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

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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 m^2/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

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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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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.

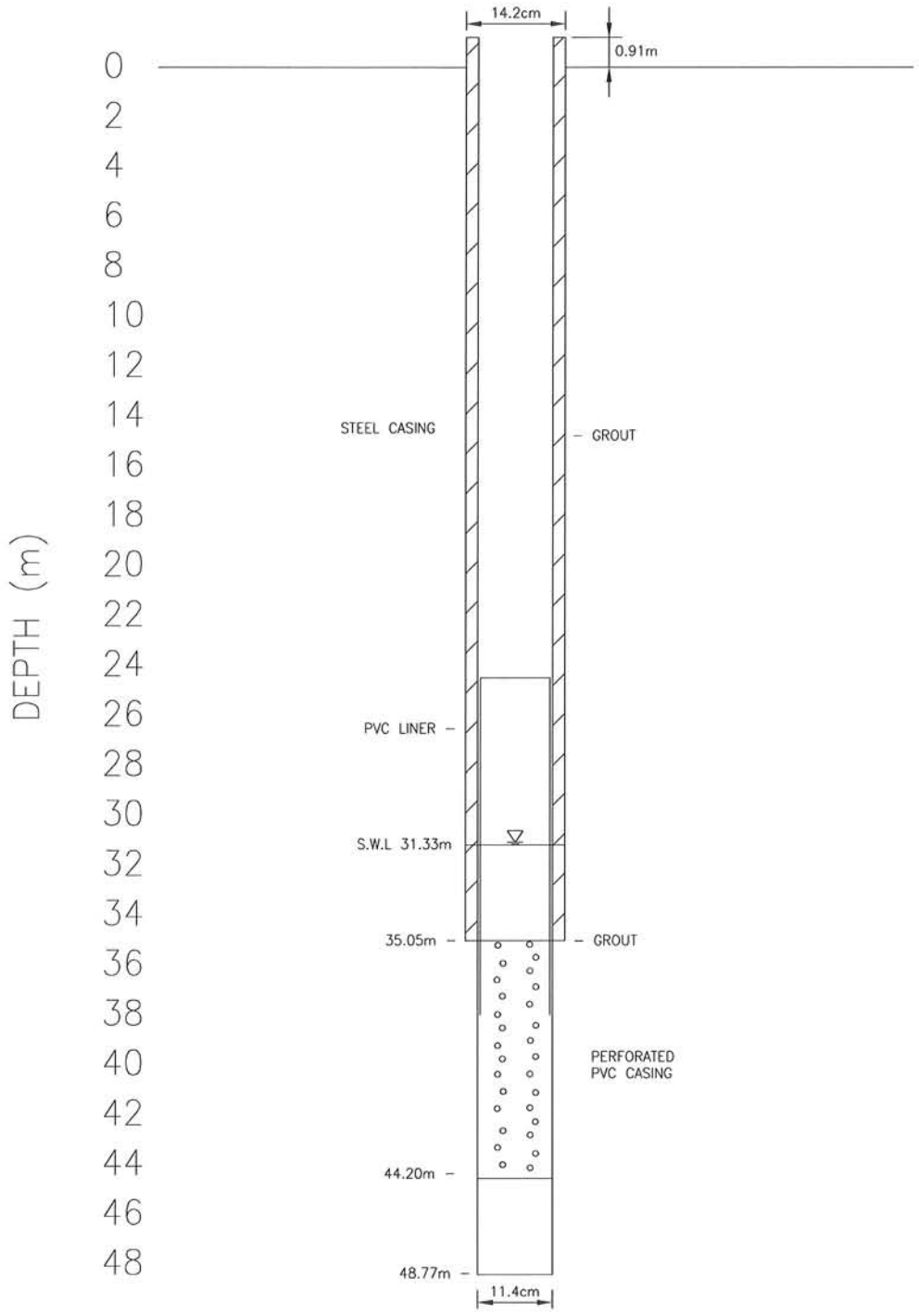
Based on the preliminary testing of the wells, it was decided to conduct a step test on PW1 to determine the desirable pumping rate for the 72-hour pumping test.

