 0 M to: 0 M

Seal:
 from: 0 M to: 0 M

Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM

Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM

Screen Installation Method:

Fittings

Top: Bottom:

Pack:

Grain Size: Amount: 0

Geophysical Log Taken:

Retained on Files:

Additional Test and/or Pump Data

Chemistries taken By Driller: Yes

Held: 0 Documents Held: 1

Pitless Adapter Type:

Drop Pipe Type:

Length: M Diameter: CM

Comments:

SOFT WATER.

Rate of water removal: 136.38 Liters/Min

Depth of pump intake: 0 M

Water level at end of pumping: 13.72 M

Distance from top of CM casing to ground level:

Depth To water level (meters)

Elapsed Time

Drawdown Minutes: Sec Recovery

Total Drawdown: 0 M

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 0 M

Type Pump Installed

Pump Type:

Pump Model:

H.P.:

Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362710
 Map Verified: Not Verified
 Date Report: 1981/07/21
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: BIG QUILL DRILLING LTD.		Drilling Company Approval No.:	
Mailing Address:	City or Town:	Postal Code:	1/4 or Sec Twp Rge West of LSD M SW 34 039 02 5
Well Owner's Name: HICKS, R	Well Location Identifier:		Location in Quarter 0 M from Boundary 0 M from Boundary
P.O. Box Number:	Mailing Address: 6315 DALMARNOCK CRES NW, CALGARY	Postal Code: T3A 1H3	Lot Block Plan
City:	Province:	Country:	Well Elev: 944.88 M How Obtain: Estimated
3. Drilling Information		6. Well Yield	
Type of Work: New Well	Proposed well use: Domestic	Test Date (yyyy/mm/dd): 1981/06/05	Start Time: 11:00 AM
Date Reclaimed:	Materials Used:	Anticipated Water Requirements/day: 0 Liters	Test Method: Air
Method of Drilling: Rotary	Flowing Well: No	Rate: Liters	Non pumping static level: 8.23 M
Gas Present:	Oil Present:		Rate of water removal: 136.38 Liters/Min
4. Formation Log		5. Well Completion	
Depth from ground level (meters)	Lithology Description	Date Started (yyyy/mm/dd): 1981/06/05	Date Completed (yyyy/mm/dd): 1981/06/05
9.45	Brown Clay & Rocks	Well Depth: 36.58 M	Borehole Diameter: 0 CM
23.77	Brown Water Bearing Sandstone	Casing Type: Galvanized Steel	Liner Type:
32.31	Gray Medium Grained Sandstone	Size OD: 11.43 CM	Size OD: 0 CM
35.05	Gray Shale	Wall Thickness: 0.36 CM	Wall Thickness: 0 CM
36.58	Light Blue Shale	Bottom at: 27.74 M	Top: 0 M Bottom: 0 M
		Perforations from: 0 M to: 0 M	Perforations Size: 0 CM x 0 CM
		Perforations from: 0 M to: 0 M	Perforations Size: 0 CM x 0 CM
		Perforations from: 0 M to: 0 M	Perforations Size: 0 CM x 0 CM
		Perforated by:	
		Seal: Driven from: 0 M to: 27.43 M	
		Seal: from: 0 M to: 0 M	
		Seal: from: 0 M to: 0 M	
		Screen Type: from: 0 M to: 0 M	Screen ID: 0 CM Slot Size: 0 CM
		Screen Type: from: 0 M to: 0 M	Screen ID: 0 CM Slot Size: 0 CM
		Screen Installation Method:	
		Fittings Top: Bottom:	
		Pack: Grain Size: Amount: 0	
		Geophysical Log Taken: Retained on Files:	
		Additional Test and/or Pump Data	
		Chemistries taken By Driller: No	
		Held: 1 Documents Held: 2	
		Pitless Adapter Type:	
		Drop Pipe Type: Length: M Diameter: CM	
		Comments:	
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			
		Depth of pump intake: 0 M Water level at end of pumping: 36.58 M Distance from top of CM casing to ground level: Depth To water level (meters) Elapsed Time Drawdown Minutes: Sec Recovery Total Drawdown: 0 M If water removal was less than 2 hr duration, reason why: Recommended pumping rate: 0 Liters/Min Recommended pump intake: 0 M Type Pump Installed Pump Type: Pump Model: H.P.: Any further pump test information?	



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0467432
Map Verified:	Not Verified
Date Report Received:	1997/04/11
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name:		Drilling Company Approval No.
ALBERTA EAGLE DRILLING LTD.		117793
Mailing Address:	City or Town:	Postal Code:
BOX 9036	SYLVAN LAKE AB CA	T4S 1S6
WellOwner's Name:		Well Location Identifier:
HAACK, ELMER		
P.O. Box Number:	Mailing Address:	Postal Code:
	15113 42 AVE, EDMONTON	T6H 5P6
City:	Province:	Country:

2. Well Location

1/4 or LSD SW	Sec 34	Twp 039	Rge 02	Westof M 5
Location in Quarter				
0 M from			Boundary	
0 M from			Boundary	
Lot 21	Block 9	Plan 8922703		
Well Elev: M		How Obtain: Not Obtain		

3. Drilling Information

Type of Work: New Well	Proposed well use
Reclaimed Well	Domestic
Date Reclaimed:	Anticipated Water
Method of Drilling: Combination	Requirements/day
Flowing Well: No	1363.8 Liters
Gas Present: No	
Rate: Liters	
Oil Present: No	

6. Well Yield

Test Date (yyyy/mm/dd): 1996/05/29	Start Time: 12:00 PM
Test Method: Air	
Non pumping static level:	12.5 M

4. Formation Log

Depth from ground level (meters)	Lithology Description
2.44	Fill
6.71	Brown Till
14.94	Gray Till
15.54	Gray Sandstone
23.77	Brown Sandstone
30.48	Gray Water Bearing Sandstone

5. Well Completion

Date Completed:	
Date Started (yyyy/mm/dd):	(yyyy/mm/dd):
1996/05/29	1996/05/29
Well Depth: 30.48 M	Borehole Diameter: 0 CM
Casing Type: Plastic	Liner Type: Plastic
Size OD: 14.12 CM	Size OD: 11.43 CM
Wall Thickness: 1.06 CM	Wall Thickness: 0.59 CM
Bottom at: 26.21 M	Top: 24.38 M Bottom: 30.48 M
Perforations from: 26.21 M to: 30.48 M	Perforations Size: 1.59 CM x 10.16 CM
from: 0 M to: 0 M	0 CM x 0 CM
from: 0 M to: 0 M	0 CM x 0 CM
Perforated by: Hand Drill	
Seal: Driven & Bentonite	
from: 12.19 M	to: 26.21 M
Seal:	
from: 0 M	to: 0 M
Seal:	
from: 0 M	to: 0 M
Screen Type:	Screen ID: 0 CM
from: 0 M to: 0 M	Slot Size: 0 CM
Screen Type:	Screen ID: 0 CM
from: 0 M to: 0 M	Slot Size: 0 CM
Screen Installation Method:	
Fittings	
Top:	Bottom:
Pack:	
Grain Size:	Amount:
Geophysical Log Taken:	
Retained on Files:	
Additional Test and/or Pump Data	
Chemistries taken By Driller: No	
Held: 0	Documents Held: 1
Pitless Adapter Type:	
Drop Pipe Type:	
Length: M	Diameter: CM
Comments:	
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO REPORTED LEVEL: 5 M.	

Rate of water

removal:	Liters/Min
Depth of pump intake:	30.48 M
Water level at end of pumping:	M
Distance from top of CM casing to ground level:	
Depth To water level (meters)	Elapsed Time
Drawdown Minutes:Sec	Recovery
1:00	12.8
2:00	12.77
3:00	12.71
4:00	12.7
5:00	12.69
6:00	12.68
7:00	12.68
8:00	12.67
10:00	12.66
120:00	12.6
Total Drawdown:	0 M
If water removal was less than 2 hr duration, reason why:	

Recommended pumping rate:

45.46 Liters/Min

Recommended pump intake:

24.38 M

Type Pump Installed

Pump Type: SUB

Pump Model:

H.P.:

Any further pump test information?

7. Contractor Certification

Driller's Name:	UNKNOWN DRILLER
Certification No.:	11184A

This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0366507
 Map Verified: Not Verified
 Date Report: 1992/11/02
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ALBERTA EAGLE DRILLING LTD. Drilling Company Approval No.: 117793
 Mailing Address: BOX 9036 City or Town: SYLVAN LAKE AB CA Postal Code: T4S 1S6
 Well Owner's Name: TUMBACH, KEN Well Location Identifier:
 P.O. Box Number: Mailing Address: 129 SUNNYVALE CRES, Postal Code: T2X 2S3
 City: CALGARY Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: M How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Combination
 Flowing Well: No Rate: Liters
 Gas Present: No Oil Present: No
 Proposed well use: Domestic
 Anticipated Water Requirements/day: 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1992/08/17 Start Time: 11:00 AM
 Test Method: Air
 Non pumping static level: 23.77 M
 Rate of water removal: 136.38 Liters/Min
 Depth of pump intake: 36.58 M
 Water level at end of pumping: 36.58 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 12.8 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)	Lithology Description
6.4	Brown Till & Clay
7.62	Brown Shale
15.24	Brown Sandstone
15.85	Gray Shale
16.15	Coal
18.29	Brown Shale
24.08	Brown Sandstone
26.82	Brownish Gray Shale
36.58	Brownish Gray Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1992/08/17 Date Completed (yyyy/mm/dd): 1992/08/17
 Well Depth: 36.58 M Borehole Diameter: 0 CM
 Casing Type: Plastic Liner Type: Plastic
 Size OD: 14.12 CM Size OD: 11.43 CM
 Wall Thickness: 0.95 CM Wall Thickness: 0.54 CM
 Bottom at: 31.7 M Top: 30.48 M Bottom: 36.58 M
 Perforations from: 32 M to: 36.58 M Perforations Size: 1.59 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by: Machine
 Seal: Driven & Bentonite from: 27.43 M to: 31.09 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: from: 0 M to: 0 M Screen ID: 0 CM Slot Size: 0 CM
 Screen Type: from: 0 M to: 0 M Screen ID: 0 CM Slot Size: 0 CM
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack: Grain Size: Amount:
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type: Length: M Diameter: CM
 Comments:
 DRILLER REPORT 15 GR HARD 7.7 PH LOW IRON.

Recommended pumping rate: 45.46 Liters/Min
 Recommended pump intake: 30.48 M
 Type Pump Installed
 Pump Type: SUB
 Pump Model: 10S05-9
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.: VA7724



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0362722
Map Verified:	Map
Date Report	
Received:	
Measurements:	Metric

1. Contractor & Well Owner Information				2. Well Location			
Company Name: STAR DRLG CO		Drilling Company Approval No.:		1/4 or LSD	Sec NE	Twp 34	Rge 039
Mailing Address:		City or Town:		Postal Code:		West of 02	
Well Owner's Name: CARLSON, PETER		Well Location Identifier:		Location in Quarter 0 M from		Boundary 0 M from	
P.O. Box Number: 451		Mailing Address: BENTLEY		Postal Code:		Lot Block Plan	
City:		Province:		Country:		Well Elev: 993.65 M	
						How Obtain: Estimated	
3. Drilling Information				6. Well Yield			
Type of Work: New Well		Proposed well use:		Test Date (yyyy/mm/dd):		Start Time:	
Reclaimed Well		Stock		1978/03/13		11:00 AM	
Date Reclaimed:		Anticipated Water		Test Method: Pump			
Method of Drilling: Rotary		Requirements/day		Non pumping		45.72 M	
Flowing Well: No		Rate: Liters		static level:			
Gas Present:		Oil Present:		45.46		Liters/Min	
4. Formation Log		5. Well Completion		Removal:		0 M	
Depth from ground level (meters)		Date Started(yyyy/mm/dd):		Date Completed (yyyy/mm/dd):		Depth of pump intake:	
Lithology Description		1978/03/09		1978/03/13		Water level at end of pumping:	
9.14 Clay		Well Depth: 77.72 M		Borehole Diameter: 0 CM		54.86 M	
45.72 Shattered Shale		Casing Type: Steel		Liner Type:		Distance from top of CM casing to ground level:	
77.72 Hard Shale Stringers		Size OD: 11.43 CM		Size OD: 0 CM		Depth To water level (meters) Elapsed Time	
		Wall Thickness: 0.36 CM		Wall Thickness: 0 CM		Drawdown Minutes:Sec Recovery	
		Bottom at: 65.53 M		Top: 0 M Bottom: 0 M		Total Drawdown: 9.14 M	
		Perforations from: 0 M to: 0 M		Perforations Size: 0 CM x 0 CM		If water removal was less than 2 hr duration, reason why:	
		from: 0 M to: 0 M		0 CM x 0 CM			
		from: 0 M to: 0 M		0 CM x 0 CM			
		Perforated by:					
		Seal: Driven				Recommended pumping rate: 45.46 Liters/Min	
		from: 0 M to: 1.22 M				Recommended pump intake: 60.96 M	
		Seal:				Type Pump Installed	
		from: 0 M to: 0 M				Pump Type:	
		Seal:				Pump Model:	
		from: 0 M to: 0 M				H.P.:	
		Screen Type:		Screen ID: 0 CM		Any further pump test information?	
		from: 0 M to: 0 M		Slot Size: 0 CM			
		Screen Type:		Screen ID: 0 CM			
		from: 0 M to: 0 M		Slot Size: 0 CM			
		Screen Installation Method:					
		Fittings					
		Top:		Bottom:			
		Pack:					
		Grain Size:		Amount: 0			
		Geophysical Log Taken:					
		Retained on Files:					
		Additional Test and/or Pump Data					
		Chemistries taken By Driller: Yes					
		Held: 0		Documents Held: 1			
		Pitless Adapter Type:					
		Drop Pipe Type:					
		Length: M		Diameter: CM			
		Comments:					
		MEDIUM HARD.					
7. Contractor Certification							
Driller's Name:		UNKNOWN DRILLER					
Certification No.:							
This well was constructed in accordance with the Water							



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0362713
Map Verified:	Not Verified
Date Report	
Received:	
Measurements:	Metric

1. Contractor & Well Owner Information				2. Well Location			
Company Name: BROWN JIM		Drilling Company Approval No.:		1/4 or LSD	Sec 34	Twp 039	Rge 02
Mailing Address:		City or Town:		Postal Code:		Westof M 5	
WellOwner's Name: BROWN, GLEN		Well Location Identifier:		Location in Quarter 0 M from Boundary 0 M from Boundary			
P.O. Box Number:		Mailing Address: LAKE COTTAGE, N.S. OF SYLVAN LAKE		Postal Code:		Lot Block Plan 21	
City:		Province:		Country:		Well Elev: 944.88 M	
						How Obtain: Estimated	
3. Drilling Information				6. Well Yield			
Type of Work: New Well		Proposed well use: Domestic		Test Date (yyyy/mm/dd): 1969/08/04		Start Time: 11:00 AM	
Reclaimed Well		Anticipated Water		Test Method: Bailer			
Date Reclaimed:		Materials Used:		Non pumping static level:		15.24 M	
Method of Drilling: Unknown		Requirements/day 0 Liters		Rate of water removal:		54.55 Liters/Min	
Flowing Well: No		Rate: Liters		Depth of pump intake:		0 M	
Gas Present:		Oil Present:		Water level at end of pumping:		0 M	
4. Formation Log		5. Well Completion		Distance from top of CM casing to ground level:			
Depth from ground level (meters)		Date Started(yyyy/mm/dd):		Date Completed (yyyy/mm/dd): 1969/08/04			
Lithology Description		Well Depth: 45.72 M		Borehole Diameter: 0 CM			
15.24 Clay & Sand		Casing Type: Unknown		Liner Type:			
25.91 Clay & Rocks		Size OD: 13.97 CM		Size OD: 0 CM			
33.53 Shale		Wall Thickness: 0 CM		Wall Thickness: 0 CM			
42.67 Sandstone Stringers		Bottom at: 28.04 M		Top: 0 M Bottom: 0 M			
45.72 Shale		Perforations from: 0 M to: 0 M		Perforations Size: 0 CM x 0 CM			
		from: 0 M to: 0 M		0 CM x 0 CM			
		from: 0 M to: 0 M		0 CM x 0 CM			
		Perforated by:					
		Seal: Driven					
		from: 0 M to: 0 M					
		Seal:					
		from: 0 M to: 0 M					
		Seal:					
		from: 0 M to: 0 M					
		Screen Type:		Screen ID: 0 CM			
		from: 0 M to: 0 M		Slot Size: 0 CM			
		Screen Type:		Screen ID: 0 CM			
		from: 0 M to: 0 M		Slot Size: 0 CM			
		Screen Installation Method:					
		Fittings					
		Top:		Bottom:			
		Pack:					
		Grain Size:		Amount: 0			
		Geophysical Log Taken:					
		Retained on Files:					
		Additional Test and/or Pump Data					
		Chemistries taken By Driller: Yes					
		Held: 0		Documents Held: 1			
		Pitless Adapter Type:					
		Drop Pipe Type:					
		Length: M		Diameter: CM			
		Comments:					
		SOFT WATER.					
7. Contractor Certification				Any further pump test information?			
Driller's Name:		UNKNOWN DRILLER		Recommended pumping rate: 0 Liters/Min			
Certification No.:				Recommended pump intake: 0 M			
				Type Pump Installed			
				Pump Type:			
				Pump Model:			
				H.P.:			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0365978
 Map Verified: Not Verified
 Date Report: 1992/09/21
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ALBERTA EAGLE DRILLING LTD.
 Mailing Address: BOX 9036
 Well Owner's Name: GRUDGEFIELD, GORD
 P.O. Box Number:
 City:
 Province:
 Country:
 City or Town: SYLVAN LAKE AB CA
 Well Location Identifier:
 Mailing Address: 169 WOODFORD DR SW, CALGARY
 Postal Code: T4S 1S6
 Postal Code: T2W 4C2

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 SW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 16 8
 Well Elev: M
 How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Combination
 Flowing Well: No
 Gas Present: No
 Proposed well use: Domestic
 Anticipated Water Requirements/day: 0 Liters
 Materials Used:
 Rate: Liters
 Oil Present: No

6. Well Yield

Test Date (yyyy/mm/dd): 1992/07/20
 Start Time: 11:00 AM
 Test Method: Air
 Non pumping static level: 23.77 M
 Rate of water removal: 118.2 Liters/Min
 Depth of pump intake: 36.58 M
 Water level at end of pumping: 36.58 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 12.8 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)	Lithology Description
2.74	Brown Till & Clay
3.35	Brown Shale
7.32	Brown Sandstone
11.89	Brown Shale
15.24	Brown Fine Grained Sandstone
16.76	Brown Shale
17.98	Brown Sandstone
20.12	Brownish Gray Shale
25.91	Brownish Gray Sandstone
28.65	Gray Silty Shale
36.58	Brownish Gray Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1992/07/20
 Date Completed (yyyy/mm/dd): 1992/07/20
 Well Depth: 36.58 M
 Borehole Diameter: 0 CM
 Casing Type: Plastic
 Liner Type: Plastic
 Size OD: 14.12 CM
 Size OD: 11.43 CM
 Wall Thickness: 0.67 CM
 Wall Thickness: 0.54 CM
 Bottom at: 32.31 M
 Top: 30.48 M
 Bottom: 36.58 M
 Perforations from: 32.31 M to: 36.58 M
 Perforations Size: 1.59 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 Perforated by: Machine
 Seal: Driven & Bentonite
 from: 27.43 M to: 31.7 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount:
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 DRILLER REPORT 18 GR HARD.