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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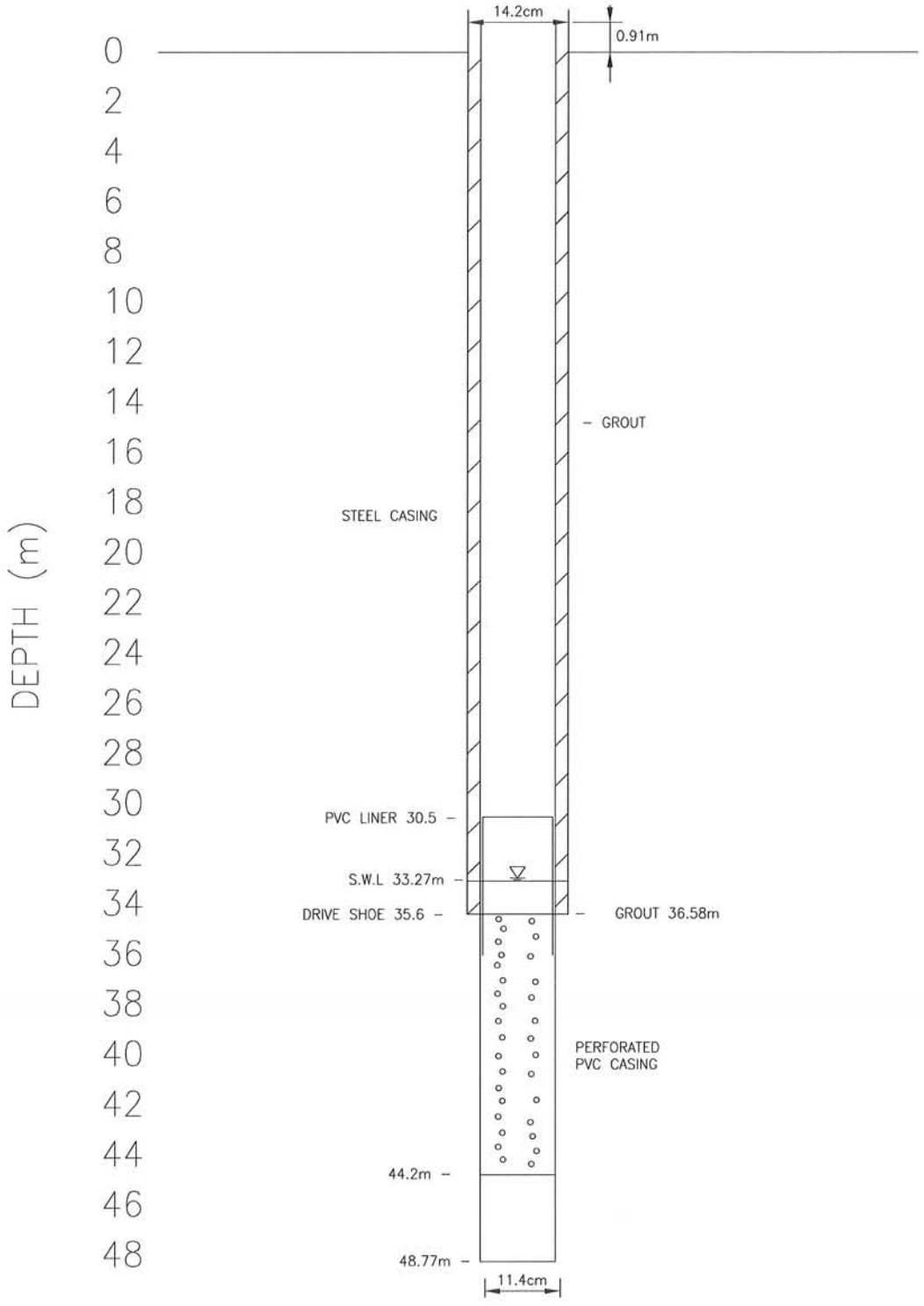
SCHEMATIC OF
OB-1

Figure No.
3



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Project
SCHEMATIC OF
PW-1

Figure No.
4

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:

$Q_{20} = (0.68)(T)(H_A)(0.7)$, 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:

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

Q_{20} = calculated safe yield for 20 years continuous pumping, in m^3/day
Q = pumping rate used during the aquifer test, in m^3/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:

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

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

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.

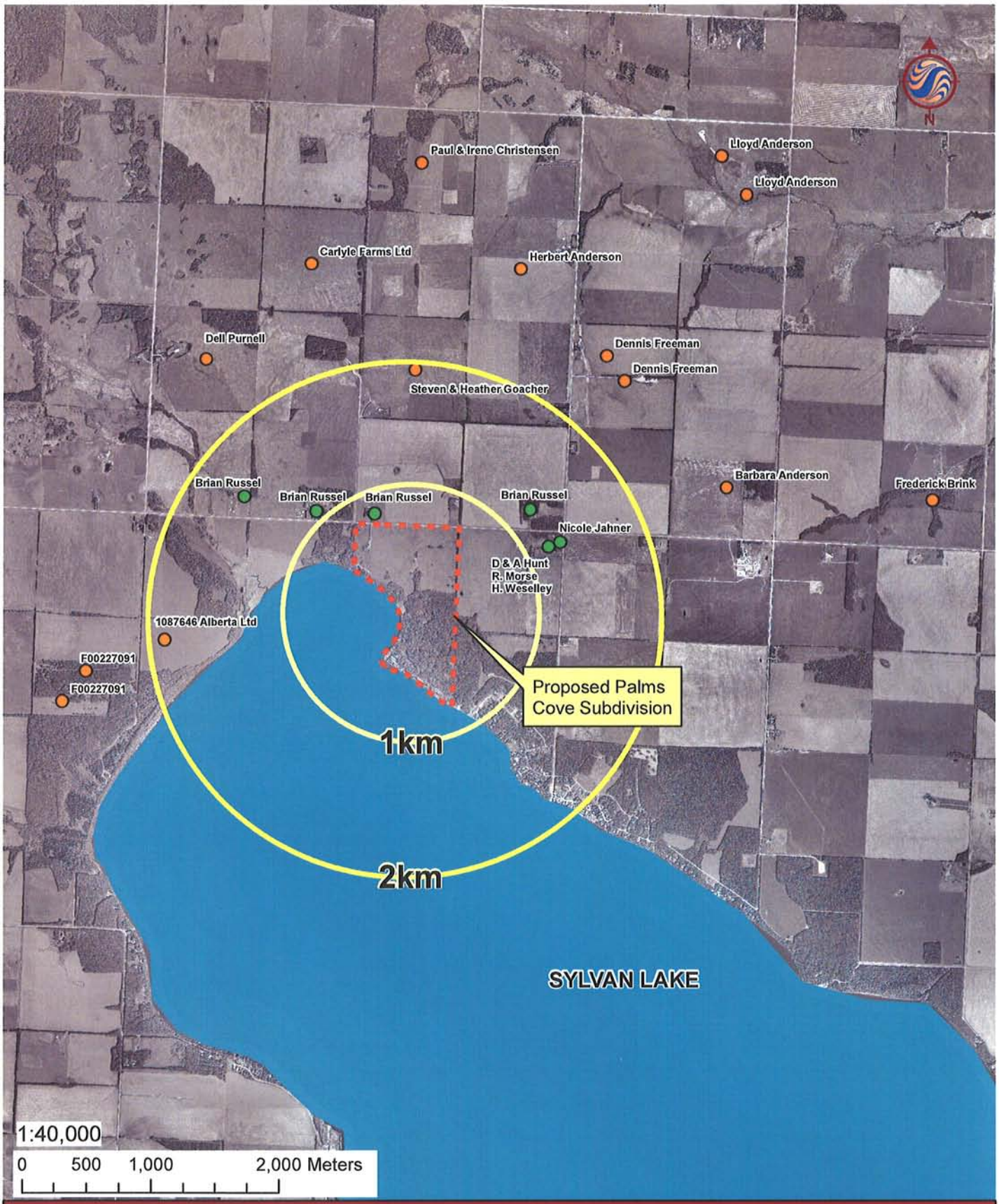
3.1 EXISTING LICENSED DIVERSIONS WITHIN 2-KILOMETERS OF PALMS COVE SUBDIVISION

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-W5	Steven & Heather Goacher	00207642-00-00	00207642 00 00	STOCK	353	15-Feb-06	14-Feb-31	61 - 67.1
SE-32-39-2-W5	F00227091	00227091-00-00	00227091 00 00	SUBDIV	41,168	26-Sep-06	25-Sep-31	27.4 - 36.6
SE-32-39-2-W5	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

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

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 Screpnek	SE-3-40-2 W.5	11U0690599 UTM5810144		280'	Domestic

3.3 PALMS COVE SITE HYDROGEOLOGIC SETTING

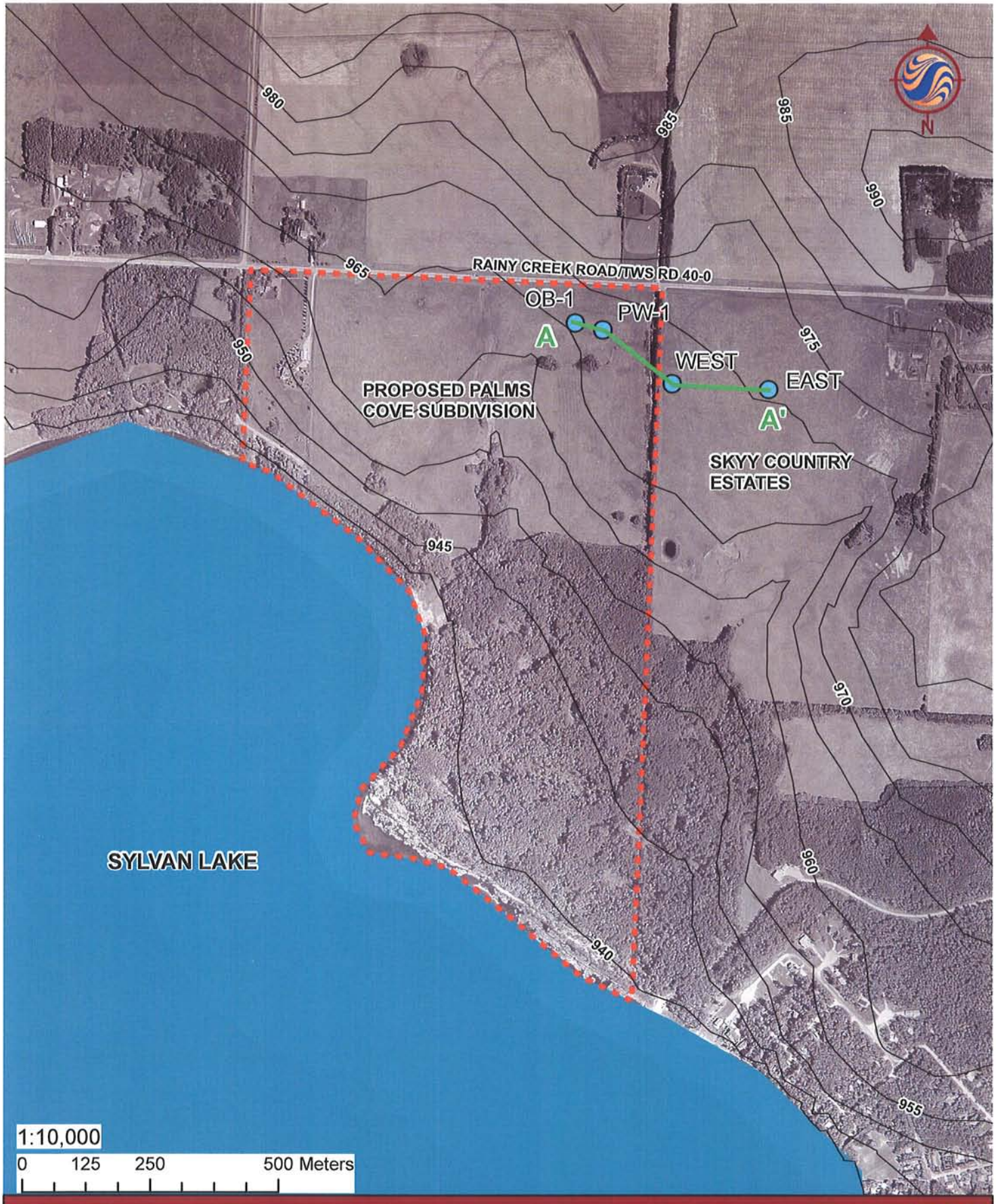
Figure 6 is a site plan that shows the location of the cross section drawn through the production and the observation wells drilled on the Palms Cove Subdivision Property. Figure 7 depicts the stratigraphic section for the Paskapoo Formation, Dalehurst Member sediments encountered in the subsurface under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