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type: SUB
 Pump Model: 10S05-9
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.: VA7724



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362712
 Map Verified: Not Verified
 Date Report: 1972/09/18
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: BROWN JIM		Drilling Company Approval No.:	
Mailing Address:		City or Town:	
Well Owner's Name: MCCOOK		Well Location Identifier:	
P.O. Box Number:		Mailing Address: 23 35 N.Y. SYLVAN LAKE NORTH SIDE	
City:		Province:	
3. Drilling Information		6. Well Yield	
Type of Work: New Well		Test Date (yyyy/mm/dd): 1972/06/12	
Reclaimed Well		Start Time: 11:00 AM	
Date Reclaimed:		Test Method: Pump	
Method of Drilling: Rotary		Non pumping static level: 21.34 M	
Flowing Well: No		Rate of water removal: 54.55 Liters/Min	
Gas Present:		Depth of pump intake: 0 M	
4. Formation Log		Water level at end of pumping: 0 M	
Depth from ground level (meters)		Distance from top of CM casing to ground level:	
15.24 Clay & Rocks		Depth To water level (meters) Elapsed Time	
18.29 Shale		Drawdown Minutes: Sec Recovery	
21.34 Blue Lost Circulation Shale		Total Drawdown: 0 M	
39.62 Lost Circulation Shale & Sandstone		If water removal was less than 2 hr duration, reason why:	
5. Well Completion		Recommended pumping rate: 0 Liters/Min	
Date Started (yyyy/mm/dd):		Recommended pump intake: 25.91 M	
Date Completed (yyyy/mm/dd): 1972/06/12		Type Pump Installed	
Well Depth: 39.62 M		Pump Type: SUB	
Casing Type: Steel		Pump Model:	
Size OD: 11.43 CM		H.P.:	
Wall Thickness: 0 CM		Any further pump test information?	
Bottom at: 19.2 M			
Top: 0 M Bottom: 0 M			
Perforations from: 0 M to: 0 M			
Perforations Size: 0 CM x 0 CM			
Perforations from: 0 M to: 0 M			
Perforations Size: 0 CM x 0 CM			
Perforations from: 0 M to: 0 M			
Perforations Size: 0 CM x 0 CM			
Perforated by:			
Seal: Driven			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Screen Type:			
from: 0 M to: 0 M			
Screen ID: 0 CM			
Slot Size: 0 CM			
Screen Type:			
from: 0 M to: 0 M			
Screen ID: 0 CM			
Slot Size: 0 CM			
Screen Installation Method:			
Fittings			
Top:			
Bottom:			
Pack:			
Grain Size:			
Amount: 0			
Geophysical Log Taken:			
Retained on Files:			
Additional Test and/or Pump Data			
Chemistries taken By Driller: Yes			
Held: 0 Documents Held: 1			
Pitless Adapter Type:			
Drop Pipe Type:			
Length: M			
Diameter: CM			
Comments:			
SOFT WATER.			
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362711
 Map Verified: Not Verified
 Date Report: 1971/08/24
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: NELSON DRILLING & PLUMBING		Drilling Company Approval No.: 1/4 or Sec Twp Rge West of LSD M	
Mailing Address: City or Town: Postal Code:		SW 34 039 02 5	
Well Owner's Name: SHAPKE, B.		Location in Quarter: 0 M from Boundary	
P.O. Box Number: Mailing Address: CALGARY		0 M from Boundary	
City: Province: Country:		Lot Block Plan	
3. Drilling Information		6. Well Yield	
Type of Work: New Well		Test Date Start Time:	
Reclaimed Well		(yyyy/mm/dd): 1971/07/01 11:00 AM	
Date Reclaimed: Materials Used:		Test Method: Pump	
Method of Drilling: Rotary		Non pumping static level: 0.91 M	
Flowing Well: No Rate: Liters		Rate of water removal: 45.46 Liters/Min	
Gas Present: Oil Present:		Depth of pump intake: 0 M	
4. Formation Log		Water level at end of pumping: 0 M	
Depth from ground level (meters)		Distance from top of CM casing to ground level:	
Lithology Description		Depth To water level (meters) Elapsed Time	
3.05 Brown Clay & Sand		Drawdown Minutes: Sec Recovery	
17.07 Blue Clay		Total Drawdown: 0.91 M	
22.86 Sandstone Stringers		If water removal was less than 2 hr duration, reason why:	
27.43 Blue Soft Shale		Recommended pumping rate: 0 Liters/Min	
32.92 Water Bearing Shale		Recommended pump intake: 0 M	
36.58 Blue Shale		Type Pump Installed	
5. Well Completion		Pump Type:	
Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd): 1971/07/01		Pump Model:	
Well Depth: 36.58 M Borehole Diameter: 0 CM		H.P.:	
Casing Type: Galvanized Steel		Any further pump test information?	
Size OD: 5.08 CM			
Wall Thickness: 0 CM			
Bottom at: 30.18 M Top: 0 M Bottom: 0 M			
Perforations			
from: 0 M to: 0 M 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
Perforated by:			
Seal: Driven			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Installation Method:			
Fittings			
Top: Bottom:			
Pack:			
Grain Size: Amount: 0			
Geophysical Log Taken:			
Retained on Files:			
Additional Test and/or Pump Data			
Chemistries taken By Driller: Yes			
Held: 0 Documents Held: 1			
Pitless Adapter Type:			
Drop Pipe Type:			
Length: M Diameter: CM			
Comments:			
MANOR INVESTMENTS NORTH SIDE OF SYLVAN LAKE. SOFT WATER.			
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			
This well was constructed in accordance with the Water			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362709
 Map Verified: Not Verified
 Date Report: 1971/10/25
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: NELSON DRILLING & PLUMBING		Drilling Company Approval No.: 1/4 or Sec Twp Rge West of LSD M	
Mailing Address: City or Town: Postal Code:		SW 34 039 02 5	
Well Owner's Name: STEVENS, OLIVA		Location in Quarter: 0 M from Boundary	
P.O. Box Number: Mailing Address: CALGARY		0 M from Boundary	
City: Province: Country:		Lot Block Plan	
3. Drilling Information		6. Well Yield	
Type of Work: New Well		Test Date Start Time:	
Reclaimed Well		(yyyy/mm/dd): 1971/08/01 11:00 AM	
Date Reclaimed: Materials Used:		Test Method: Pump	
Method of Drilling: Rotary		Non pumping static level: 3.66 M	
Flowing Well: No Rate: Liters		Rate of water removal: 45.46 Liters/Min	
Gas Present: Oil Present:		Depth of pump intake: 0 M	
4. Formation Log		Water level at end of pumping: 0 M	
Depth from ground level (meters)		Distance from top of CM casing to ground level:	
Lithology Description		Depth To water level (meters) Elapsed Time	
7.62 Brown Clay		Drawdown Minutes: Sec Recovery	
17.37 Blue Clay		Total Drawdown: 3.96 M	
33.22 Water Bearing Shale		If water removal was less than 2 hr duration, reason why:	
36.58 Blue Shale		Recommended pumping rate: 0 Liters/Min	
5. Well Completion		Recommended pump intake: 0 M	
Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd): 1971/08/01		Type Pump Installed	
Well Depth: 36.58 M Borehole Diameter: 0 CM		Pump Type:	
Casing Type: Galvanized Steel Liner Type:		Pump Model:	
Size OD: 5.08 CM Size OD: 0 CM		H.P.:	
Wall Thickness: 0 CM Wall Thickness: 0 CM		Any further pump test information?	
Bottom at: 27.43 M Top: 0 M Bottom: 0 M			
Perforations from: 0 M to: 0 M Perforations Size: 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
Perforated by:			
Seal: Driven from: 0 M to: 0 M			
Seal: from: 0 M to: 0 M			
Seal: from: 0 M to: 0 M			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Installation Method:			
Fittings Top: Bottom:			
Pack: Grain Size: Amount: 0			
Geophysical Log Taken: Retained on Files:			
Additional Test and/or Pump Data			
Chemistries taken By Driller: Yes			
Held: 0 Documents Held: 1			
Pitless Adapter Type: Drop Pipe Type:			
Length: M Diameter: CM			
Comments: COTTAGE @ MANOR INVESTMENTS NORTH SIDE OF SYLVAN LAKE. SOFT WATER.			
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			
This well was constructed in accordance with the Water			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362723
 Map Verified: Map
 Date Report: 1979/10/09
 Received:
 Measurements: Imperial

1. Contractor & Well Owner Information

Company Name: SYLVAN LAKE DRLG Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: CARLSON, PETER Well Location Identifier:
 P.O. Box Number: 451 Mailing Address: BENTLEY Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NE 34 039 02 5
 Location in Quarter
 0 FT from Boundary
 0 FT from Boundary
 Lot Block Plan
 Well Elev: 3250 FT How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Gallons
 Gas Present: Oil Present:

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd): 1979/08/29 11:00 AM
 Test Method: Pump
 Non pumping static level: 150 FT
 Rate of water removal: 7 Gallons/Min
 Depth of pump intake: 0 FT
 Water level at end of pumping: 220 FT
 Distance from top of casing to ground level:
 Depth To water level (feet)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 70 FT
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (feet)
Lithology Description
 15 Clay & Rocks
 255 Shale & Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1979/08/28 Date Completed (yyyy/mm/dd): 1979/08/29
 Well Depth: 255 FT Borehole Diameter: 0 Inches
 Casing Type: Steel Liner Type:
 Size OD: 4.5 inches Size OD: 0 inches
 Wall Thickness: 0.141 inches Wall Thickness: 0 inches
 Bottom at: 229 FT Top: 0 FT Bottom: 0 FT
 Perforations from: 0 FT to: 0 FT Perforations Size: 0 inches x 0 inches
 from: 0 FT to: 0 FT 0 inches x 0 inches
 from: 0 FT to: 0 FT 0 inches x 0 inches
 Perforated by:
 Seal: Driven from: 0 FT to: 3 FT
 Seal: from: 0 FT to: 0 FT
 Seal: from: 0 FT to: 0 FT
 Screen Type: Screen ID: 0 inches
 from: 0 FT to: 0 FT Slot Size: 0 inches
 Screen Type: Screen ID: 0 inches
 from: 0 FT to: 0 FT Slot Size: 0 inches
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 1 Documents Held: 3
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: FT Diameter: inches
 Comments:

Recommended pumping rate: 0 Gallons/Min
 Recommended pump intake: 0 FT
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362724
 Map Verified: Map
 Date Report
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: ERICKSON ERNFRED		Drilling Company Approval No.: 1/4 or Sec Twp Rge West of LSD M	
Mailing Address: City or Town: Postal Code:		NE 34 039 02 5	
Well Owner's Name: CARLSON, H.		Location in Quarter	
Well Location Identifier:		0 M from Boundary	
P.O. Box Number: Mailing Address: BENTLEY		0 M from Boundary	
Postal Code:		Lot Block Plan	
City: Province: Country:		Well Elev: 994.87 M How Obtain: Estimated	
3. Drilling Information		6. Well Yield	
Type of Work: Federal Well Survey		Test Date Start Time:	
Reclaimed Well		(yyyy/mm/dd):	
Date Reclaimed: Materials Used:		1934/01/01 11:00 AM	
Method of Drilling: Drilled		Test Method: Unknown	
Flowing Well: No		Non pumping 21.34 M	
Gas Present: Rate: Liters Oil Present:		static level:	
4. Formation Log		Rate of water removal: 0 Liters/Min	
Depth from ground level (meters)		Depth of pump intake: 0 M	
Lithology Description		Water level at end of pumping: 0 M	
		Distance from top of CM casing to ground level:	
		Depth To water level (meters) Elapsed Time	
		Drawdown Minutes: Sec Recovery	
		Total Drawdown: 0 M	
		If water removal was less than 2 hr duration, reason why:	
		Recommended pumping rate: 0 Liters/Min	
		Recommended pump intake: 0 M	
		Type Pump Installed	
		Pump Type: SP M	
		Pump Model:	
		H.P.:	
		Any further pump test information?	
5. Well Completion			
Date Started (yyyy/mm/dd):		Date Completed (yyyy/mm/dd):	
1934/01/01		1934/01/01	
Well Depth: 65.84 M		Borehole Diameter: 0 CM	
Casing Type: Unknown		Liner Type:	
Size OD: 5.08 CM		Size OD: 0 CM	
Wall Thickness: 0 CM		Wall Thickness: 0 CM	
Bottom at: 0 M		Top: 0 M Bottom: 0 M	
Perforations		Perforations Size:	
from: 0 M to: 0 M		0 CM x 0 CM	
from: 0 M to: 0 M		0 CM x 0 CM	
from: 0 M to: 0 M		0 CM x 0 CM	
Perforated by:			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Screen Type:		Screen ID: 0 CM	
from: 0 M to: 0 M		Slot Size: 0 CM	
Screen Type:		Screen ID: 0 CM	
from: 0 M to: 0 M		Slot Size: 0 CM	
Screen Installation Method:			
Fittings			
Top: Bottom:			
Pack:			
Grain Size: Amount: 0			
Geophysical Log Taken:			
Retained on Files:			
Additional Test and/or Pump Data			
Chemistries taken By Driller: No			
Held: 0 Documents Held: 1			
Pitless Adapter Type:			
Drop Pipe Type:			
Length: M Diameter: CM			
Comments:			
PASKAPOO FORMATION.			
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			
This well was constructed in accordance with the Water			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362715
 Map Verified: Not Verified
 Date Report: 1970/11/05
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information		2. Well Location	
Company Name: LAWSON, M.E. WATER WELLS		Drilling Company Approval No.: 1/4 or Sec Twp Rge West of LSD M	
Mailing Address: City or Town: Postal Code:		NW 34 039 02 5	
Well Owner's Name: RICHARSON, JACK		Location in Quarter: 0 M from Boundary	
P.O. Box Number: Mailing Address: NORTH END SYLVAN LAKE, OLDS		0 M from Boundary	
City: Province: Country:		Lot Block Plan	
3. Drilling Information		6. Well Yield	
Type of Work: New Well		Test Date Start Time:	
Reclaimed Well		(yyyy/mm/dd): 1970/08/18 11:00 AM	
Date Reclaimed: Materials Used:		Test Method: Pump	
Method of Drilling: Rotary		Non pumping static level: 5.79 M	
Flowing Well: No Rate: Liters		Rate of water removal: 90.92 Liters/Min	
Gas Present: Oil Present:		Depth of pump intake: 0 M	
4. Formation Log		Water level at end of pumping: 0 M	
Depth from ground level (meters)		Distance from top of CM casing to ground level:	
5.18 Sandy Clay		Depth To water level (meters) Elapsed Time	
6.1 Sand		Drawdown Minutes: Sec Recovery	
15.24 Clay & Boulders		Total Drawdown: 6.4 M	
18.29 Sandstone		If water removal was less than 2 hr duration, reason why:	
5. Well Completion		Recommended pumping rate: 0 Liters/Min	
Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd): 1970/08/18		Recommended pump intake: 0 M	
Well Depth: 18.29 M Borehole Diameter: 0 CM		Type Pump Installed	
Casing Type: Steel Liner Type:		Pump Type:	
Size OD: 12.7 CM Size OD: 0 CM		Pump Model:	
Wall Thickness: 0 CM Wall Thickness: 0 CM		H.P.:	
Bottom at: 15.54 M Top: 0 M Bottom: 0 M		Any further pump test information?	
Perforations			
from: 0 M to: 0 M 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
from: 0 M to: 0 M 0 CM x 0 CM			
Perforated by:			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Seal:			
from: 0 M to: 0 M			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Type: Screen ID: 0 CM			
from: 0 M to: 0 M Slot Size: 0 CM			
Screen Installation Method:			
Fittings			
Top: Bottom:			
Pack:			
Grain Size: Amount: 0			
Geophysical Log Taken:			
Retained on Files:			
Additional Test and/or Pump Data			
Chemistries taken By Driller: No			
Held: 0 Documents Held: 1			
Pitless Adapter Type:			
Drop Pipe Type:			
Length: M Diameter: CM			
Comments:			
7. Contractor Certification			
Driller's Name: UNKNOWN DRILLER			
Certification No.:			
This well was constructed in accordance with the Water			



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362716
 Map Verified: Not Verified
 Date Report: 1976/09/03
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: WEINMAN, GARRY
 Well Location Identifier:
 P.O. Box Number: Mailing Address: 1312 CRAIG RD SW, CALGARY Postal Code:
 City: Province: Country:

Drilling Company Approval No.:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 975.36 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1976/08/13
 Start Time: 11:00 AM
 Test Method: Pump
 Non pumping static level: 14.94 M
 Rate of water removal: 227.3 Liters/Min
 Depth of pump intake: 19.81 M
 Water level at end of pumping: 19.81 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:
 Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

4. Formation Log

Depth from ground level (meters)
Lithology Description
 8.53 Brown Shale
 20.73 Brown Sandstone
 25.91 Gray Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1976/08/12
 Date Completed (yyyy/mm/dd): 1976/08/13
 Well Depth: 25.91 M
 Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel
 Liner Type:
 Size OD: 11.43 CM
 Size OD: 0 CM
 Wall Thickness: 0.36 CM
 Wall Thickness: 0 CM
 Bottom at: 21.64 M
 Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforated by:
 Seal: Driven from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 MEDIUM HARD WATER.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362717
 Map Verified: Not Verified
 Date Report
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: PIERSON, GORDON
 P.O. Box Number: Mailing Address: 12 VARNA PLACE NW, CALGARY T3A 0E8
 City: Province: Country:

Drilling Company Approval No.:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 969.26 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Rotary
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1976/07/15
 Start Time: 11:00 AM
 Test Method: Pump
 Non pumping static level: 9.14 M
 Rate of water removal: 18.18 Liters/Min
 Depth of pump intake: 18.29 M
 Water level at end of pumping: 0 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:
 Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type: HAND PUMP
 Pump Model:
 H.P.:
 Any further pump test information?

4. Formation Log

Depth from ground level (meters)
Lithology Description
 10.67 Clay & Rocks
 25.91 Brown Sandstone
 38.1 Gray Shale & Sandstone

5. Well Completion

Date Started (yyyy/mm/dd): 1976/07/14
 Date Completed (yyyy/mm/dd): 1976/07/15
 Well Depth: 38.1 M Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel
 Liner Type:
 Size OD: 11.43 CM Size OD: 0 CM
 Wall Thickness: 0.36 CM Wall Thickness: 0 CM
 Bottom at: 31.09 M Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M Perforations Size: 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by:
 Seal: Driven from: 0 M to: 31.09 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 SOFT WATER.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362718
 Map Verified: Not Verified
 Date Report: 1981/05/20
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ALBERTA EAGLE DRILLING LTD.
 Mailing Address: BOX 9036
 Well Owner's Name: REID, WILF
 P.O. Box Number:
 City:
 Province:
 Country:
 City or Town: SYLVAN LAKE AB CA
 Well Location Identifier:
 Mailing Address: 23 BAINES CRES, RED DEER
 Postal Code: T4S 1S6
 Drilling Company Approval No.: 117793

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 969.26 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Rotary
 Flowing Well: No
 Gas Present:
 Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters
 Materials Used:
 Rate: Liters
 Oil Present:

6. Well Yield

Test Date (yyyy/mm/dd): 1981/04/30
 Start Time: 11:00 AM
 Test Method: Pump
 Non pumping static level: 23.47 M
 Rate of water removal: 45.46 Liters/Min
 Depth of pump intake: 30.48 M
 Water level at end of pumping: 27.43 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 3.96 M
 If water removal was less than 2 hr duration, reason why:
 Recommended pumping rate: 45.46 Liters/Min
 Recommended pump intake: 30.48 M
 Type Pump Installed
 Pump Type: SUB
 Pump Model:
 H.P.:
 Any further pump test information?

4. Formation Log

Depth from ground level (meters)
 Lithology Description
 3.66 Clay
 9.14 Shale
 33.53 Brown Sandstone
 45.72 Shale & Sandstone Ledges

5. Well Completion

Date Started (yyyy/mm/dd): 1981/04/28
 Date Completed (yyyy/mm/dd): 1981/04/30
 Well Depth: 45.72 M
 Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel
 Liner Type:
 Size OD: 11.43 CM
 Size OD: 0 CM
 Wall Thickness: 0.36 CM
 Wall Thickness: 0 CM
 Bottom at: 37.19 M
 Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforations from: 0 M to: 0 M
 Perforations Size: 0 CM x 0 CM
 Perforated by:
 Seal: Driven from: 0 M to: 37.19 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type: Length: M Diameter: CM
 Comments:
 MEDIUM HARD WATER.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362720
 Map Verified: Not Verified
 Date Report
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ERICKSON & KANGAS
 Mailing Address: UNKNOWN
 Well Owner's Name: GOUTHEAU, DENNIS
 P.O. Box Number:
 City: Province: Country:
 Drilling Company Approval No.: NONE
 City or Town: Postal Code:
 Well Location Identifier:
 Mailing Address: SYLVAN LAKE
 Postal Code:
 Rate: Liters
 Oil Present:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 34 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 980.12 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present:
 Proposed well use:
 Domestic
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1963/06/27
 Start Time: 11:00 AM
 Test Method: Unknown
 Non pumping static level: 10.67 M
 Rate of water removal: 45.46 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 0 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0.61 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)
Lithology Description
 3.05 Clay
 12.19 Sandstone
 21.95 Blue Shale
 24.38 Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1963/06/27
 Date Completed(yyyy/mm/dd):
 Well Depth: 24.38 M
 Borehole Diameter: 0 CM
 Casing Type: Unknown
 Liner Type:
 Size OD: 11.43 CM
 Size OD: 0 CM
 Wall Thickness: 0 CM
 Wall Thickness: 0 CM
 Bottom at: 17.37 M
 Top: 0 M Bottom: 0 M
 Perforations
 from: 0 M to: 0 M
 from: 0 M to: 0 M
 from: 0 M to: 0 M
 Perforations Size:
 0 CM x 0 CM
 0 CM x 0 CM
 0 CM x 0 CM
 Perforated by:
 Seal: Loose
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type:
 from: 0 M to: 0 M
 Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 SOFT WATER.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362728
 Map Verified: Map
 Date Report: 1975/01/03
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: FORRESTER WATER WELL DRILLING (1981) LTD.
 Mailing Address: RR 1
 Well Owner's Name: BRATTBERG, ELMER
 P.O. Box Number: 300
 City: BENTLEY
 Province:
 Country:
 Drilling Company Approval No.: 2318
 City or Town: RED DEER AB CA
 Well Location Identifier:
 Mailing Address: BENTLEY
 Postal Code:
 Rate: Liters
 Oil Present:
 Proposed well use: Domestic & Stock
 Anticipated Water Requirements/day: 0 Liters

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 35 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 990.6 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present:
 Materials Used:
 Rate: Liters
 Oil Present:
 Proposed well use: Domestic & Stock
 Anticipated Water Requirements/day: 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1974/11/05
 Start Time: 11:00 AM
 Test Method: Bailer
 Non pumping static level: 38.1 M
 Rate of water removal: 95.47 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 50.29 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)
Lithology Description
 12.19 Brown Sandy Clay
 18.29 Gray Conglomerate
 21.95 Brown Sandstone
 24.38 Gray Sandstone
 26.82 Gray Hard Sandstone
 38.1 Gray Sandy Shale
 41.76 Gray Hard Sandstone
 43.28 Dark Gray Water Bearing Shale & Sandstone Ledges
 48.46 Light Gray Bentonitic Shale
 53.95 Water Bearing Coal
 64.01 Light Gray Bentonitic Shale

5. Well Completion

Date Started (yyyy/mm/dd): 1974/10/31
 Date Completed (yyyy/mm/dd): 1974/11/05
 Well Depth: 64.01 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type: Steel
 Size OD: 17.78 CM
 Size OD: 14.12 CM
 Wall Thickness: 0.59 CM
 Wall Thickness: 0.79 CM
 Bottom at: 29.26 M
 Top: 0 M Bottom: 64.01 M
 Perforations from: 29.26 M to: 64.01 M
 Perforations Size: 0.95 CM x 15.24 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 from: 0 M to: 0 M
 0 CM x 0 CM
 Perforated by: Torch
 Seal: Driven
 from: 0 M to: 29.26 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 SOFT WATER.