Qualico Development - Sylvan Lake

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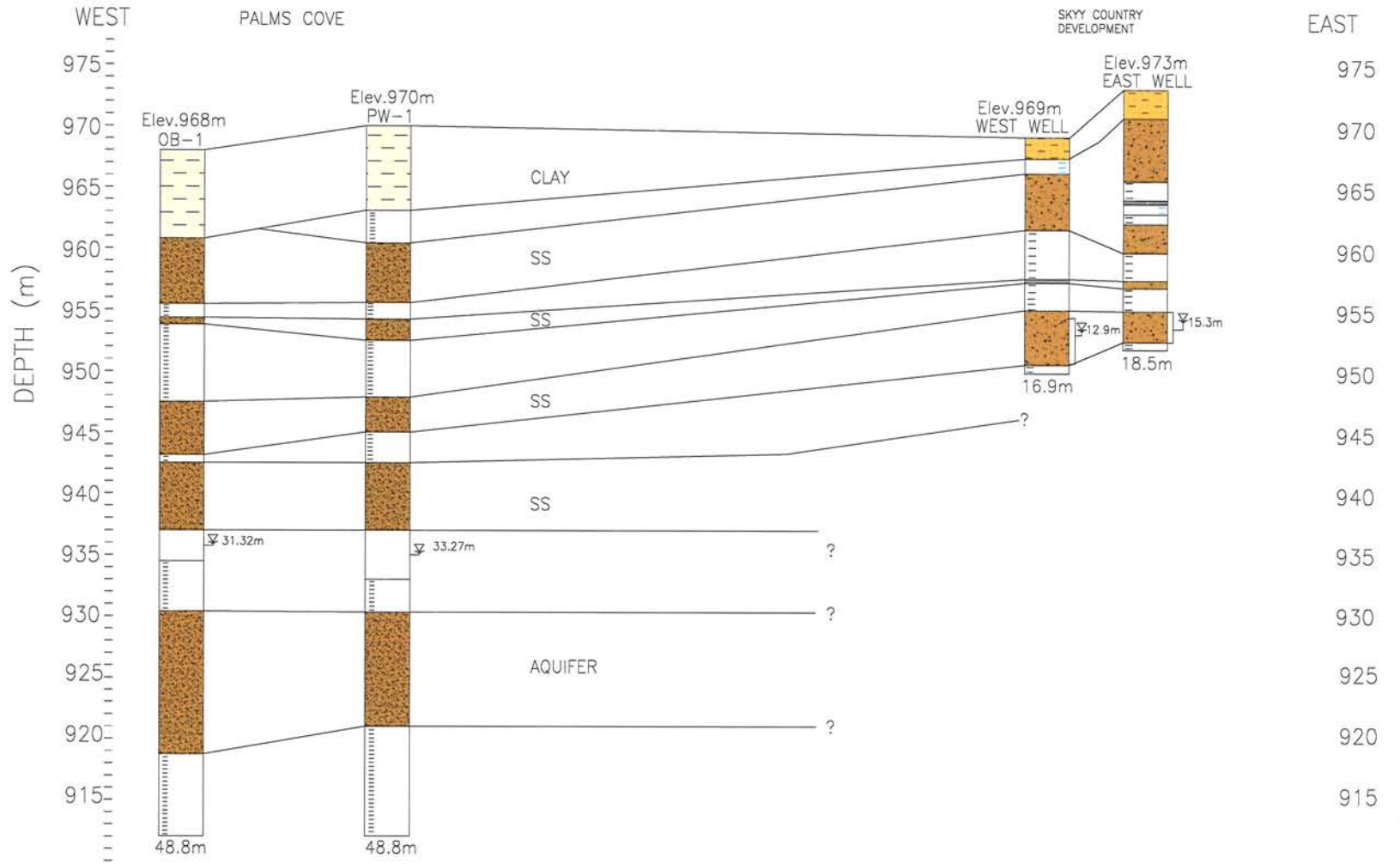

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ORIGINAL SHEET - LEGAL

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Legend

CLAY TILL
GREY SHALE
SANDSTONE
SANDSTONE & SHALE
COAL
COLOURED SHALE
CLAY

NOTES:
VERTIAL SCALE 1:10
HORIZONTAL SCALE 1:30
VERTICAL EXAGERATION 3X

Project
PALMS COVE ESTATES 7

Figure No.
7

Title
EAST-WEST HYDROGEOLOGIC PROFILE

(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 Subdivsiion on nearby wells and Sylvan Lake.

3.4.1 STEP TEST RESULTS

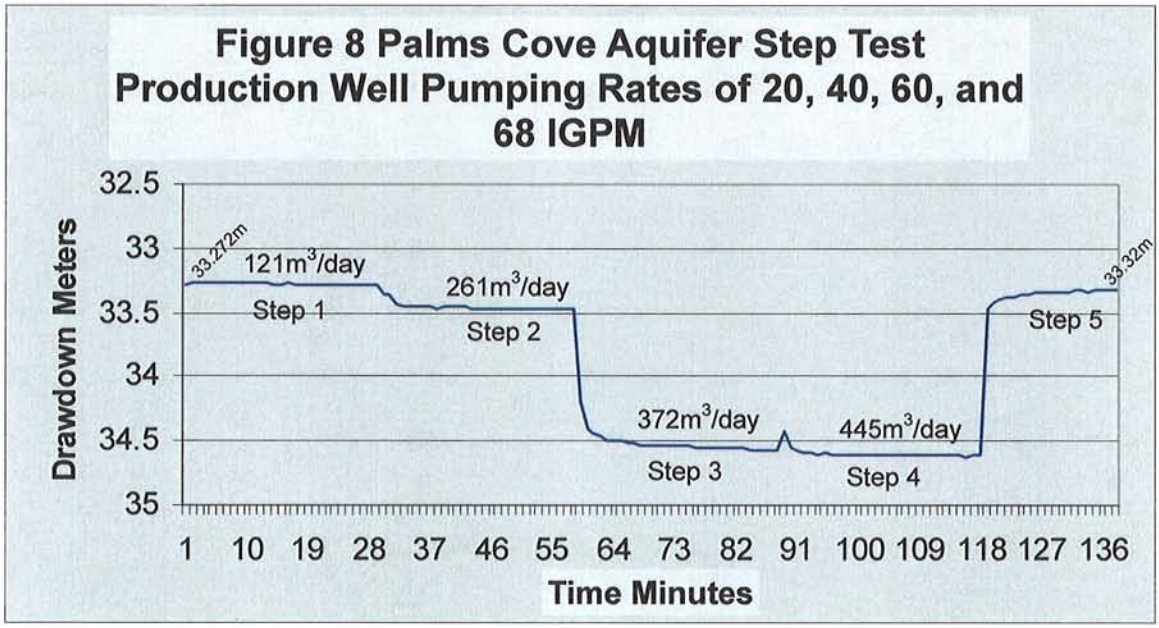
Figures 8 and 9 show the data results for the step test for the pumping and observation wells. These data show that the drawdown in the pumping well was nil at 121 cubic meters/day. The drawdown at 261 and 372 cubic meters per day was more pronounced. When the pumping rate increased to 445 cubic meters 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.