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362729
 Map Verified: Map
 Date Report: 1980/09/03
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: FORRESTER WATER WELL DRILLING (1981) LTD.
 Mailing Address: RR 1
 Well Owner's Name: BRATTBERG, ELMER
 P.O. Box Number: 300
 City: BENTLEY
 Province:
 Country:
 Drilling Company Approval No.: 2318
 City or Town: RED DEER AB CA
 Well Location Identifier:
 Postal Code:
 Mailing Address: BENTLEY
 Postal Code:
 Province:
 Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 35 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 1005.84 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present:
 Proposed well use: Stock
 Anticipated Water Requirements/day
 0 Liters
 Materials Used:
 Rate: Liters
 Oil Present:

6. Well Yield

Test Date (yyyy/mm/dd): 1980/06/12
 Start Time: 11:00 AM
 Test Method: Bailor
 Non pumping static level: 42.67 M
 Rate of water removal: 90.92 Liters/Min
 Depth of pump intake: 57.91 M
 Water level at end of pumping: 51.82 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes:Sec Recovery
 Total Drawdown: 9.14 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)	Lithology Description
0.3	Topsoil
1.52	Yellow Sandy Clay
5.49	Yellow Soft Sandstone
6.1	Yellow Hard Sandstone
10.36	Gray Sandy Clay
15.24	Brownish Gray Sandstone
18.59	Light Brown Coarse Grained Sandstone
20.12	Gray Hard Sandstone
20.42	Gray Fine Grained Sandstone
21.03	Gray Hard Sandstone
23.47	Dark Gray Soft Sandstone
25.6	Gray Sticky Shale
29.26	Blue Sandy Shale
30.78	Gray Water Bearing Sandstone
31.7	Blue Gray Sandy Shale
35.36	Blue Gray Coarse Grained Sandstone
38.71	Gray Sticky Shale
44.5	Blue Sandy Shale
45.72	Gray Carbonaceous Shale
48.77	Blue Shale
51.21	Gray Water Bearing Sandstone
54.56	Blue Gray Water Bearing Shale & Sandstone Ledges
56.69	Blue Gray Water Bearing Sandstone
60.96	Blue Sandy Shale & Sandstone Ledges

5. Well Completion

Date Started (yyyy/mm/dd): 1980/06/09
 Date Completed (yyyy/mm/dd): 1980/06/12
 Well Depth: 60.96 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type: Steel
 Size OD: 17.78 CM
 Size OD: 14.12 CM
 Wall Thickness: 0.59 CM
 Wall Thickness: 0.79 CM
 Bottom at: 32.31 M
 Top: 0 M Bottom: 60.96 M
 Perforations from: 35.66 M to: 60.96 M
 Perforations Size: 0.95 CM x 15.24 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by: Torch
 Seal: Driven
 from: 0 M to: 32.31 M
 Seal:
 from: 0 M to: 0 M
 Seal:
 from: 0 M to: 0 M
 Screen Type:
 from: 0 M to: 0 M Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Type:
 from: 0 M to: 0 M Screen ID: 0 CM
 Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 1 Documents Held: 2
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362731
 Map Verified: Map
 Date Report
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: ERICKSON ERNFRED
 Drilling Company Approval No.:
 Mailing Address: City or Town: Postal Code:
 Well Owner's Name: BRATTBERG, H. Well Location Identifier:
 P.O. Box Number: Mailing Address: BENTLEY Postal Code:
 City: Province: Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 35 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 996.39 M How Obtain: Estimated

3. Drilling Information

Type of Work: Federal Well Survey
 Reclaimed Well
 Date Reclaimed: Materials Used:
 Method of Drilling: Drilled
 Flowing Well: No Rate: Liters
 Gas Present: Oil Present:

Proposed well use:
 Domestic & Stock
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date Start Time:
 (yyyy/mm/dd): 1932/01/01 11:00 AM
 Test Method: Unknown
 Non pumping static level: 50.29 M
 Rate of water removal: 0 Liters/Min
 Depth of pump intake: 0 M
 Water level at end of pumping: 0 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes: Sec Recovery
 Total Drawdown: 0 M
 If water removal was less than 2 hr duration, reason why:
 Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type: SP E
 Pump Model:
 H.P.:
 Any further pump test information?

4. Formation Log

Depth from ground level (meters)
 Lithology Description

5. Well Completion

Date Started (yyyy/mm/dd): Date Completed (yyyy/mm/dd):
 1932/01/01
 Well Depth: 65.53 M Borehole Diameter: 0 CM
 Casing Type: Galvanized Steel Liner Type:
 Size OD: 5.08 CM Size OD: 0 CM
 Wall Thickness: 0 CM Wall Thickness: 0 CM
 Bottom at: 0 M Top: 0 M Bottom: 0 M
 Perforations from: 0 M to: 0 M Perforations Size: 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by:
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Type: Screen ID: 0 CM
 from: 0 M to: 0 M Slot Size: 0 CM
 Screen Installation Method:
 Fittings Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: No
 Held: 0 Documents Held: 1
 Pitless Adapter Type:
 Drop Pipe Type: Length: M Diameter: CM
 Comments:
 PASKAPOO FORMATION.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water



Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.: 0362730
 Map Verified: Map
 Date Report: 1980/09/03
 Received:
 Measurements: Metric

1. Contractor & Well Owner Information

Company Name: FORRESTER WATER WELL DRILLING (1981) LTD.
 Mailing Address: RR 1
 Well Owner's Name: BRATTBERG, ELMER
 P.O. Box Number: 300
 City:
 Drilling Company Approval No.: 2318
 City or Town: RED DEER AB CA
 Well Location Identifier:
 Mailing Address: BENTLEY
 Postal Code:
 Province:
 Country:

2. Well Location

1/4 or Sec Twp Rge West of
 LSD M
 NW 35 039 02 5
 Location in Quarter
 0 M from Boundary
 0 M from Boundary
 Lot Block Plan
 Well Elev: 1005.84 M
 How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
 Reclaimed Well
 Date Reclaimed:
 Method of Drilling: Cable Tool
 Flowing Well: No
 Gas Present:
 Materials Used:
 Rate: Liters
 Oil Present:
 Proposed well use:
 Domestic & Stock
 Anticipated Water
 Requirements/day
 0 Liters

6. Well Yield

Test Date: (yyyy/mm/dd): 1980/06/09
 Start Time: 11:00 AM
 Test Method: Bailor
 Non pumping static level: 50.29 M
 Rate of water removal: 90.92 Liters/Min
 Depth of pump intake: 68.58 M
 Water level at end of pumping: 56.39 M
 Distance from top of CM casing to ground level:
 Depth To water level (meters)
 Elapsed Time
 Drawdown Minutes:Sec Recovery
 Total Drawdown: 6.1 M
 If water removal was less than 2 hr duration, reason why:

4. Formation Log

Depth from ground level (meters)	Lithology Description
1.22	Dark Brown Sandy Clay
2.44	Light Brown Sandy Clay
4.27	Dark Gray Sticky Clay
6.1	Brownish Gray Clay & Shale
8.53	See Comments Clay & Silt
10.97	Yellow Sticky Clay
13.72	Brown Clay & Shale
15.24	Blue Gray Shale
16.46	Blue Shale
19.2	Clay & Shale
21.03	Brown Soft Sandstone
21.34	Gray Hard Sandstone
22.25	Gray Sandy Shale
23.77	Gray Hard Sandstone
27.74	Gray Sandy Shale & Sandstone
29.57	Gray Sticky Shale
32	Blue Shale
39.32	Gray Sandy Shale
47.24	Gray Sandstone
55.17	Gray Shale & Sandstone Ledges
58.52	Dark Gray Sandstone
61.87	Gray Hard Sandstone
64.31	Black Silty Shale
67.36	Gray Sticky Shale
68.88	Carbonaceous Shale
69.19	Blue Gray Sandy Shale
71.63	Gray Hard Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1980/05/21
 Date Completed(yyyy/mm/dd): 1980/06/09
 Well Depth: 71.63 M
 Borehole Diameter: 0 CM
 Casing Type: Steel
 Liner Type: Steel
 Size OD: 17.78 CM
 Size OD: 14.12 CM
 Wall Thickness: 0.59 CM
 Wall Thickness: 0.79 CM
 Bottom at: 36.88 M
 Top: 0 M Bottom: 71.63 M
 Perforations from: 46.02 M to: 71.63 M
 Perforations Size: 0.95 CM x 15.24 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 from: 0 M to: 0 M 0 CM x 0 CM
 Perforated by: Torch
 Seal: Driven from: 0 M to: 36.88 M
 Seal: from: 0 M to: 0 M
 Seal: from: 0 M to: 0 M
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM Slot Size: 0 CM
 Screen Type: from: 0 M to: 0 M
 Screen ID: 0 CM Slot Size: 0 CM
 Screen Installation Method:
 Fittings
 Top: Bottom:
 Pack:
 Grain Size: Amount: 0
 Geophysical Log Taken:
 Retained on Files:
 Additional Test and/or Pump Data
 Chemistries taken By Driller: Yes
 Held: 0 Documents Held: 2
 Pitless Adapter Type:
 Drop Pipe Type:
 Length: M Diameter: CM
 Comments:
 28'- GRAVEL & COAL CONG. SOFT WATER.

Recommended pumping rate: 0 Liters/Min
 Recommended pump intake: 0 M
 Type Pump Installed
 Pump Type:
 Pump Model:
 H.P.:
 Any further pump test information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
 Certification No.:
 This well was constructed in accordance with the Water

APPENDIX B

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190
Date _____ 200 , Time _____
Owner's Name Nicole Tanner Phone 403-748-4180
Owner's Address RR1 Site 1 Box 1x Bentley TOC QTO
Location, Legal: Lsd NE S 34 Twp 39 R 2 W. 5
Location, GPS: 11UD690800 WTM 5809844 Elev. _____
Well location: Pit ☒ , Inside building _____, Near Dugout _____, Near barn _____
Other _____
Total depth _____ Casing Diam. 82" Casing Material Steel Height above gnd Ø
Casing wall thickness _____ Completion zone _____ to _____
Depth to water, measured _____ Reported _____
Driller _____ Year drilled _____
Pump depth _____ . Pump make _____, HP _____
Intake depth of pump _____ Height csg. above ground _____
Water quality: Hard _____, Med. ☒, Soft _____, Rusty _____, Black, _____ Smell, _____ Other _____
Elect. Conductivity _____ pH _____ Temperature _____ ° C. Water treated? _____
Taste: Good Appearance Clear Gas present? _____ Supply _____
Use of well: Domestic ☒, Livestock (how many) _____, Industrial (type) _____,
Dairy _____, Poultry _____, Commercial _____ Other _____
Seasonal use? Yes _____ No ☒ . Increase in use in last 5 years? _____
Other (specify) _____ . Estimated annual production _____
Any dugouts or springs on property? No

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190

Date _____ 200 , Time _____

Owner's Name Doug/Andrea Hunt, Reg Morse Phone 748-419-6661 (Doug)
Harst Weselley

Owner's Address Site 1 RR1 Box 30 Bentley Tn. Oso

Location, Legal: Lsd NE S 34 Twp 39 R 2 W. 5

Location, GPS: 11U0690770 Wtm 5809859 Elev. _____

Well location: Pit ☒ , Inside building _____, Near Dugout _____, Near barn _____

Other located on Tinner Property

Total depth _____ Casing Diam. 5.65" Casing Material Steel Height above gnd 0

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported _____

Driller Arden Basin Year drilled _____

Pump depth _____ Pump make _____, HP _____

Intake depth of pump _____ Height csg. above ground _____

Water quality: Hard _____, Med. _____, Soft ☒ , Rusty _____, Black, _____ Smell, Sulphur Other _____

Elect. Conductivity _____ pH _____ Temperature _____ ° C. Water treated? _____

Taste: Sulphur Appearance Clear Gas present? _____ Supply _____

Use of well: Domestic ☒ , Livestock (how many) ~30 , Industrial (type) _____,
Dairy _____, Poultry _____, Commercial _____ Other _____

Seasonal use? Yes _____ No ☒ . Increase in use in last 5 years? _____

Other (specify) _____ Estimated annual production _____

Any dugouts or springs on property? No

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190

Date _____ 200 , Time _____

Owner's Name Brian Russell Phone 748-2013

Owner's Address Box 305 Eckville

Location, Legal: Lsd SW S 4 Twp 40 R 2 W. 5

Location, GPS: 11U0688289 UTM5810055 Elev. _____

Well location: Pit ☒ , Inside building _____, Near Dugout _____, Near barn _____

Other East of house

Total depth 300' Casing Diam. _____ Casing Material steel Height above gnd 0

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported _____

Driller Aiken Basin Year drilled 1980

Pump depth ~40'-100' Pump make submersible , HP _____

Intake depth of pump _____ Height csg. above ground _____

Water quality: Hard _____, Med. ☒ , Soft ☒ , Rusty _____, Black, _____ Smell, ☒ Other _____

Elect. Conductivity _____ pH _____ Temperature _____ ° C. Water treated? _____

Taste: No good Appearance color sometimes Gas present? _____ Supply _____

Use of well: Domestic ☒ , Livestock (how many) _____, Industrial (type) _____, Dairy _____, Poultry _____, Commercial _____ Other _____

Seasonal use? Yes _____ No ☒ . Increase in use in last 5 years? _____

Other (specify) _____ Estimated annual production _____

Any dugouts or springs on property? Lots of springs

2nd Well

- SW of house
- Livestock
- Casing 4' above gnd
- early 1970
- 30-40' to water

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190

Date _____ 200 , Time _____

Owner's Name Brian Russell Phone 748-2013

Owner's Address Box 305 Eckville

Location, Legal: Lsd SE S 4 Twp 40 R 2 W. 5

Location, GPS: 1140688881 UTM 5809990 Elev. _____

Well location: Pit _____, Inside building ☒, Near Dugout _____, Near barn _____

Other _____

Total depth _____ Casing Diam. _____ Casing Material Steel Height above gnd 0

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported _____

Driller _____ Year drilled ~1940

Pump depth _____ Pump make _____, HP _____

Intake depth of pump _____ Height csg. above ground _____

Water quality: Hard _____, Med. _____, Soft ☒, Rusty _____, Black, _____ Smell, _____ Other _____

Elect. Conductivity _____ pH _____ Temperature _____ ° C. Water treated? _____

Taste: Good Appearance clear Gas present? _____ Supply _____

Use of well: Domestic ☒, Livestock (how many) _____, Industrial (type) _____,
Dairy _____, Poultry _____, Commercial _____ Other _____

Seasonal use? Yes _____ No ☒. Increase in use in last 5 years? _____

Other (specify) _____ Estimated annual production _____

Any dugouts or springs on property? Dugout east of house

Well 2

- located behind shed
- livestock

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190

Date _____ 200 , Time _____

Owner's Name Ralph Noves Phone 748-2222

Owner's Address Box 1 Site 1 RRI Bentley

Location, Legal: Lsd SW S 3 Twp 40 R 2 W. 5

Location, GPS: 11U0689351 UTM5810009 Elev. _____

Well location: Pit _____, Inside building _____, Near Dugout _____, Near barn _____

Other N of house

Total depth _____ Casing Diam. 4.5" Casing Material Steel Height above gnd 8"

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported 130'

Driller Cliff Richmond Year drilled ~1982

Pump depth _____ Pump make _____, HP _____

Intake depth of pump _____ Height csg. above ground _____

Water quality: Hard _____, Med. ☒, Soft _____, Rusty _____, Black, _____ Smell, _____ Other _____

Elect. Conductivity _____ pH _____ Temperature _____ °C. Water treated? _____

Taste: Good Appearance Clear Gas present? _____ Supply _____

Use of well: Domestic ☒, Livestock (how many) _____, Industrial (type) _____,
Dairy _____, Poultry _____, Commercial _____ Other _____

Seasonal use? Yes _____ No ☒. Increase in use in last 5 years? _____

Other (specify) _____ Estimated annual production _____

Any dugouts or springs on property? No

WATER WELL QUESTIONNAIRE

Project Name Palms Cove Project No. 113929190

Date _____ 200 , Time _____

Owner's Name Randy Scerpneck Phone 748-2491

Owner's Address RR1 Box 177 Bentley TocoJo

Location, Legal: Lsd SE S 3 Twp 40 R 2 W. 5

Location, GPS: 11U0690599 UTM 5810144 Elev. _____

Well location: Pit _____, Inside building _____, Near Dugout _____, Near barn _____

Other NW of house

Total depth 280' Casing Diam. 6.5" Casing Material Steel Height above gnd 29"

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported 190'

Driller Aiken Basin Year drilled _____

Pump depth _____ Pump make _____, HP _____

Intake depth of pump _____ Height csg. above ground _____

Water quality: Hard _____, Med. ☒, Soft _____, Rusty _____, Black, _____ Smell, _____ Other _____

Elect. Conductivity _____ pH _____ Temperature _____ ° C. Water treated? _____

Taste: Good Appearance Clear Gas present? _____ Supply _____

Use of well: Domestic ☒, Livestock (how many) _____, Industrial (type) _____,
Dairy _____, Poultry _____, Commercial _____ Other _____

Seasonal use? Yes _____ No ☒ Increase in use in last 5 years? _____

Other (specify) _____ Estimated annual production _____

Any dugouts or springs on property? No

APPENDIX C

Well Identification and Location

Owner Name: Qualeo Palm Cove Address: _____ Town: _____ Postal Code: 06-1

Location: 1/4 or L&S: NW 34 SEC: 39 TWP: 2 RGE: 5 W of MER: _____ Lot: _____ Block: _____ Plan: _____ Additional Description: West water well

Measured from Boundary of: ☐ Quarter ☐ Lot GPS Coordinates in Decimal Degrees (NAD-83)
Latitude: 52.40611° Longitude: 114.20817° Elevation: 968m
☐ Hand Held Auto 20-30m ☐ Diff. Corr. Hand Held 5-10m ☐ Surveyed GPS <1m

Drilling Information

Method of Drilling: ☐ Auger ☐ Backhoe/Dug ☐ Boring ☒ Cable Tool ☐ Rotary (air) ☐ Rotary (mud)

Type of Work: ☒ New Well (Producing) ☐ Test Hole or ☐ New Well (Dry) Plugged: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement ☐ Other (Specify): _____
Amount Used: _____
☐ Deepened Well ☐ Reconstructed Well - Well ID (if applicable): _____

Proposed Well Use: ☐ Household (up to 1250 m³/yr with residence on property) ☐ Other (Specify): _____
(Note: All wells, except household wells, must be licensed by Alberta Environment to divert and use groundwater)

Formation Log

Measurements in: ☐ Metric ☒ Imperial

Depth from ground level	Indicate if Water Bearing	Lithology Description
0-12		Clay Brown
12-31		SS Brown
31-36		Shale Brown
36-40		SS Grey
40-55		Shale Grey
55-58		Shale Brown
58-70		SS Brown
70-77		Shale Grey (silty)
77-97	7 GPM	SS Grey
97-116		Shale Grey
116-150	✓	SS Grey
150-160		Shale Grey

Well Completion

Measurements in: ☐ Metric ☒ Imperial

Total Depth Drilled: 160' Finished Well Depth: 160' Start Date: 10/02/12 End Date: 10/02/12

Borehole: Diameter: 6 3/4" From: 0 To: 113
Diameter: 5" From: 113 To: 160'

Surface Casing (if applicable): ☒ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Cement ☐ Other: _____
Size OD: 5 1/2" Wall Thickness: 0.58"
Bottom at: 113'

Well Casing/Liner: ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Other: _____
Size OD: 9 1/2" Wall Thickness: 0.257"
Top at: 80' Bottom at: 160'

Perforations: From: 115' To: 145'
From: _____ To: _____
Size: 3/8" x 12"
Perforated by: ☐ Machine ☐ Saw ☒ Drill

Annular Seal: ☐ Bentonite Slurry ☒ Bentonite Chips ☐ Cement
Placed From: 0 To: 113
Amount: 10

☐ Drive Shoe, at: 113 ☐ Welded Ring, at: _____
☐ Shale Trap, at: _____ ☐ Other, at: _____

Screen Type: ☐ Stainless Steel ☐ PVC
Size OD: _____
Interval From: _____ To: _____ Slot Size: _____
Interval From: _____ To: _____ Slot Size: _____
☐ Telescoped ☐ Attached to Casing
Top Fittings: ☐ Pecker ☐ Coupler Bottom Fittings: ☐ Wash-down ☐ Ball ☐ Plug

Pack: ☐ Artificial/Mechanical ☒ Natural Grain Size: _____ Amount: _____

Yield Test

Test Date: 10/02/12 Start Time: 2:30 am Distance From Top of Casing to Ground Level: 3 m ☐ Imperial ☒ Metric Static Water Level: 104 m ☐ Imperial ☒ Metric Taken From: ☐ Top of Casing ☐ Ground Level

☐ Artesian Flow ☐ Yes, flow control installed Describe: _____

Rate: _____ L/min or gpm

Method of Water Removal: ☒ Pump ☐ Bailor ☐ Air
Pumping Rate: 43 L/min ☒ gpm Water Removal Rate: _____ L/min ☒ gpm Air Removal Rate: 43 L/min ☒ gpm
Depth Pumped From: 130 m ☒ Depth Bailed From: _____ m ☒ Depth Air Tested From: 160 m ☒

If water removal period was <2 hours, explain why: _____

Recommended Pump Rate: 10 L/min or ☒ gpm Pump installed ☐ Yes ☐ No Depth: _____
Recommended Pump Intake Depth (From TOC): 130 m ☒ Type: _____ Model: _____ H.P.: _____

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: _____ m ☒ Well Disinfected Upon Completion
☐ Gas Depth: _____ m ☐ Electric ☐ Gamma
Remedial Action Taken: _____ ☐ Other (Specify): _____

Additional Comments on Well: _____
Sample Collected for Potability: ☐ Yes (Result Attached) ☐ No

Water Diverted for Drilling: Water Source: Shop Amount Taken: 1200 Diversion Date: 10/02/12 Time: 7:00 am

Contractor Certification: ☒ Copy of Drilling Report Given to Owner
Name of Drilling Report responsible for drilling/construction of well: _____ Certification No: 83061A
Company Name: Alken Basin Drilling Ltd 966

I certify that this well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this record is true and describes the works and hydrologic conditions at the time of well completion only.

Approval Holder Signature: [Signature] Date: 10/02/12

Depth to water level	Pumping	Elapsed Time	Recovery
		Minutes	
	104.2	0	130.0
	119.1	1	120.1
	122.6	2	115.4
	124.1	3	111.1
	125.2	4	108.6
	126.3	5	106.0
	126.9	6	107.5
	127.5	7	107.1
	128.4	8	106.8
	129.1	9	106.0
	130.0	10	105.4
	130.0	12	105.1
	130.0	14	104.8
		16	104.6
		18	104.3
		20	104.2
		25	
		30	
		35	
		40	
		50	
		60	
		75	
		90	
		105	
		120	



Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID:

GoA Well Tag No.

Date Report Received

Well Identification and Location

Owner Name: Ameco Palm Cove Address: _____ Town: _____ Postal Code: _____
Location: 14 or 152: NW 34 SEC: 39 TWP: 2 RGE: 5 W of Mer: _____ Lot: _____ Block: _____ Plan: _____ Additional Description: PW-1

Measured from Boundary of: ☐ Quarter ☐ Lot GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 52.40601 Longitude: 114.20737 Elevation: 970m
m/ft from ☐ N ☐ S _____ m/ft from ☐ E ☐ W ☐ Hand Held Auto 20-30m ☐ Off. Corr. Hand Held 5-10m ☐ Surveyed GPS <1m

Drilling Information

Method of Drilling: ☐ Auger ☐ Backhoe/Dug ☐ Boring ☐ Cable Tool ☐ Rotary (air) ☐ Rotary (mud)
Type of Work: ☒ New Well (Producing) ☐ Test Hole or ☐ New Well (Dry) Plugged: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement
Plugged with: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement ☐ Other (Specify): _____
Amount Used: _____
Proposed Well Use: ☐ Household (up to 1250 m3/yr with residence on property) ☐ Other (Specify): _____
☐ Deepened Well ☐ Reconstructed Well - Well ID (if applicable): _____
(Note: All wells, except household wells, must be licensed by Alberta Environment to divert and use groundwater)

Formation Log

Measurements in: ☐ Metric ☒ Imperial

Depth from ground level	Indicate if Water Bearing	Lithology Description
0-12		Clay Brown
12-22		Shale Brown (silty)
22-34		SS Brown
34-40		Shale Grey
40-47		SS Grey
47-62		Shale Grey
62-68		SS Brown
68-72		Shale Grey
72-76		SS Grey Brown
76-83		Shale Grey
83-105	760M	SS Grey Brown
105-121		Shale Grey
121-147		SS Grey
147-160		Shale Grey

Well Completion Measurements in: ☐ Metric ☒ Imperial

Total Depth Drilled: 160 Finished Well Depth: 160 Start Date: 10/02/11 End Date: 10/02/11

Borehole: Diameter: 6 3/4" From: 0 To: 117'
Diameter: 5" From: 117' To: 160'

Surface Casing: (If applicable) ☒ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Cement ☐ Other: _____
Well Casing/Liner: ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Other: _____
Size OD: 4 1/2" Wall Thickness: 0.257"
Top at: 100' Bottom at: 160'

Perforations: From: 120 To: 145'
From: _____ To: _____
Size: 3/8" X 18"
Perforated by: ☐ Machine ☐ Saw ☒ Drill

Annular Seal: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement
Placed From: 0 To: 117'
Amount: 10
☒ Drive Shoe, at: 117' ☐ Welded Ring, at: _____
☐ Shale Trap, at: _____ ☐ Other, at: _____

Screen Type: ☐ Stainless Steel ☐ PVC
Size OD: _____
Interval From: _____ To: _____ Slot Size: _____
Interval From: _____ To: _____ Slot Size: _____
☐ Telescoped ☐ Attached to Casing
Top Fittings: ☐ Packer ☐ Coupler Bottom Fittings: ☐ Wash-down ☐ Ball ☐ Plug

Pack: ☐ Artificial/Mechanical ☐ Natural Grain Size: _____ Amount: _____

Yield Test

Test Date: 10/02/11 Start Time: 3:30 am/pm am Distance From Top of Casing to Ground Level: 3 m/ft 0 Static Water Level: 111 m/ft 0

Measurements in: ☐ Metric ☒ Imperial Taken From: ☒ Top of Casing ☐ Ground Level

Depth to water level

Pumping Rate	Elapsed Time (Minutes)	Recovery
110.9	0	113.6
112.8	1	108.9
112.8	2	111.1
112.9	3	111.0
113.0	4	111.0
113.1	5	110.9
113.1	6	
113.1	7	
113.2	8	
113.2	9	
113.2	10	
113.2	12	
113.2	14	
113.3	16	
113.3	18	
113.4	20	
113.4	25	
113.4	30	
113.4	35	
113.4	40	
113.4	50	
113.5	60	
113.5	75	
113.5	90	
113.5	105	
113.6	120	

☐ Artesian Flow ☐ Yes, flow control installed Describe: _____
Rate: _____ L/min or gpm

Method of Water Removal: ☒ Pump ☐ Bailer ☐ Air
Pumping Rate: 40 L/min or gpm Water Removal Rate: _____ L/min or gpm Water Removal Rate: 112.80 L/min or gpm
Depth Pumped From: 120 m/ft Depth Bailed From: _____ m/ft Depth Air Tested From: 160 m/ft

If water removal period was <2 hours, explain why: _____

Recommended Pump Rate: 10 L/min or gpm Pump installed ☐ Yes ☐ No Depth: _____
Recommended Pump Intake Depth (From TOC): _____ m/ft Type: _____ Model: _____ H.P.: _____

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: _____ m/ft ☒ Well Disinfected Upon Completion
☐ Gas Depth: _____ m/ft Geophysical Log Taken: ☐ Electric ☐ Gamma ☐ Other (Specify): _____

Remedial Action Taken: _____ Sample Collected for Potability: ☐ Yes ☐ Result Attached ☐ No

Additional Comments on Well: _____

Water Diverted for Drilling

Water Source: Shop Amount Taken: 1200 Diversion Date: 10/02/11 Time: 7:00 am/pm am

Contractor Certification

☒ Copy of Drilling Report Given to Owner
Name of Journeyman responsible for drilling/construction of well: Mike Johnson Certification No: 83061A
Company Name: Alken Basin Drilling LTD 966
I certify that this well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this record is true and describes the works and hydrogeologic conditions at the time of well completion only.
Approval Holder Signature: [Signature] Date: 10/02/11

1 Well Identification and Location

Owner Name: Dunlop (Baker) Corp Address: CR EOS Group Inc. Suite 200, 3203-93 St Town: Edmonton Postal Code: T6N 0B2

Location 1/4 or LSD: NW 34 SEC: 39 TWP: 2 RGE: 5 Lot: 5 Block: 5 Plan: 5 Additional Description:

Measured from Boundary of: ☐ Quarter ☐ Lot GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 53.4060 Longitude: 114.20737 Elevation: 920m
m/ft from ☐ N ☐ S ☐ E ☐ W ☐ Hand Held Auto 20-30m ☐ Diff. Corr. Hand Held 5-10m ☐ Surveyed GPS <1m

2 Drilling Information

Method of Drilling: ☐ Auger ☐ Backhoe/Dug ☐ Boring ☐ Cable Tool ☐ Rotary (air) ☐ Rotary (mud)

Type of Work: ☐ New Well (Producing) ☐ Test Hole or ☐ New Well (Dry) Plugged: YY MM DD
Plugged with: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement ☐ Other (Specify):
Amount Used: _____

Proposed Well Use: ☐ Household (up to 1250 m3/yr with residence on property) ☐ Other (Specify):
(Note: All wells, except household wells, must be licensed Alberta Environment to divert and use groundwater)

☐ Deepened Well ☐ Reconstructed Well - Well ID (if applicable):

3 Formation Log

Depth from ground level	Indicate if Water Bearing	Lithology Description
11-12		Clay Brown
12-22		Shale Brown (silty)
22-34		SS Brown
34-40		SS Green
40-47		SS Green
47-62		Shale Green
62-68		SS Brown
68-72		Shale Green
72-76		SS Grey Brown
76-83		Shale Green
83-105	76PM	SS Grey Brown
105-121		Shale Green
121-147		SS Grey
147-160		Shale Green

4 Well Completion

Measurements in: ☐ Metric ☒ Imperial

Total Depth Drilled: 160 Finished Well Depth: 160 Start Date: 10 MAR 1998 End Date: 10 MAR 1998

Borehole: Diameter: 6 3/4" From: 0 To: 117
Diameter: 5" From: 117 To: 160

Surface Casing: (if applicable) ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Cement ☐ Other:
Size OD: 5 9/16" Wall Thickness: 0.58"
Bottom at: 117

Well Casing/Liner: ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Other:
Size OD: 4 1/2" Wall Thickness: 0.23"
Top at: 100 Bottom at: 160

Perforations: From: 120 To: 145
From: _____ To: _____
Size: 3/8" X 18"
Perforated by: ☐ Machine ☐ Saw ☐ Other:

Annular Seal: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement
Placed From: 0 To: 117
Amount: 1.2

☒ Drive Shoe, at: 117 ☐ Welded Ring, at: _____
☐ Shale Trap, at: _____ ☐ Other, at: _____

Screen Type: ☐ Stainless Steel ☐ PVC
Size OD: _____
Interval From: _____ To: _____ Slot Size: _____
Interval From: _____ To: _____ Slot Size: _____
☐ Telescoped ☐ Attached to Casing
Top Fittings: ☐ Packer ☐ Coupler Bottom Fittings: ☐ Wash-down ☐ Ball ☐

Pack: ☐ Artificial/Mechanical ☐ Natural Grain Size: _____ Amount: _____

5 Yield Test

Test Date: 10/02/98 Start Time: 3:30 am/pm am Distance From Top of Casing to Ground Level: 3 m/ft Static Water Level: 111 m/ft

Measurements in: ☐ Metric ☒ Imperial Taken From: ☐ Top of Casing ☒ Ground Lev

☐ Artesian Flow Rate: _____ L/min or gpm ☐ Yes, flow control installed Describe: _____

Method of Water Removal: ☒ Pump ☐ Bailer ☐ Air
Pumping Rate: 40 L/min or gpm Water Removal Rate: _____ L/min or gpm
Depth Pumped From: 120 m/ft Depth Bailed From: _____ m/ft
Water Removal Rate: 80 L/min or gpm
Depth Air Tested From: 160 m/ft

If water removal period was <2 hours, explain why: _____

Recommended Pump Rate: 10 L/min or gpm Pump Installed ☐ Yes ☐ No Depth: _____
Recommended Pump Intake Depth (From TOC): _____ m/ft Type: _____ Model: _____ H.P.: _____

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: _____ m/ft ☐ Gas Depth: _____ m/ft ☒ Well Disinfected Upon Completion

Remedial Action Taken: _____ Geophysical Log Taken: ☐ Electric ☐ Gamma ☐ Other (Specify): _____

Additional Comments on Well: _____ Sample Collected for Potability: ☐ Yes (☐ Result Attached) ☒ No

6 Water Diverted for Drilling

Water Source: Shpp Amount Taken: 1200 Diversion Date: 10 MAR 1998 Time: 7:00 am/pm

7 Contractor Certification

☒ Copy of Drilling Report Given to Owner
Name of Journeyman responsible for drilling/construction of well: Shirley Korman Certification No: 832061A
Company Name: Alken Basin Drilling Ltd 966

I certify that this well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this record is true and describes the works and hydrogeologic conditions at the time of well completion only.

Approval Holder Signature: _____ Date: 10 MAR 1998

1 Well Identification and Location

Owner Name: Charles (Palm Cove) Address: 810 EDS Group Inc Town: Edmonton Postal Code: T6N 0B2
Location 1/4 or LBD: SEC 34 TWP: 39 RGE: 2 W of MBR: 3 Lot: 3 Block: 3 Plan: 3 Additional Description: West Waterwell
Measured from Boundary of: ☐ Quarter ☐ Lot GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 52.40611 Longitude: 111.20817 Elevation: 968m
m/ft from ☐ N ☐ S ☐ E ☐ W ☐ Hand Held Auto 20-30m ☒ Diff. Corr. Hand Held 5-10m ☐ Surveyed GPS <1m

2 Drilling Information

Method of Drilling: ☐ Auger ☐ Backhoe/Dug ☐ Boring ☐ Cable Tool ☐ Rotary (air) ☐ Rotary (mud)
Type of Work: ☒ New Well (Producing) ☐ Test Hole or ☐ New Well (Dry) Plugged: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement ☐ Other (Specify):
Amount Used: _____
☐ Deepened Well ☐ Reconstructed Well - Well ID (if applicable):
Proposed Well Use: ☐ Household (up to 1250 m3/yr with residence on property) ☐ Other (Specify):
(Note: All wells, except household wells, must be licensed by Alberta Environment to divert and use groundwater)

3 Formation Log

Measurements in: ☐ Metric ☐ Imperial

Depth from ground level	Indicate if Water Bearing	Lithology Description
0-12		Clay Brown
12-31		SS Brown
31-36		Shale Brown
36-40		SS Grey
40-55		Shale Grey
55-58		Shale Brown
58-70		SS Brown
70-77		Shale Grey (clay)
77-97	760m	SS Grey
97-116		Shale Grey
116-150		SS Grey
150-160		Shale Grey

Well Completion Measurements in: ☐ Metric ☐ Imperial

Total Depth Drilled: 160 Finished Well Depth: 160 Start Date: 10/10/10 End Date: 10/10/10

Borehole: Diameter: 6 3/4 From: 0 To: 113
Diameter: 5' From: 113 To: 160

Surface Casing: (if applicable) ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Cement ☐ Other:
Size OD: 5 9/16
Wall Thickness: 0.58"
Bottom at: 113'

Well Casing/Liner: ☐ Steel ☐ Galvanized Steel ☐ PVC ☐ Fiberglass ☐ Other:
Size OD: 4 1/2 Wall Thickness: 0.257
Top at: 80 Bottom at: 160
Perforations: From: 115 To: 145
From: _____ To: _____
Size: 3/8" x 12"
Perforated by: ☐ Machine ☐ Saw ☐ Drill ☐ Other:

Annular Seal: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement
Placed From: 0 To: 113
Amount: 10
☐ Drive Shoe, at: 113 ☐ Welded Ring, at: _____
☐ Shale Trap, at: _____ ☐ Other, at: _____

Screen Type: ☐ Stainless Steel ☐ PVC
Size OD: _____
Interval From: _____ To: _____ Slot Size: _____
Interval From: _____ To: _____ Slot Size: _____
☐ Telescoped ☐ Attached to Casing
Top Fittings: ☐ Packer ☐ Coupler Bottom Fittings: ☐ Wash-down ☐ Ball ☐ Plug

Pack: ☐ Artificial/Mechanical ☐ Natural Grain Size: _____ Amount: _____

4 Yield Test

Test Date: 10/10/10 Start Time: 2:30 am/pm Distance From Top of Casing to Ground Level: 3 m/ft Static Water Level: 104 m/ft

☐ Artesian Flow ☐ Yes, flow control installed Describe: _____
Rate: _____ L/min or gpm

Method of Water Removal: ☒ Pump ☐ Bailor ☐ Air
Pumping Rate: 43 L/min or gpm Water Removal Rate: _____ L/min or gpm Air Removal Rate: 43 L/min or gpm
Depth Pumped From: 130 m/ft Depth Bailed From: _____ m/ft Depth Air Tested From: 160 m/ft

If water removal period was <2 hours, explain why: _____

Recommended Pump Rate: 10 L/min or gpm Pump installed ☐ Yes ☐ No Depth: _____
Recommended Pump Intake Depth (From TOC): 130 m/ft Type: _____ Model: _____ H.P.: _____

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: _____ m/ft ☐ Well Disinfected Upon Completion
☐ Gas Depth: _____ m/ft Geophysical Log Taken: ☐ Electric ☐ Gamma ☐ Other (Specify): _____
Remedial Action Taken: _____
Additional Comments on Well: _____
Sample Collected for Potability: ☐ Yes (Result Attached) ☐ No

5 Water Diverted for Drilling

Water Source: Shop Amount Taken: 1200 Diversion Date: 10/10/10 Time: 7:00 am/pm

6 Contractor Certification

☒ Copy of Drilling Report Given to Owner
Name of Journeyman responsible for drilling/construction of well: Alken Busin Certification No: 83061A
Company Name: Alken Busin Drilling Ltd
☐ I certify that this well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act.
All information in this record is true and describes the works and hydrogeologic conditions at the time of well completion only.
Approval Holder Signature: [Signature] Date: 10/10/10

APPENDIX D

**Stantec**

Stantec Consulting Ltd.
600 - 4808 Ross Street
Red Deer, AB T4N 1X5
Tel. 403-341-3320

Pumping Test - Water Level Data

Page 1 of 3

Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

Location: W1/2-34-39-2-W.5

Pumping Test: Pumping Test 1

Pumping well: PW-1

Test conducted by: Alken Basin Drilling Ltd.