STEP DRAWDOWN TEST
FOR PW1 WELL
FIGURE 8.0

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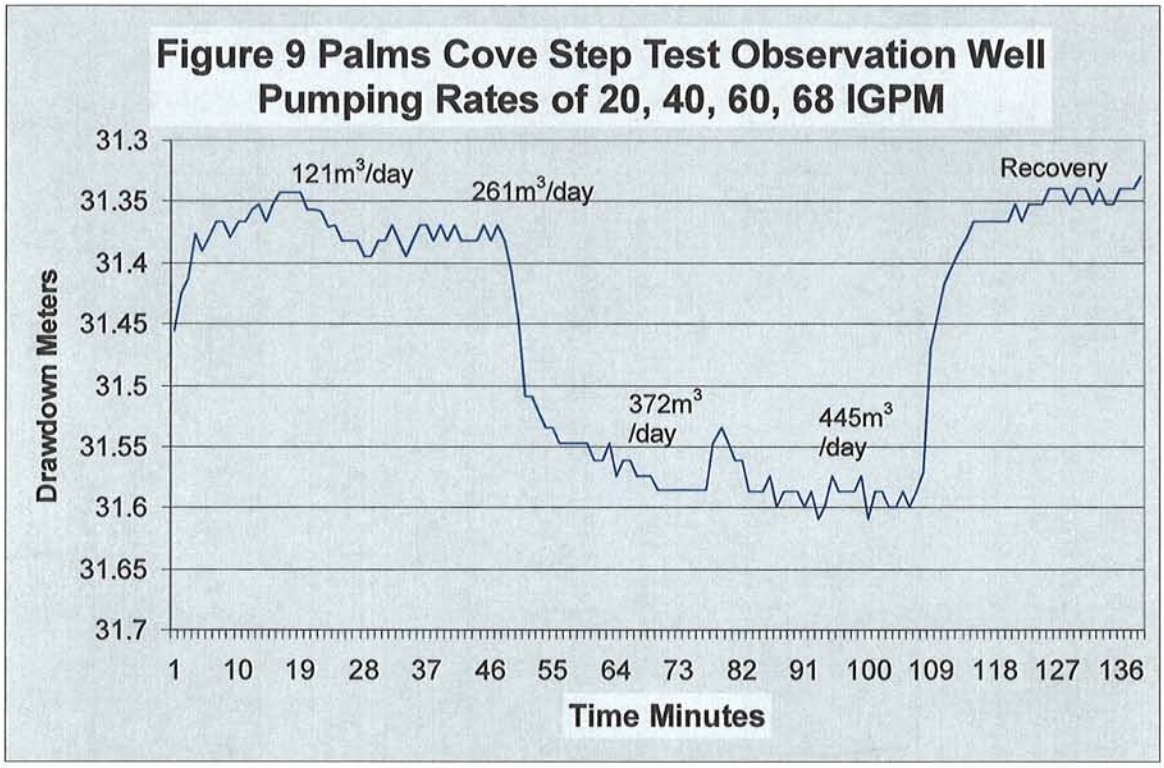