Test date: 2/12/2010

Discharge: variable, average rate 454.89 [m³/d]

Observation well: PW-1

Static water level [m]: -0.10

Radial distance to PW [m]: -

	Time [min]	Water Level [m]	Drawdown [m]
1	2	0.946	1.046
2	4	1.132	1.232
3	6	1.169	1.269
4	8	1.198	1.298
5	10	1.211	1.311
6	12	1.223	1.323
7	14	1.231	1.331
8	16	1.246	1.346
9	18	1.246	1.346
10	20	1.263	1.363
11	24	1.269	1.369
12	30	1.273	1.373
13	34	1.279	1.379
14	40	1.284	1.384
15	44	1.277	1.377
16	50	1.281	1.381
17	60	1.286	1.386
18	70	1.298	1.398
19	80	1.298	1.398
20	90	1.302	1.402
21	100	1.306	1.406
22	120	1.306	1.406
23	140	1.313	1.413
24	160	1.308	1.408
25	180	1.312	1.412
26	210	1.312	1.412
27	240	1.315	1.415
28	270	1.321	1.421
29	300	1.329	1.429
30	330	1.325	1.425
31	360	1.327	1.427
32	420	1.329	1.429
33	480	1.337	1.437
34	540	1.34	1.44
35	600	1.344	1.444
36	660	1.348	1.448
37	720	1.346	1.446
38	780	1.352	1.452
39	840	1.348	1.448
40	960	1.358	1.458
41	1080	1.356	1.456
42	1200	1.365	1.465
43	1320	1.358	1.458
44	1440	1.352	1.452
45	1680	1.358	1.458
46	1920	1.362	1.462



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Red Deer, AB T4N 1X5
Tel. 403-341-3320

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Pumping Test - Water Level Data

Page 2 of 3

Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

	Time [min]	Water Level [m]	Drawdown [m]
47	2160	1.364	1.464
48	2400	1.367	1.467
49	2640	1.363	1.463
50	2880	1.364	1.464
51	3120	1.363	1.463
52	3360	1.379	1.479
53	3600	1.373	1.473
54	3820	1.377	1.477
55	4060	1.388	1.488
56	4300	1.383	1.483
57	4302	0.258	0.358
58	4304	0.185	0.285
59	4306	0.154	0.254
60	4308	0.135	0.235
61	4310	0.123	0.223
62	4312	0.114	0.214
63	4314	0.104	0.204
64	4316	0.098	0.198
65	4318	0.098	0.198
66	4320	0.089	0.189
67	4324	0.085	0.185
68	4330	0.079	0.179
69	4334	0.073	0.173
70	4340	0.068	0.168
71	4350	0.066	0.166
72	4360	0.057	0.157
73	4370	0.053	0.153
74	4380	0.051	0.151
75	4390	0.055	0.155
76	4410	0.047	0.147
77	4430	0.047	0.147
78	4450	0.041	0.141
79	4470	0.037	0.137
80	4500	0.037	0.137
81	4530	0.035	0.135
82	4560	0.033	0.133
83	4590	0.037	0.137
84	4620	0.031	0.131
85	4680	0.031	0.131
86	4740	0.035	0.135
87	4800	0.029	0.129
88	4860	0.03	0.13
89	4920	0.023	0.123
90	5040	0.021	0.121
91	5160	0.019	0.119
92	5280	0.021	0.121
93	5400	0.022	0.122
94	5520	0.026	0.126
95	5760	0.009	0.109
96	6000	0.009	0.109
97	6240	0.007	0.107



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Pumping Test - Water Level Data

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Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

	Time [min]	Water Level [m]	Drawdown [m]
98	6480	0.005	0.105
99	6700	-0.003	0.097
100	6940	-0.007	0.093
101	7180	-0.011	0.089
102	7420	0.007	0.107
103	7680	0.02	0.12
104	7920	0.014	0.114
105	8202	0.007	0.107



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Pumping Test - Water Level Data

Page 1 of 3

Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

Location: W1/2-34-39-2-W.5

Pumping Test: Pumping Test 1

Pumping well: PW-1

Test conducted by: Alken Basin Drilling Ltd.

Test date: 2/12/2010

Discharge: variable, average rate 454.89 [m³/d]

Observation well: OB-1

Static water level [m]: -0.03

Radial distance to PW [m]: 55.04

	Time [min]	Water Level [m]	Drawdown [m]
1	2	0.075	0.105
2	4	0.127	0.157
3	6	0.153	0.183
4	8	0.179	0.209
5	10	0.179	0.209
6	12	0.205	0.235
7	14	0.218	0.248
8	16	0.205	0.235
9	18	0.218	0.248
10	20	0.218	0.248
11	24	0.231	0.261
12	30	0.231	0.261
13	34	0.231	0.261
14	40	0.268	0.298
15	44	0.244	0.274
16	50	0.244	0.274
17	60	0.255	0.285
18	70	0.268	0.298
19	80	0.257	0.287
20	90	0.255	0.285
21	100	0.27	0.30
22	120	0.27	0.30
23	140	0.28	0.31
24	160	0.27	0.30
25	180	0.27	0.30
26	210	0.27	0.30
27	240	0.293	0.323
28	270	0.283	0.313
29	300	0.28	0.31
30	330	0.293	0.323
31	360	0.283	0.313
32	420	0.283	0.313
33	480	0.293	0.323
34	540	0.283	0.313
35	600	0.283	0.313
36	660	0.306	0.336
37	720	0.296	0.326
38	780	0.296	0.326
39	840	0.309	0.339
40	900	0.296	0.326
41	960	0.296	0.326
42	1020	0.309	0.339
43	1140	0.319	0.349
44	1260	0.306	0.336
45	1381	0.296	0.326
46	1442	0.319	0.349



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Pumping Test - Water Level Data

Page 2 of 3

Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

	Time [min]	Water Level [m]	Drawdown [m]
47	1560	0.293	0.323
48	1680	0.306	0.336
49	1800	0.296	0.326
50	1920	0.306	0.336
51	2140	0.293	0.323
52	2380	0.306	0.336
53	2620	0.306	0.336
54	2860	0.293	0.323
55	3098	0.293	0.323
56	3240	0.293	0.323
57	3480	0.306	0.336
58	3720	0.293	0.323
59	3960	0.293	0.323
60	4086	0.306	0.336
61	4300	0.293	0.323
62	4302	0.203	0.233
63	4304	0.151	0.181
64	4306	0.112	0.142
65	4308	0.099	0.129
66	4310	0.099	0.129
67	4312	0.073	0.103
68	4314	0.073	0.103
69	4316	0.073	0.103
70	4318	0.06	0.09
71	4320	0.06	0.09
72	4324	0.047	0.077
73	4330	0.047	0.077
74	4334	0.036	0.066
75	4340	0.036	0.066
76	4350	0.01	0.04
77	4360	0.023	0.053
78	4372	0.023	0.053
79	4390	0.013	0.043
80	4414	0.013	0.043
81	4442	0.013	0.043
82	4472	0.013	0.043
83	4580	0.013	0.043
84	4636	-0.013	0.017
85	4730	-0.013	0.017
86	4796	-0.013	0.017
87	4908	-0.013	0.017
88	5140	-0.013	0.017
89	5492	-0.013	0.017
90	5504	-0.016	0.014
91	5854	-0.016	0.014
92	6084	-0.016	0.014
93	6382	-0.029	0.001
94	6510	-0.016	0.014
95	6876	-0.029	0.001
96	7036	-0.029	0.001
97	7352	-0.029	0.001



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Pumping Test - Water Level Data

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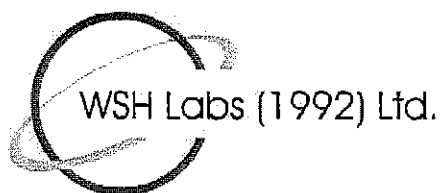
Project: Palms Cove Aquifer test

Number: 113929190

Client: Qualico Developments

	Time [min]	Water Level [m]	Drawdown [m]
98	7456	-0.016	0.014
99	7640	-0.016	0.014
100	8204	-0.016	0.014

APPENDIX E



3851B – 21 Street NE • Calgary, Alberta, Canada • T2E 6T5

Phone: (403) 250-9164 • Fax: (403) 291-4597 • www.wshlabs.com

Alken Basin Drilling

Box 47
Bentley, AB T0C 0J0

Phone: (403) 748-4340

Fax: (403) 748-2880

Email:

Lab Number: 64911

PO Number:

Sample Info: Qualco Palm Cove
New Well
NW-34-39-2-W5

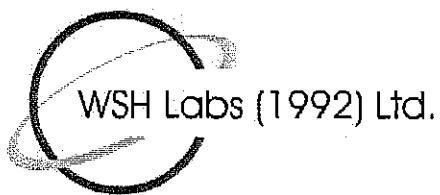
Sampled By: Wade Balon
Date Sampled: 2/18/2010
Date Received: 2/19/2010
Date Reported: 3/1/2010

Analyte	Units	Result	Canadian Drinking Water Guideline Maximum
Calcium	mg/L	12.5	No Guideline
Iron	mg/L	0.04	0.3
Magnesium	mg/L	4.7	No Guideline
Manganese	mg/L	0.02	0.05
Potassium	mg/L	1.2	No Guideline
Sodium	mg/L	175	200
Bicarbonates	mg/L	432	No Guideline
Bromides	mg/L	< 0.1	No Guideline
Carbonates	mg/L	12	No Guideline
Chlorides	mg/L	0.8	250
Fluorides	mg/L	0.50	1.5
Nitrates as N	mg/L	< 0.02	10
Nitrites as N	mg/L	< 0.02	1
NO ₃ + NO ₂ as N	mg/L	< 0.02	No Guideline
Sulfates	mg/L	61	500

Parameter	Units	Result	Canadian Drinking Water Guideline Maximum
Electrical Conductivity	µS/cm	744	No Guideline
pH	pH	8.42	6.5 - 8.5
Hardness (as CaCO ₃)	mg/L	51	No Guideline
Total Alkalinity (as CaCO ₃)	mg/L	378	No Guideline
P-Alkalinity (as CaCO ₃)	mg/L	6	No Guideline
Hydroxide (as CaCO ₃)	mg/L	0	No Guideline
Total Dissolved Solids (calculated)	mg/L	483	500
Sulfides as S	mg/L	< 0.03	0.05
Turbidity	NTU	0.3	1
Color	TCU	< 5	15
Total Kjeldahl Nitrogen	mg/L	< 0.9	No Guideline
Ammonia Nitrogen	mg/L	< 0.9	No Guideline
Total Phosphorus as P	mg/L	< 0.4	No Guideline
Phenol	mg/L	0.1	No Guideline

Microbiology	Units	Result	Canadian Drinking Water Guideline Maximum
Total Coliform	CFU/100 mL	0	Zero / Absent
Escherichia Coliform	CFU/100 mL	0	Zero / Absent

Sum of Cations	8.65	TDS / EC Ratio	0.65
Sum of Anions	8.79	Sodium Adsorption Ratio	10.71
Ion Balance	0.98	Saturation Index	0.60



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Email:

Lab Number: 64911

PO Number:

Sample Info: Qualco Palm Cove
New Well
NW-34-39-2-W5

Sampled By: Wade Balon
Date Sampled: 2/18/2010
Date Received: 2/19/2010
Date Reported: 3/1/2010

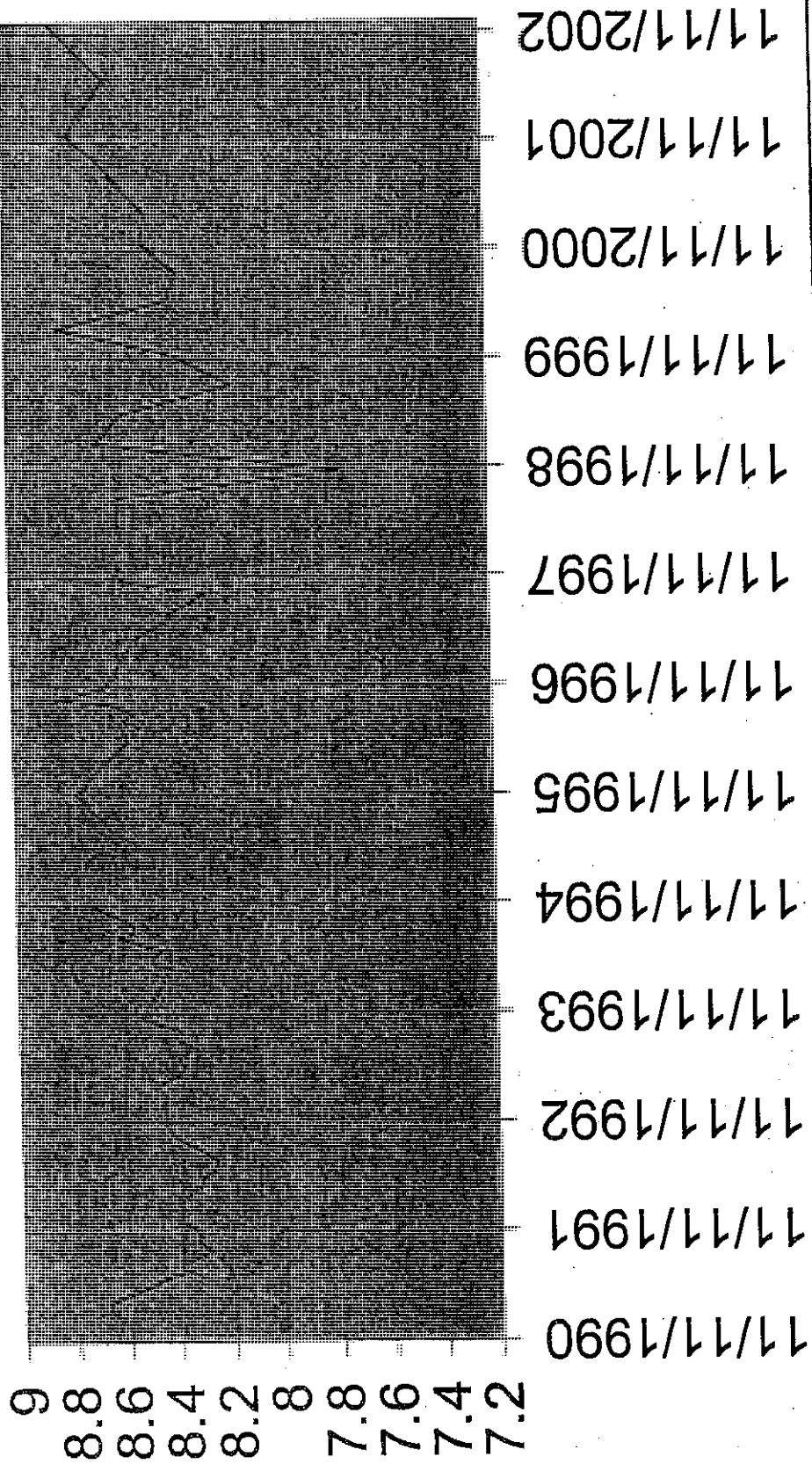
Trace Metals	Units	Result	Canadian Drinking Water Guideline Maximum
Boron	µg/L	222	5000
Aluminum	µg/L	20.2	100
Chromium	µg/L	< 0.1	50
Copper	µg/L	< 0.08	1000
Zinc	µg/L	60.2	5000
Arsenic	µg/L	0.88	10
Selenium	µg/L	0.06	10
Cadmium	µg/L	< 0.05	5
Antimony	µg/L	0.3	6
Barium	µg/L	31.6	1000
Mercury	µg/L	< 0.05	1
Lead	µg/L	< 0.1	10
Uranium	µg/L	< 0.04	20

Certified By: 3W

Accredited by CALA to ISO/IEC 17025 for specific tests. The results above are related only to the items analyzed.
< denotes less than detection limit. TNTC = Too Numerous To Count (>200 colonies).

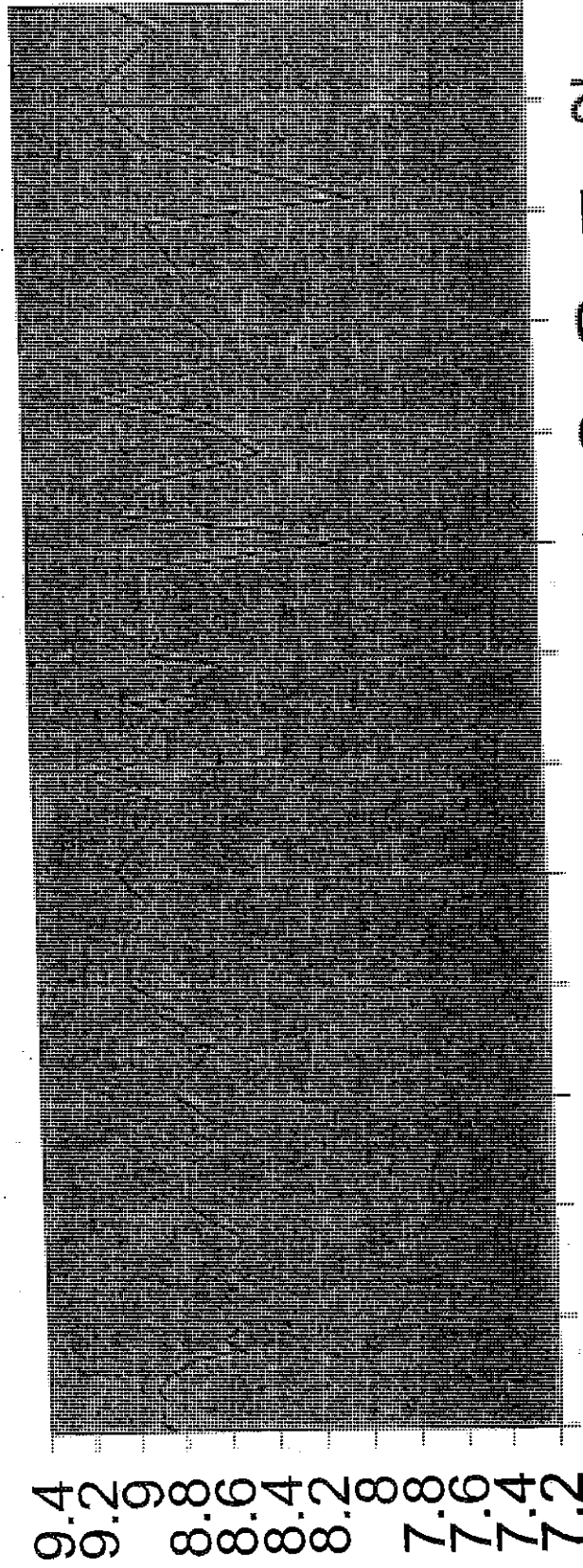
APPENDIX F

Sylvan Lake, 1-32-39-2-W.5, 1-2604E



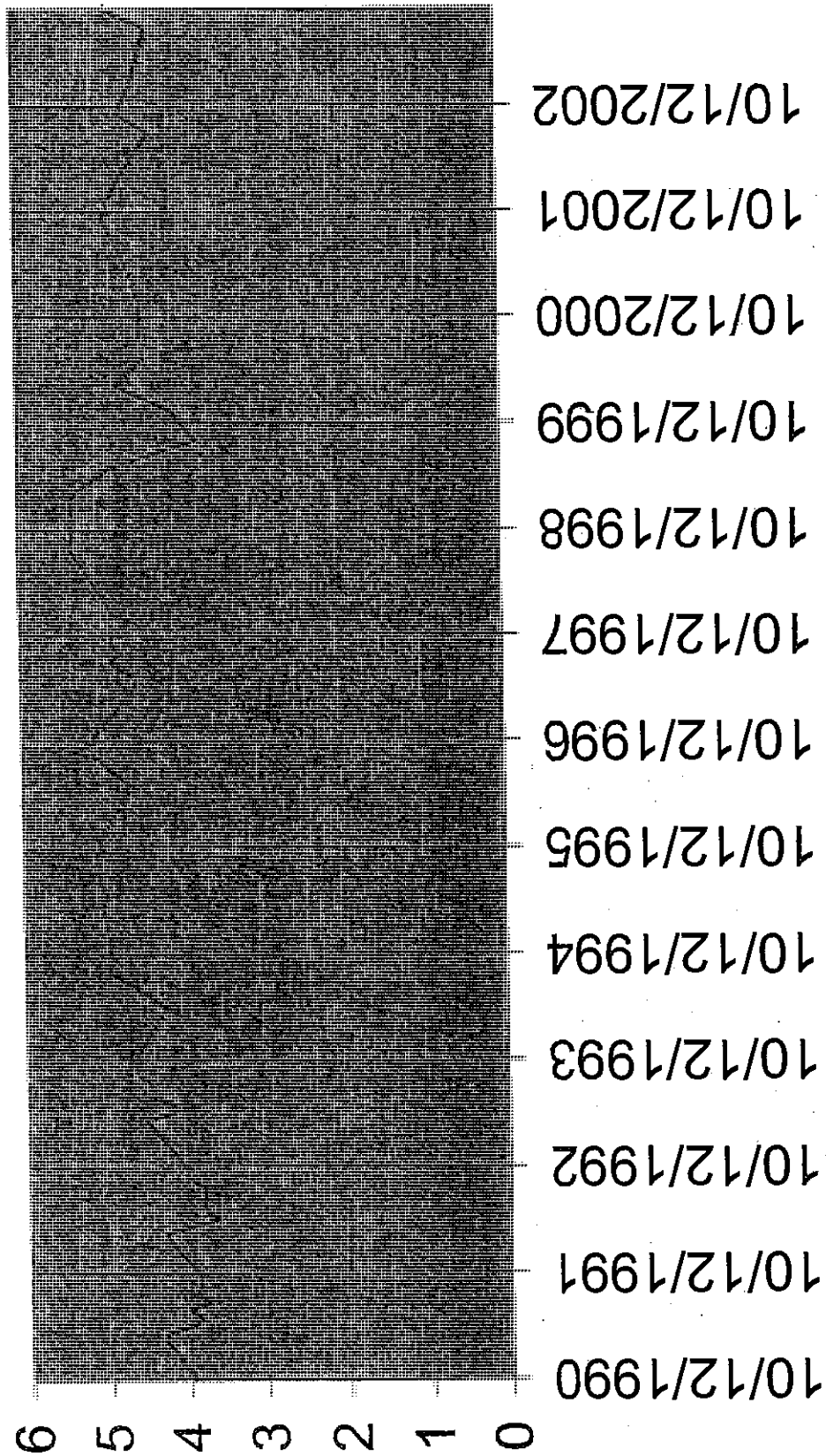
11/11/1990 11/11/1991 11/11/1992 11/11/1993 11/11/1994 11/11/1995 11/11/1996 11/11/1997 11/11/1998 11/11/1999 11/11/2000 11/11/2001 11/11/2002

Sylvan Lake, 1-32-39-2-W.5, 1-2605E

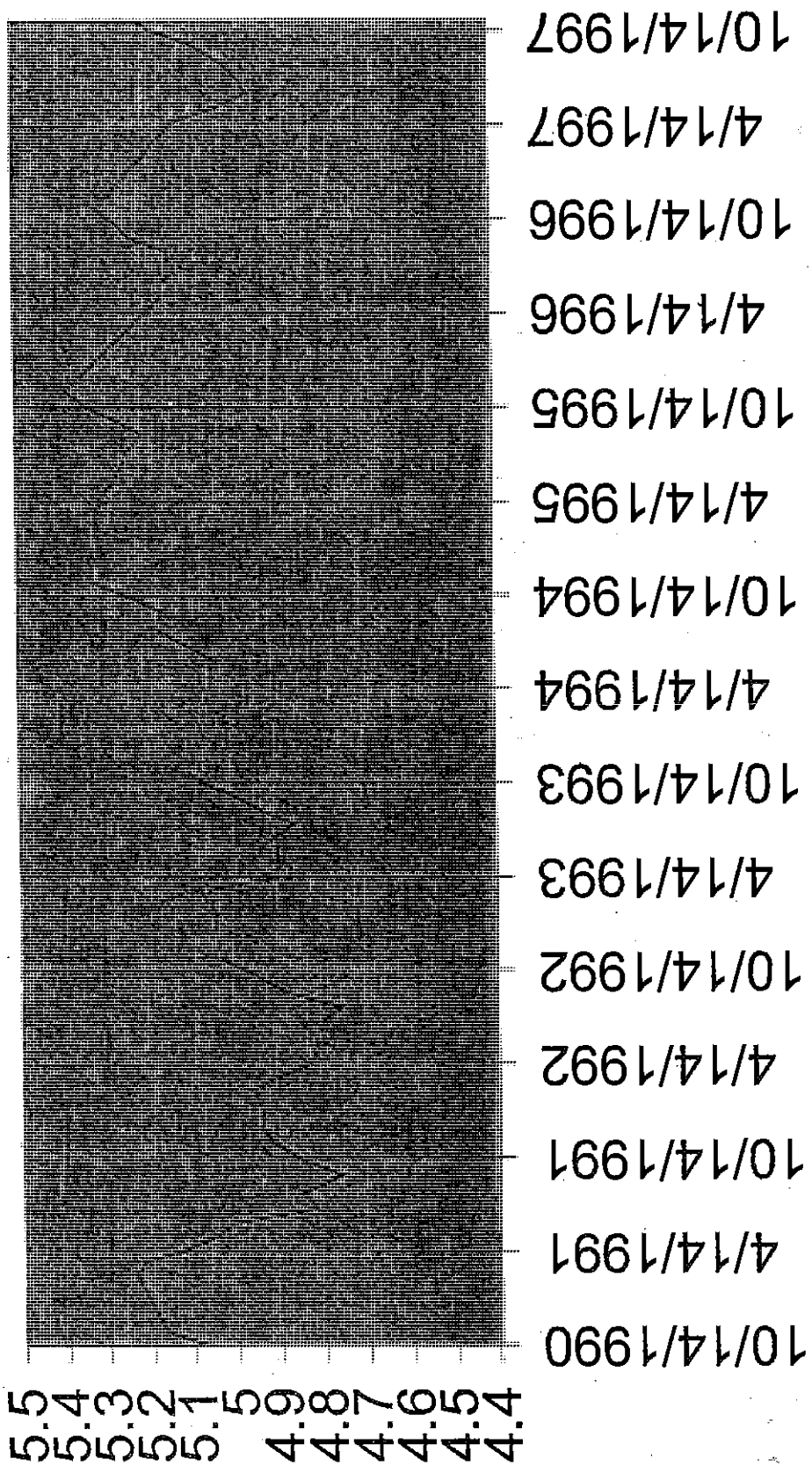


10/12/1990 10/12/1991 10/12/1992 10/12/1993 10/12/1994 10/12/1995 10/12/1996 10/12/1997 10/12/1998 10/12/1999 10/12/2000 10/12/2001 10/12/2002