113929190

STEP DRAWDOWN TEST
FOR OB1 WELL
FIGURE 9.0

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

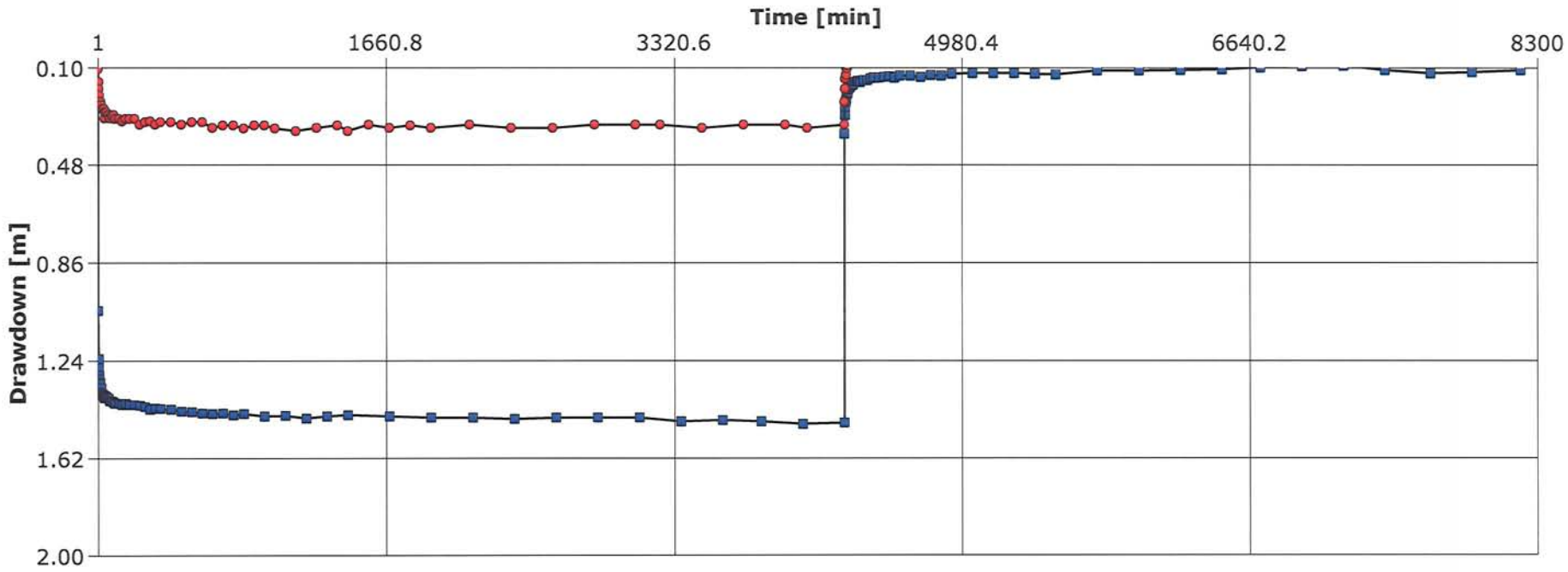

Figure 10. Time - drawdown linear plot of wells PW-1 and OB-1

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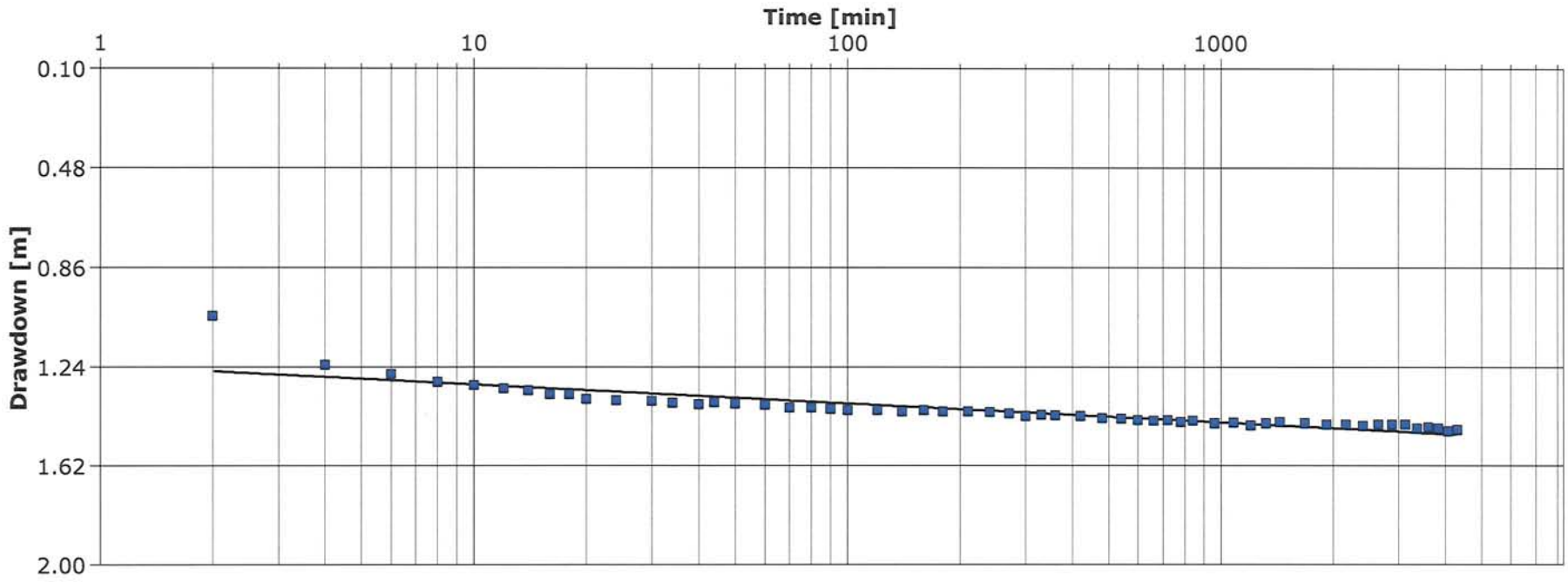
Pumping Test Analysis Report

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 Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
PW-1	1.14×10^{3}	1.09×10^{2}	1.00×10^{-15}	5.95×10^{0}	1.00×10^{-15}	0.06	

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

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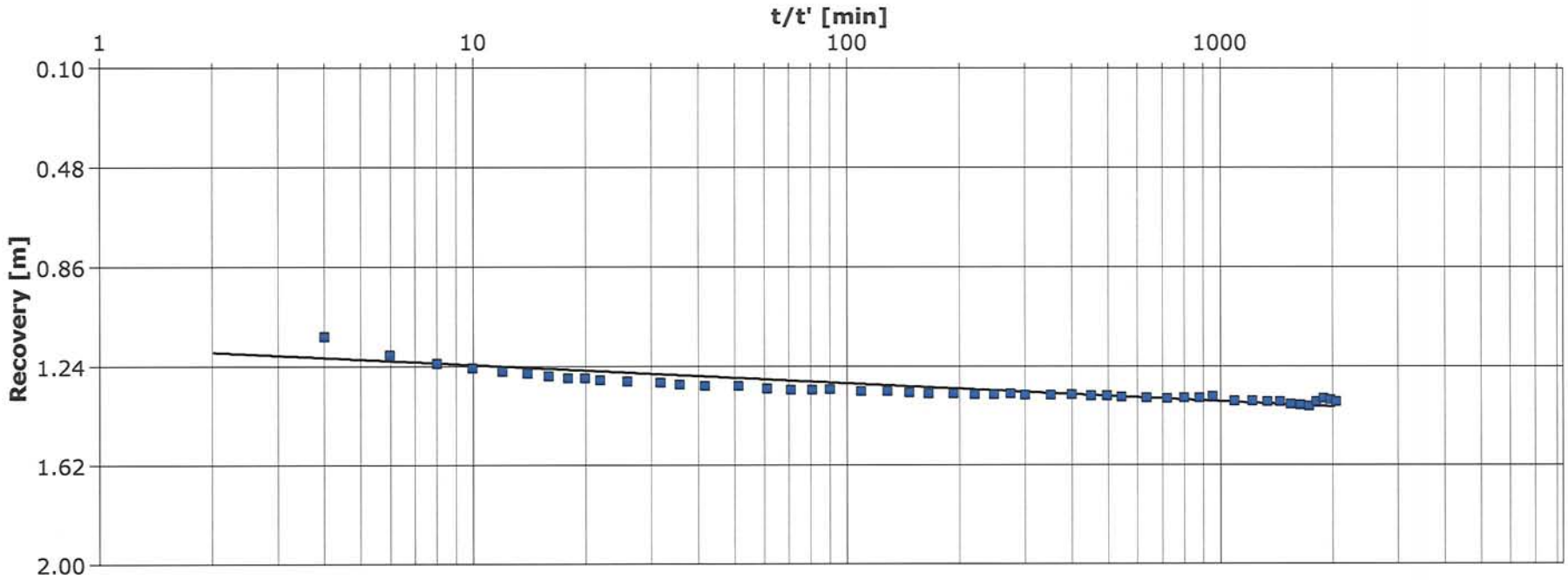
Pumping Test Analysis Report