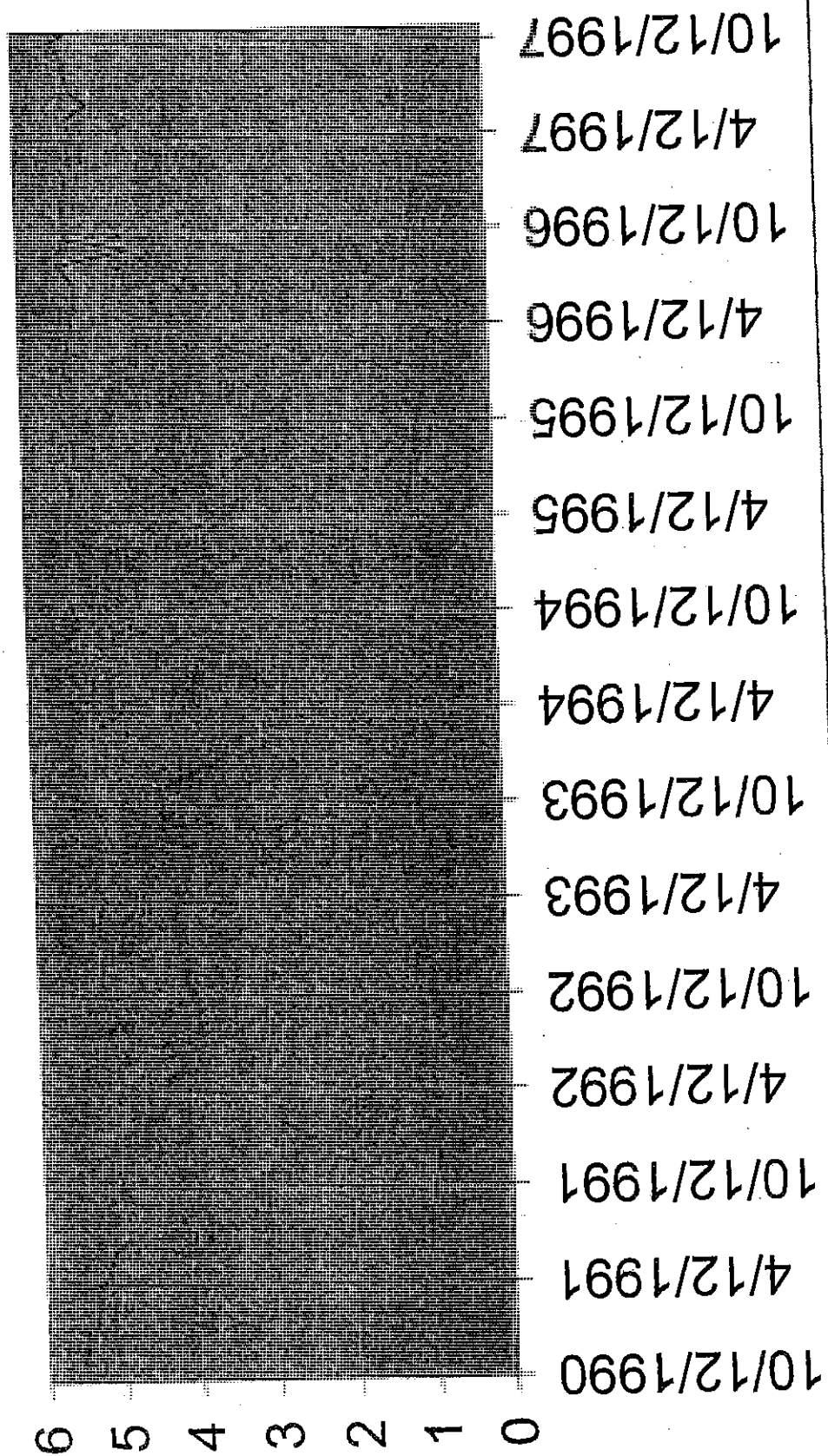
Sylvan Lake, 1-32-39-2-W.5, 1-2606E



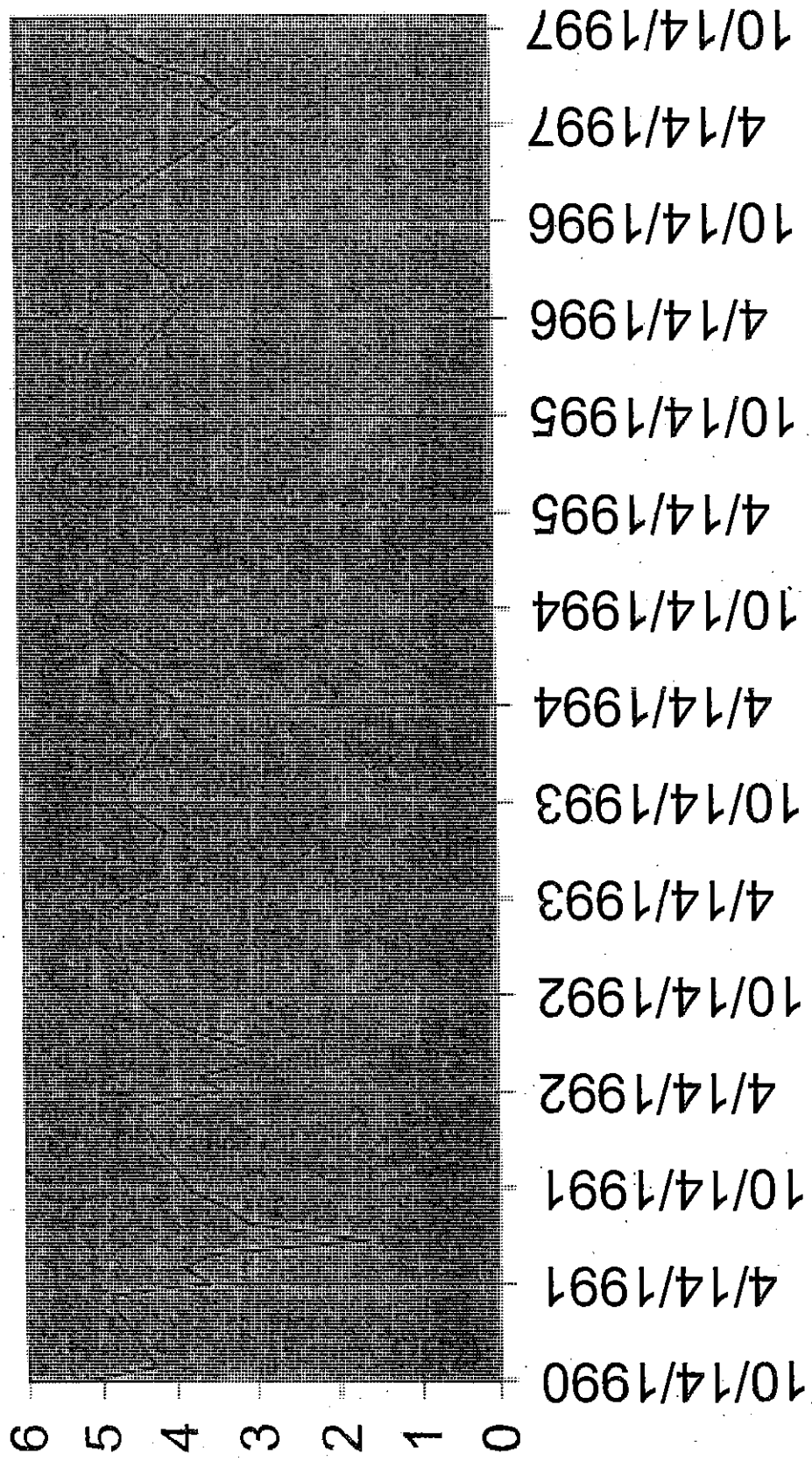
Sylvan Lake, 1-19-39-1-W.5, 2-2609E



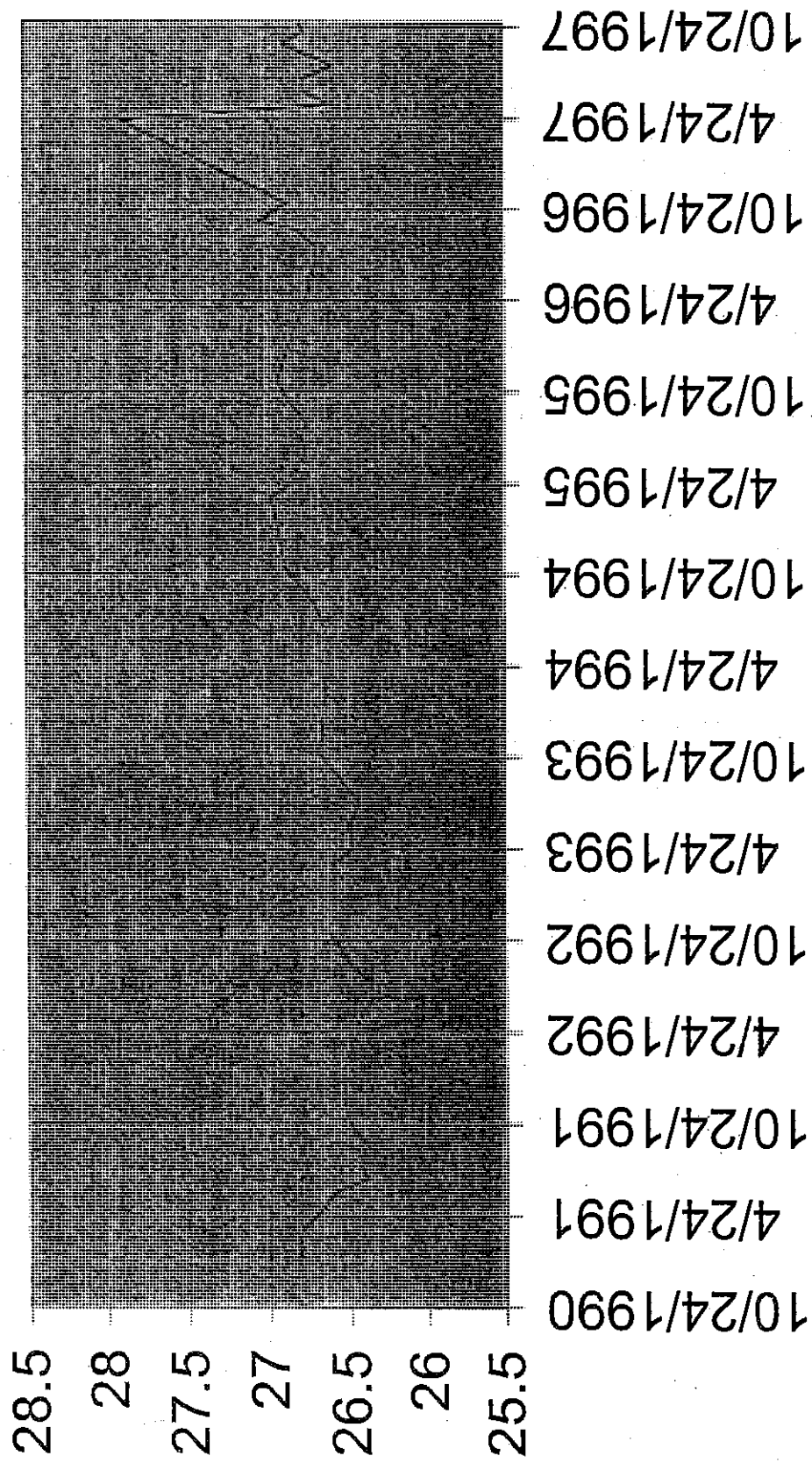
Sylvan Lake, 1-19-39-1-W.5, 2-2610E



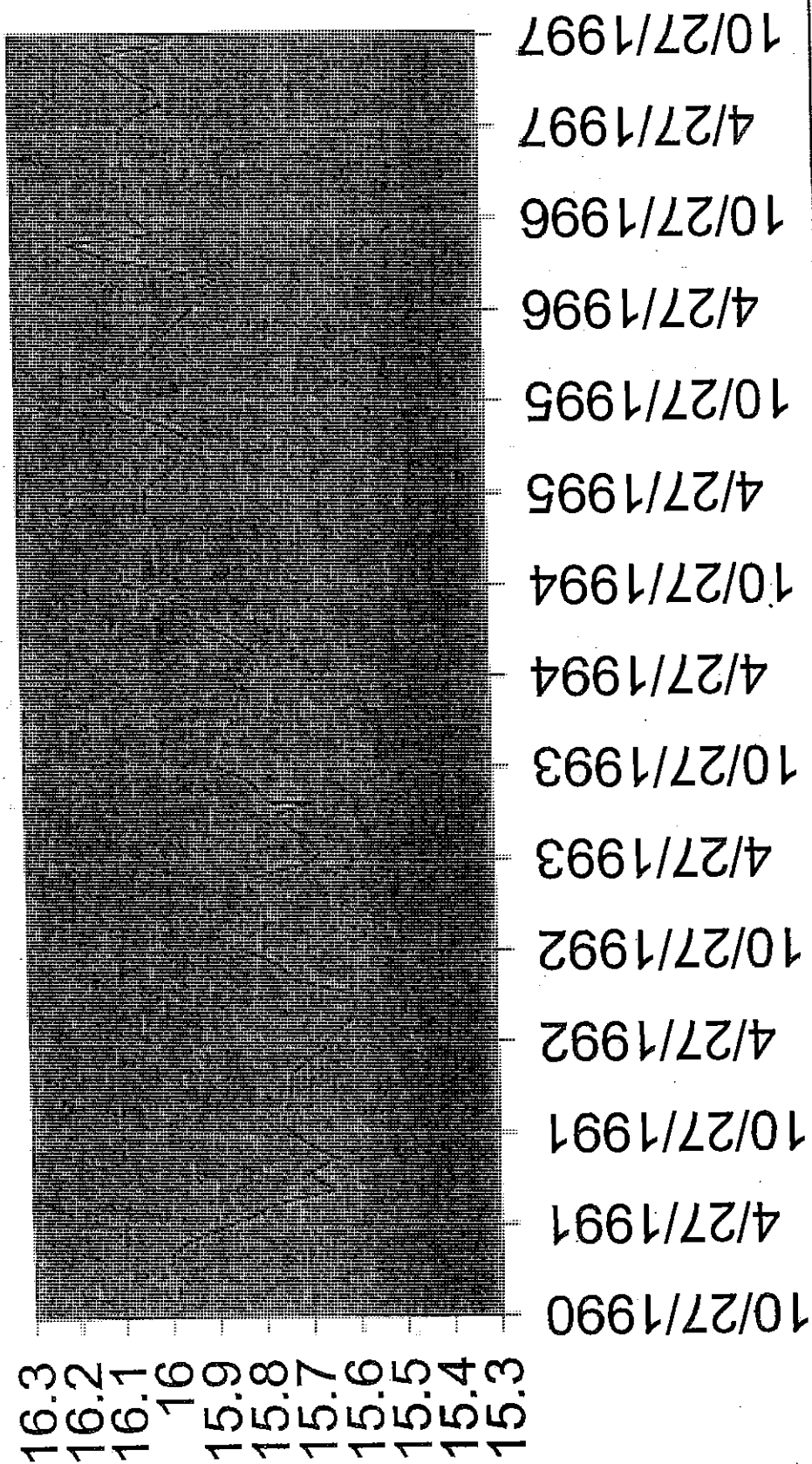
Sylvan Lake, 1-19-39-1-W.5, 2-2611-E



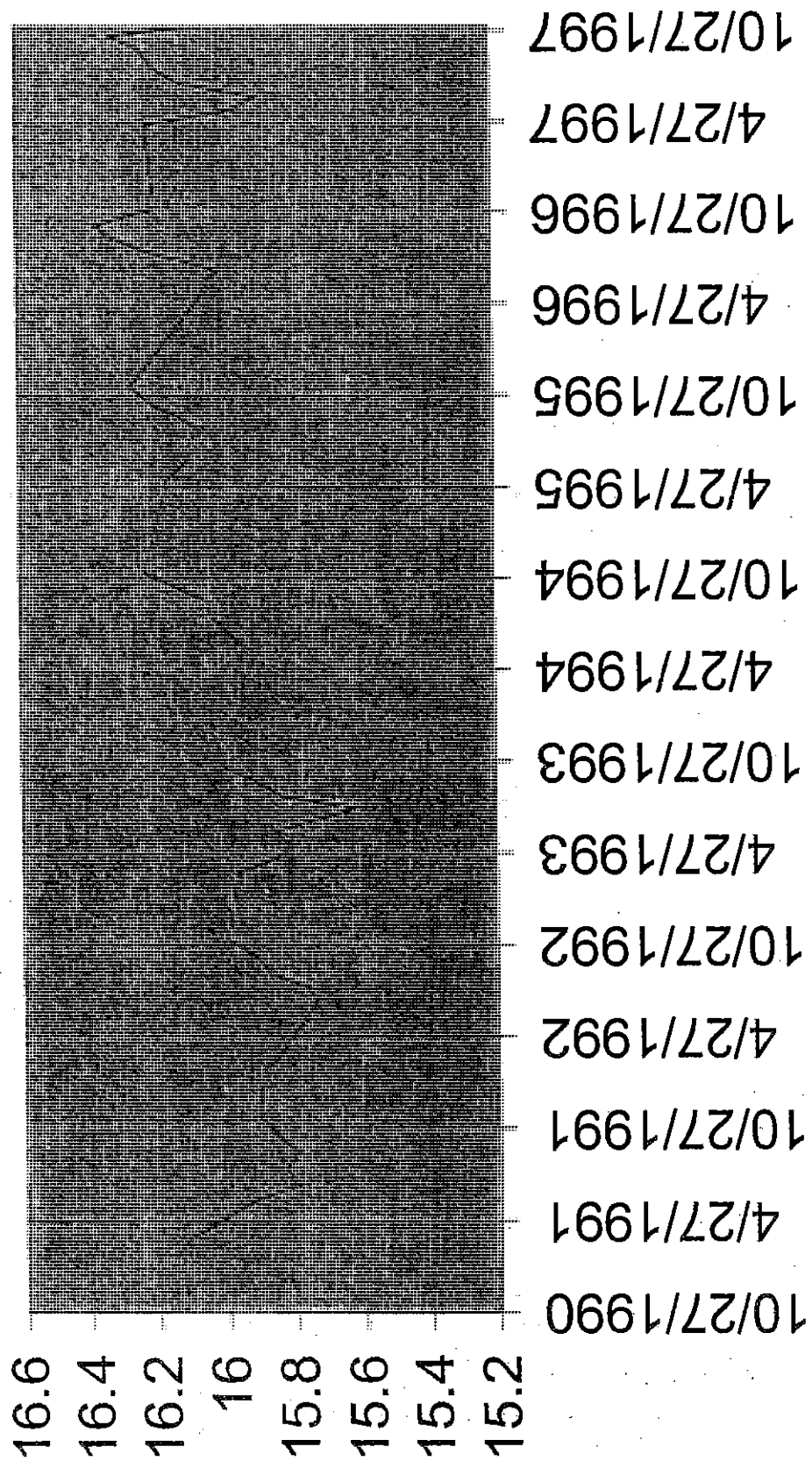
Sylvan Lake, 15-9-39-1-W.5, 3-2613E



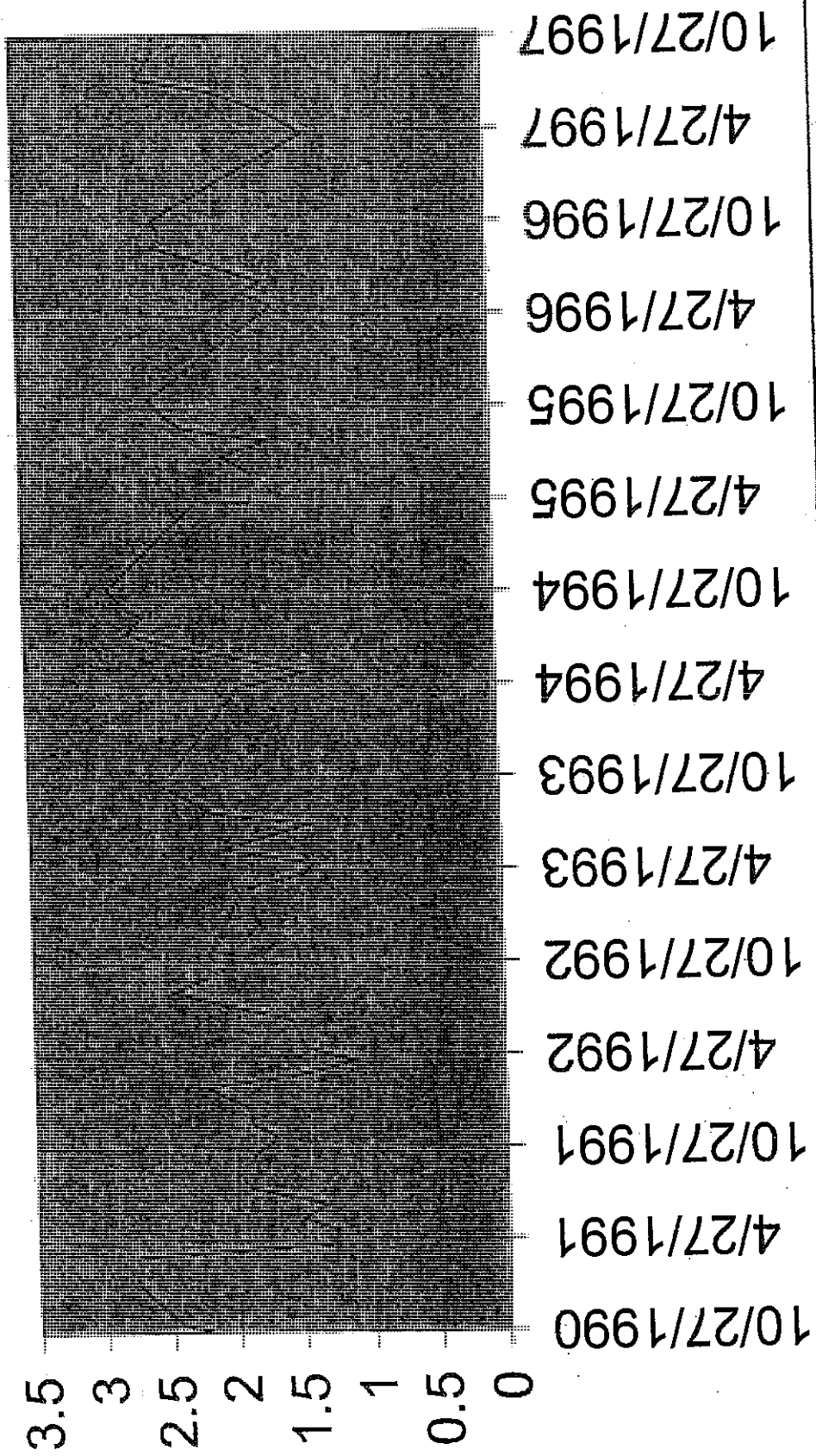
Sylvan Lake, 13-26-39-2-W.5, 4-2616-E



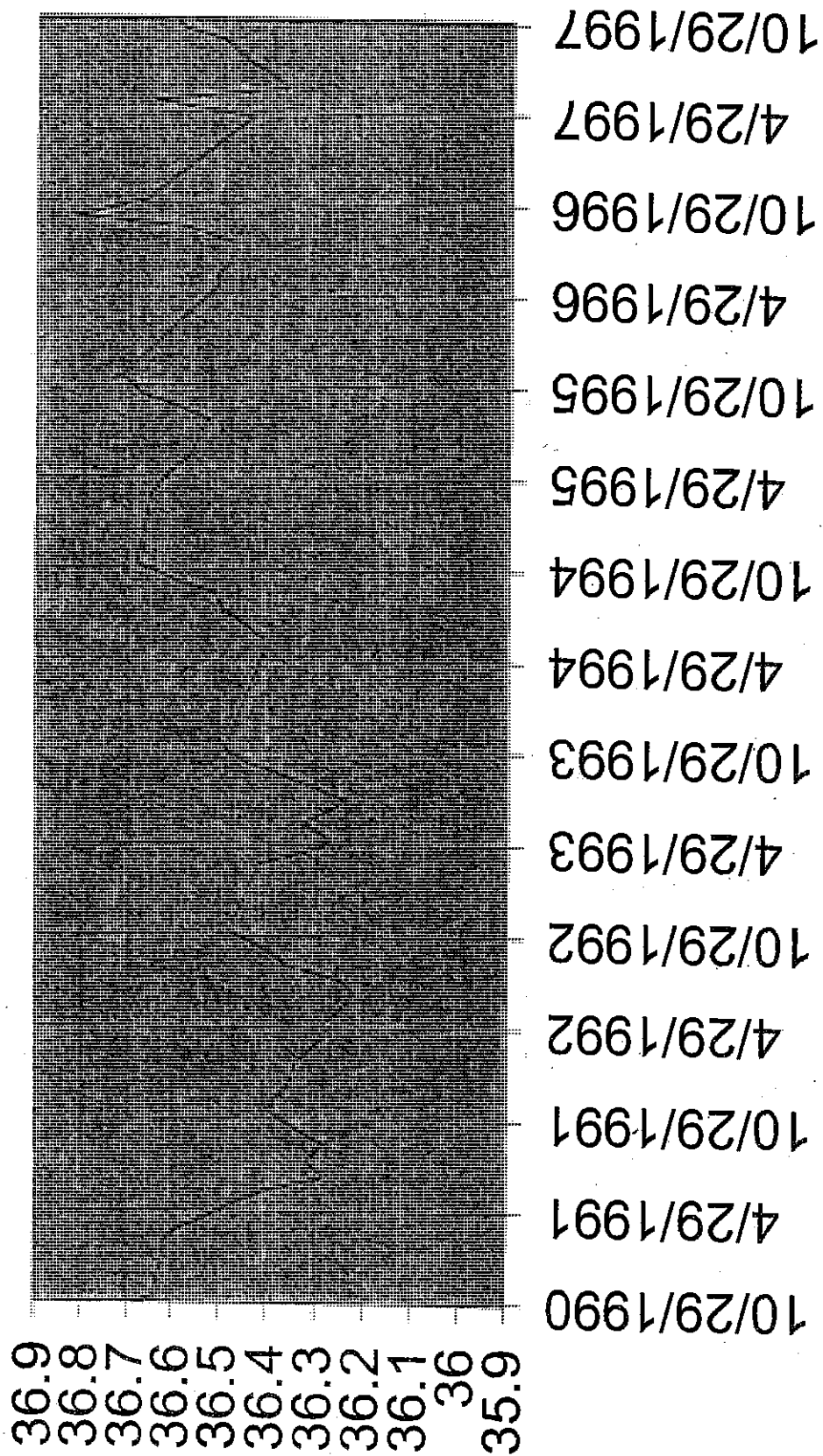
Sylvan Lake, 13-26-39-2-W.5, 4-2617E



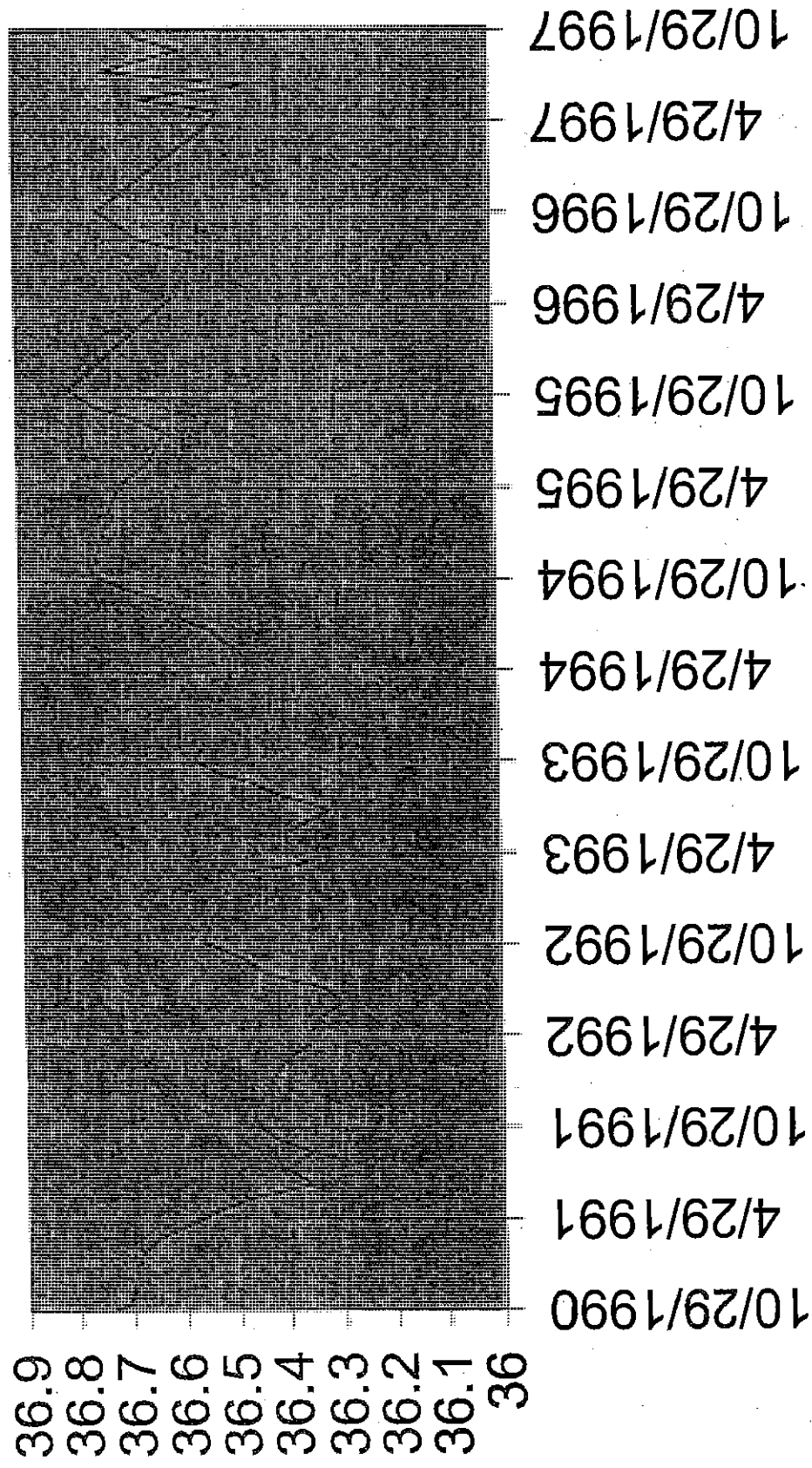
Sylvan Lake, 13-26-39-2-W.5, 4-2618-E



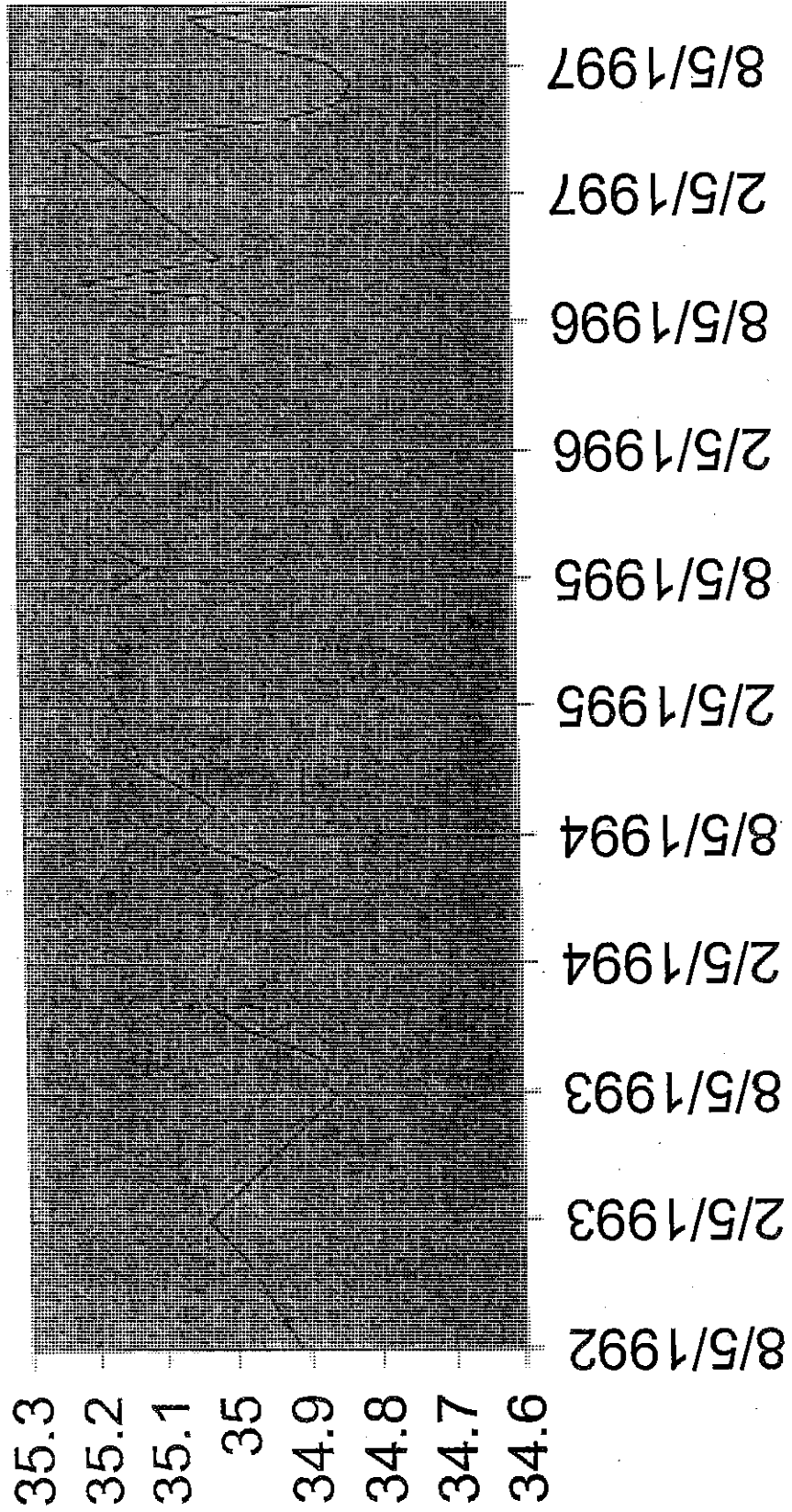
Sylvan Lake, 1-25-39-2-W.5, 5-2619-E