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 [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
PW-1	1.19×10^{3}	1.15×10^{2}	3.87×10^{-15}	1.78×10^{0}	1.91×10^{-6}	0.06	

Figure 12. Time - recovery semi-log plot of well PW-1 , using the double-porosity method

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Pumping Test Analysis Report

Project: Palms Cove Aquifer test

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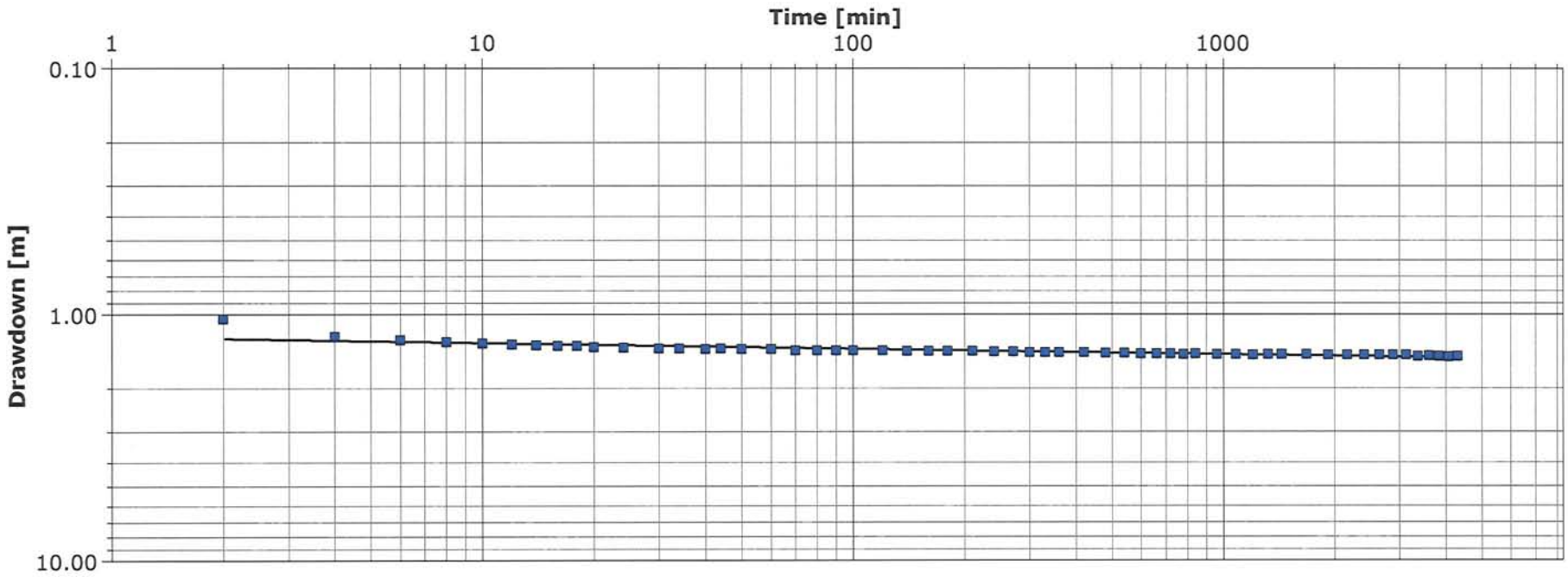
Location: W1/2-34-39-2-W.5	Pumping Test: Pumping Test 1	Pumping well: PW-1
Test conducted by: Alken Basin Drilling Ltd.		Test date: 2/12/2010
Analysis performed by: Grant Nielsen		Date: 3/24/2010
Aquifer Thickness: 10.40 m	Discharge: variable, average rate 454.89 [m³/d]	



Calculation after Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
PW-1	1.14×10^{3}	1.09×10^{2}	3.48×10^{-15}	1.00×10^{0}	3.62×10^{-15}	0.06	

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

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Pumping Test Analysis Report