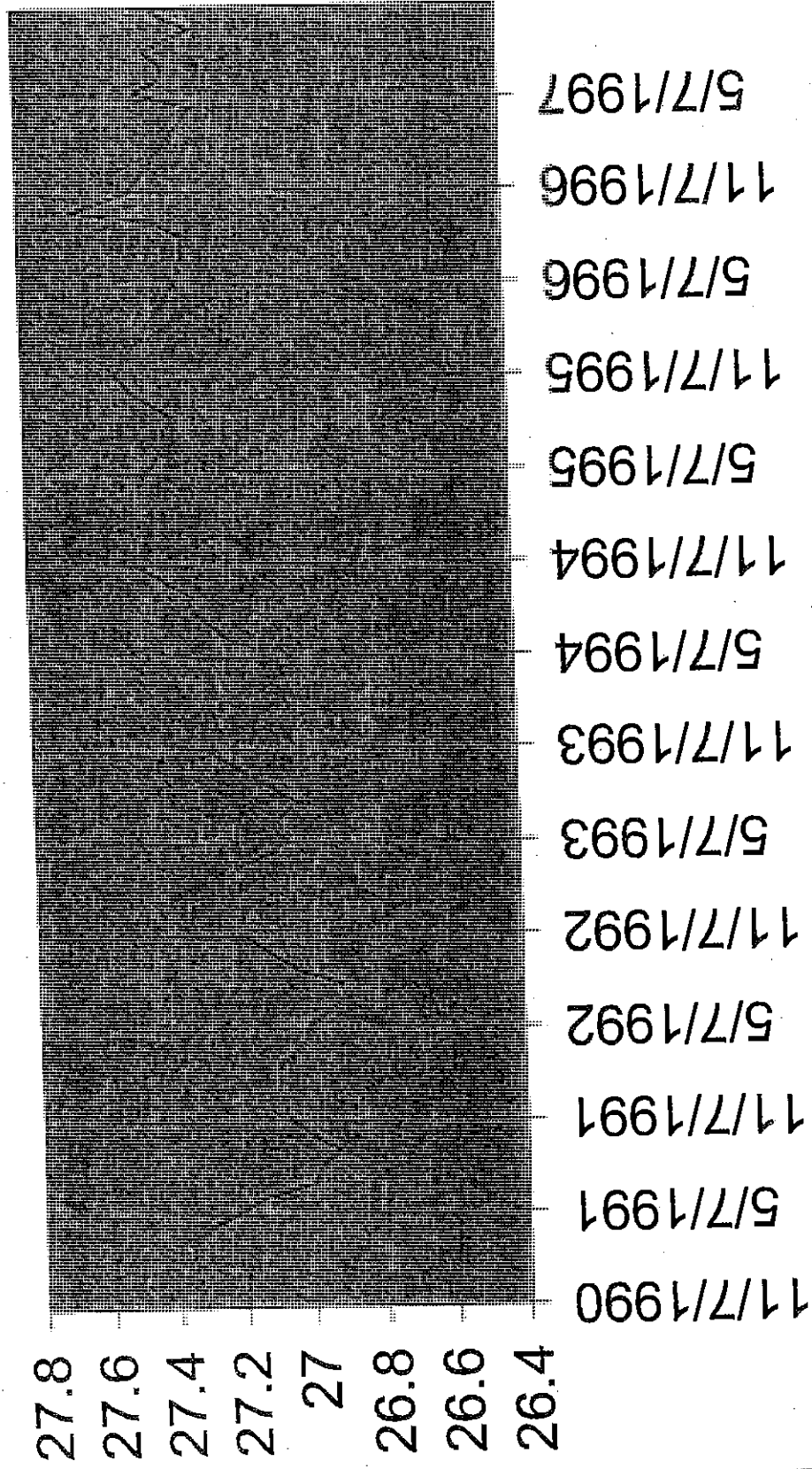
Sylvan Lake, 1-25-39-2-W.5, 5-2620-E



Sylvan Lake, 1-25-39-2-W.5, 5-2621-E

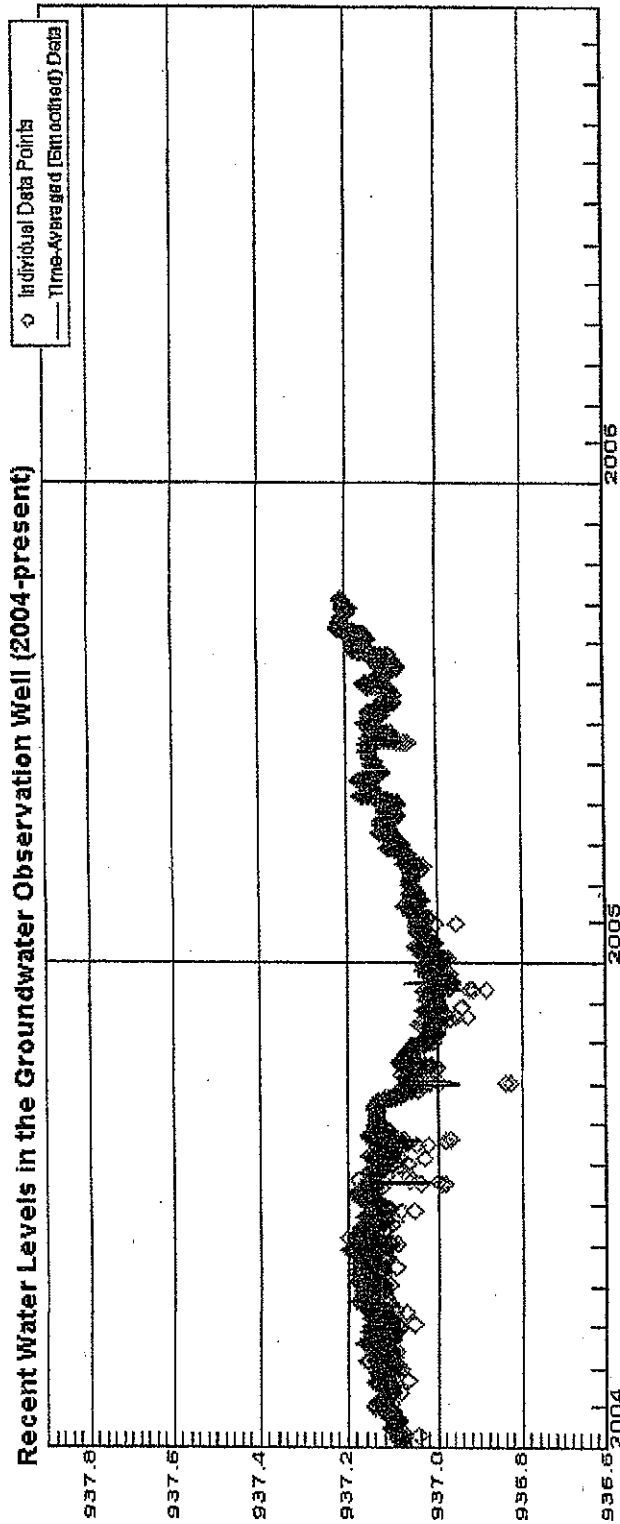


Sylvan Lake, 15-9-39-1-W.5, 3-2622-E

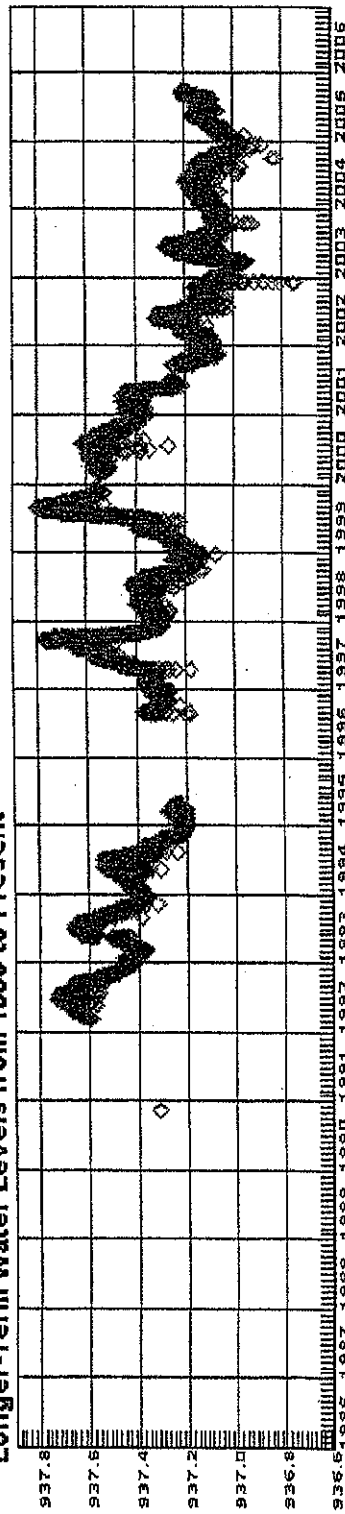


Alberta
Environment

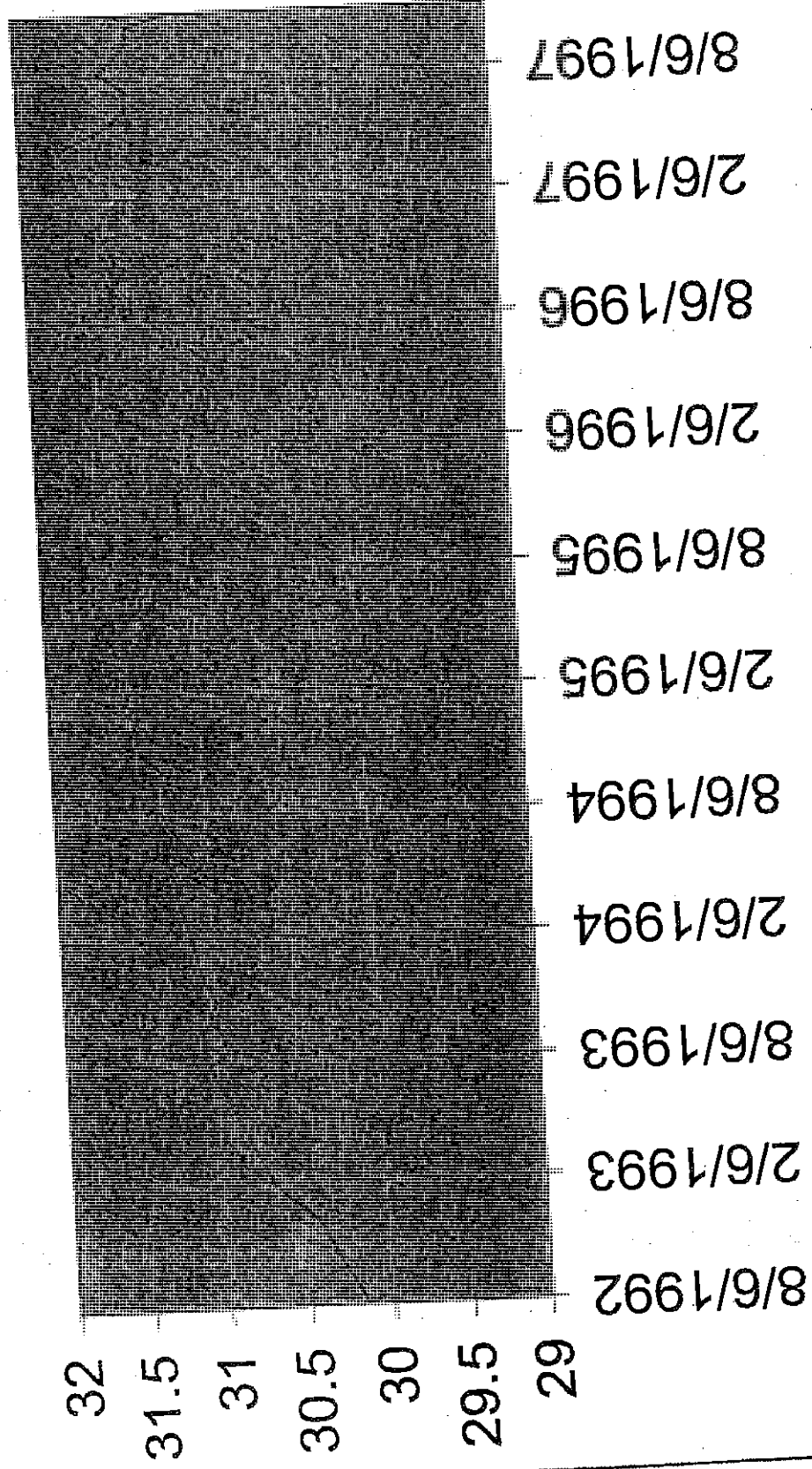
Recent Water Levels in the Groundwater Observation Well (2004-present)



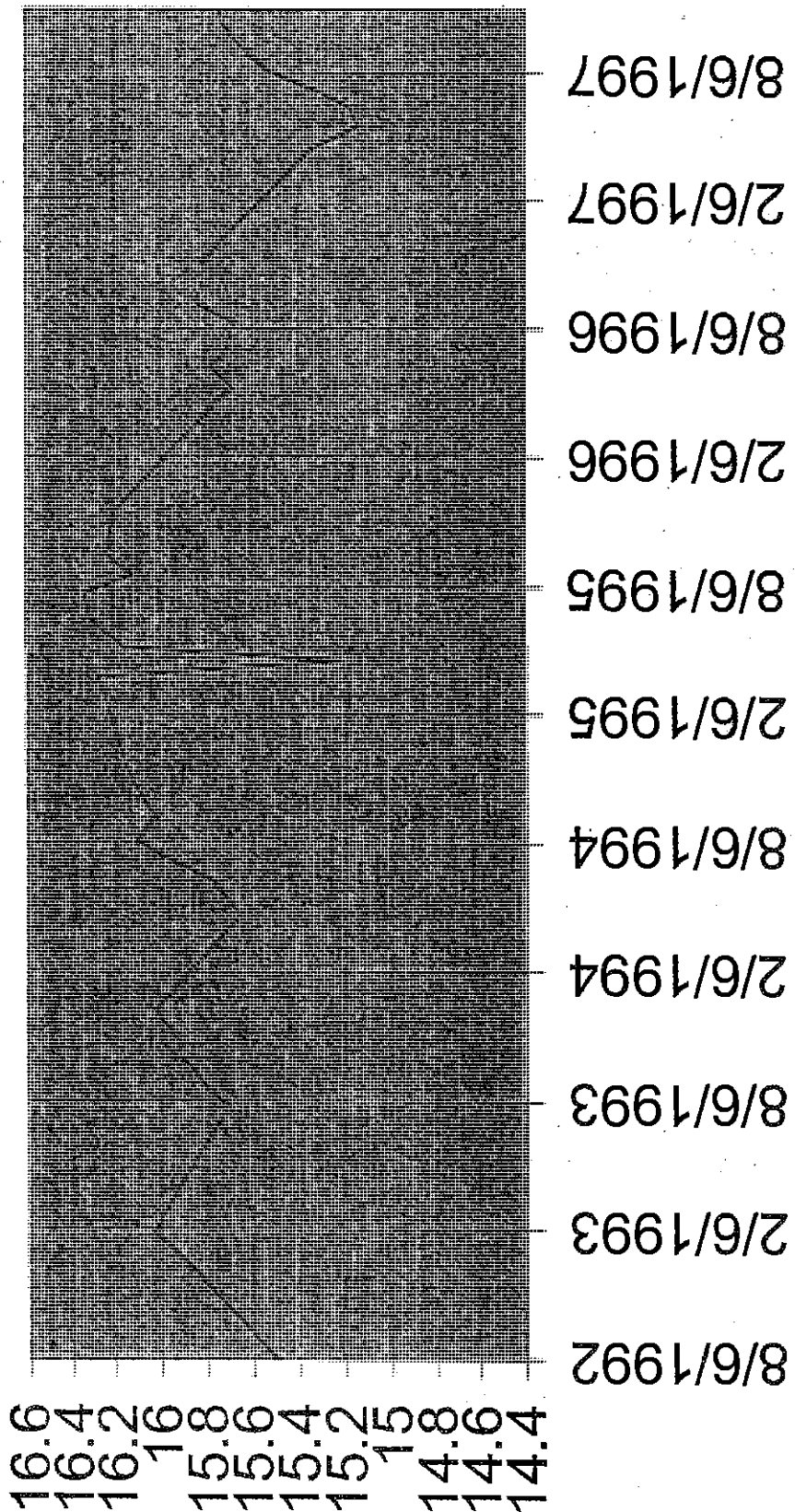
Longer-Term Water Levels from 1990 to Present



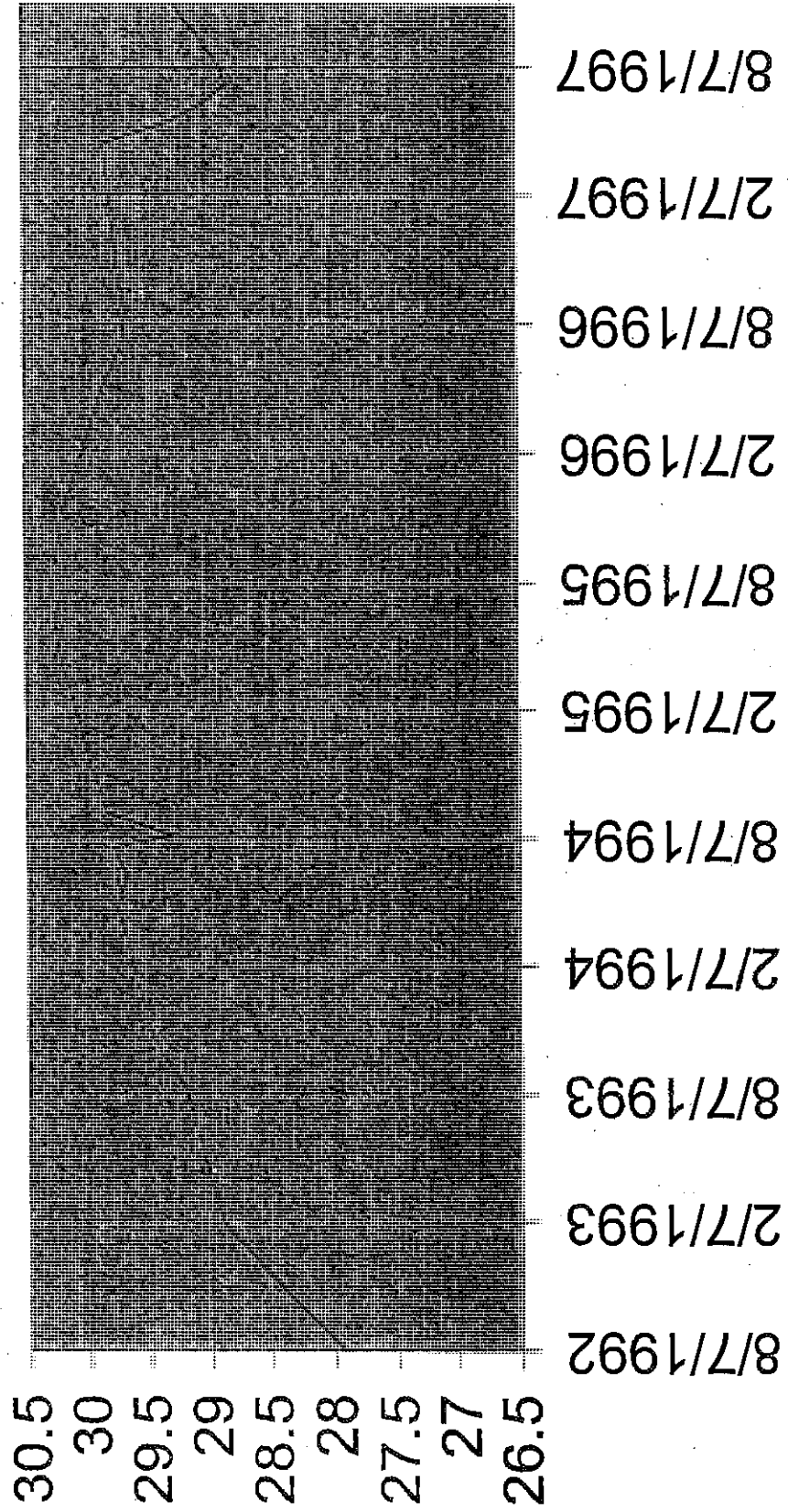
Sylvan Lake, 8-10-39-2-W.5, 6-2693-E



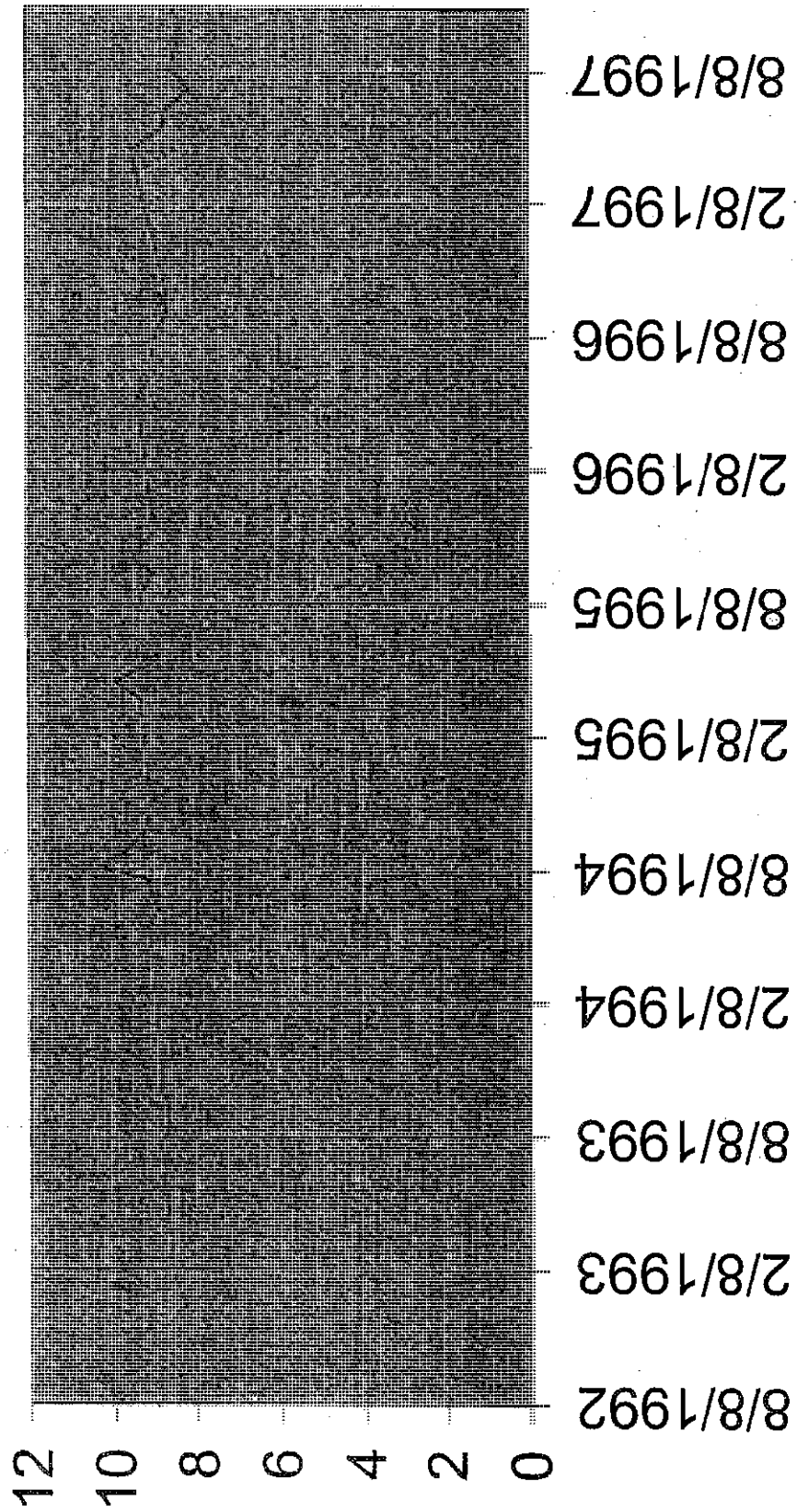
Sylvan Lake, 8-10-39-2-W.5, 6-2694-E



Sylvan Lake, 9-1-39-2-W.5, 7-2696-E



Sylvan Lake, 9-1-39-2-W.5, 7-2697-E



Sylvan Lake, 9-1-39-2-W.5, 7-2698-E