Project: Palms Cove Aquifer test

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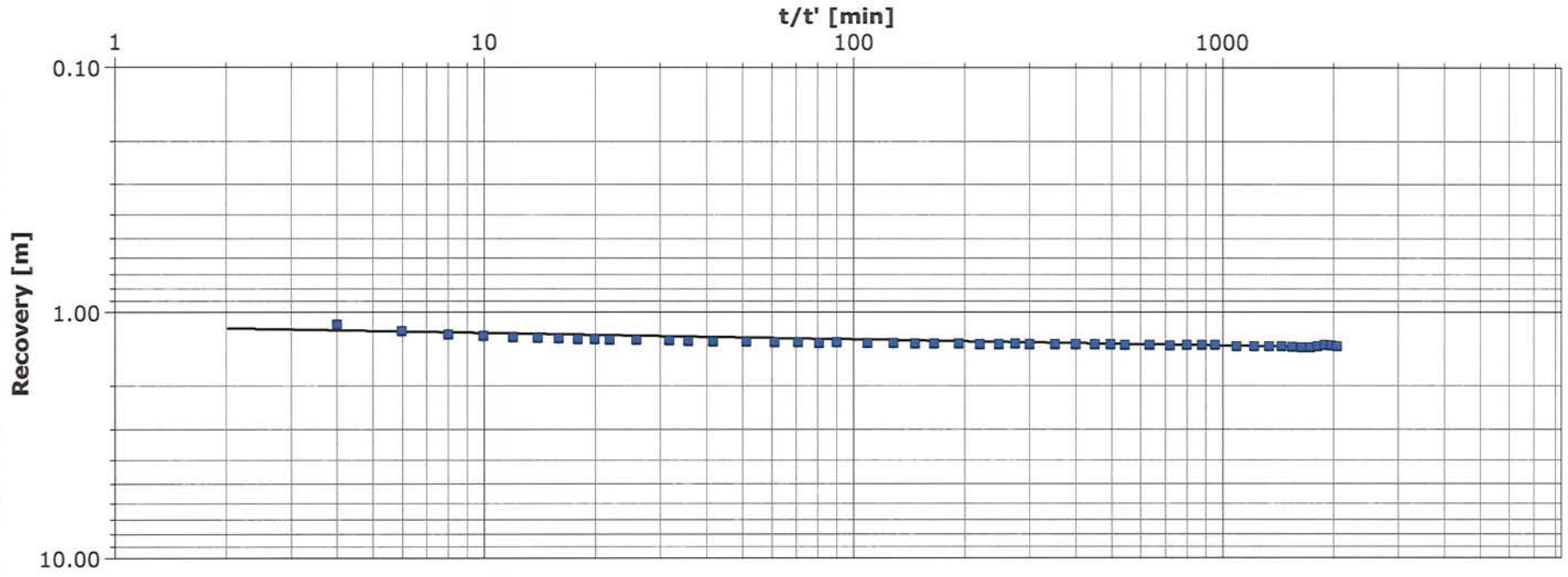
Location: W1/2-34-39-2-W.5	Pumping Test: Pumping Test 1	Pumping well: PW-1
Test conducted by: Alken Basin Drilling Ltd.		Test date: 2/12/2010
Analysis performed by: Grant Nielsen		Date: 3/24/2010
Aquifer Thickness: 10.40 m	Discharge: variable, average rate 454.89 [m³/d]	



Calculation after AGARWAL + Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
PW-1	1.11×10^{3}	1.06×10^{2}	1.79×10^{-13}	1.00×10^{0}	1.00×10^{-15}	0.06	

Figure 14. Time - recovery log-log plot of well PW-1 , using the double-porosity method

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Pumping Test Analysis Report

Project: Palms Cove Aquifer test

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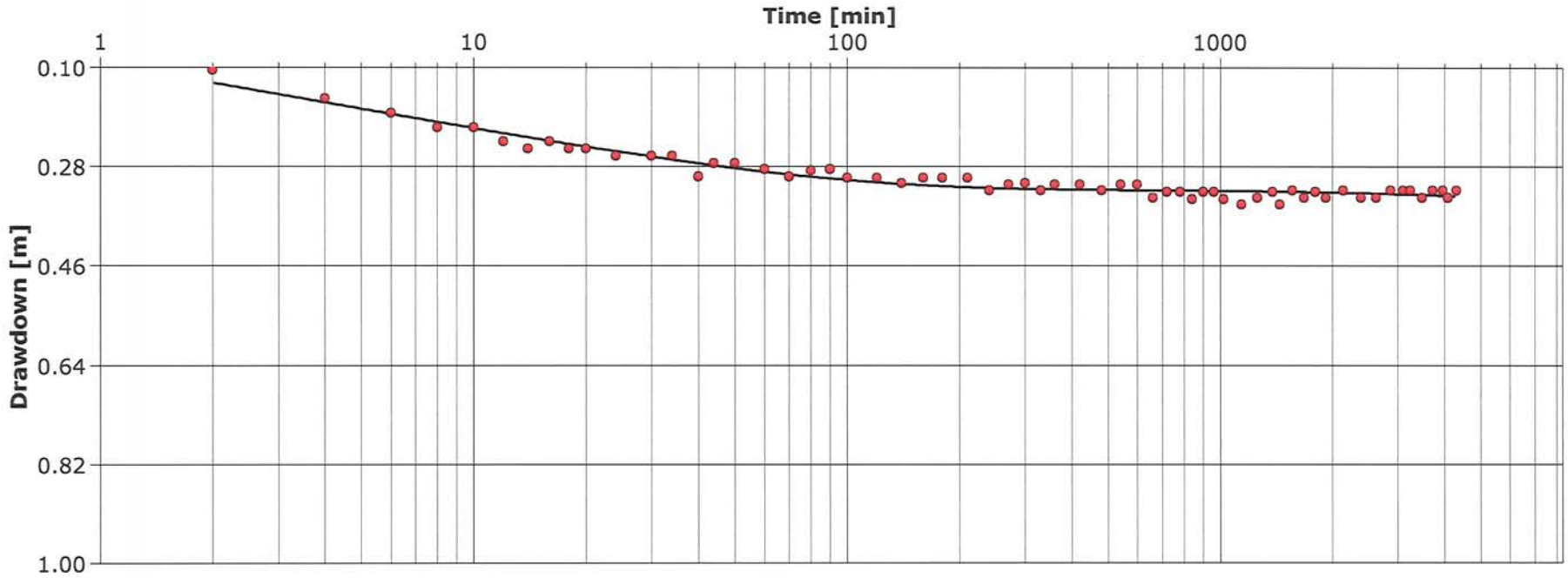
Client: Qualico Developments

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 Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
OB-1	6.60×10^{2}	6.35×10^{1}	6.87×10^{-5}	1.40×10^{2}	3.61×10^{-3}	55.04	

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

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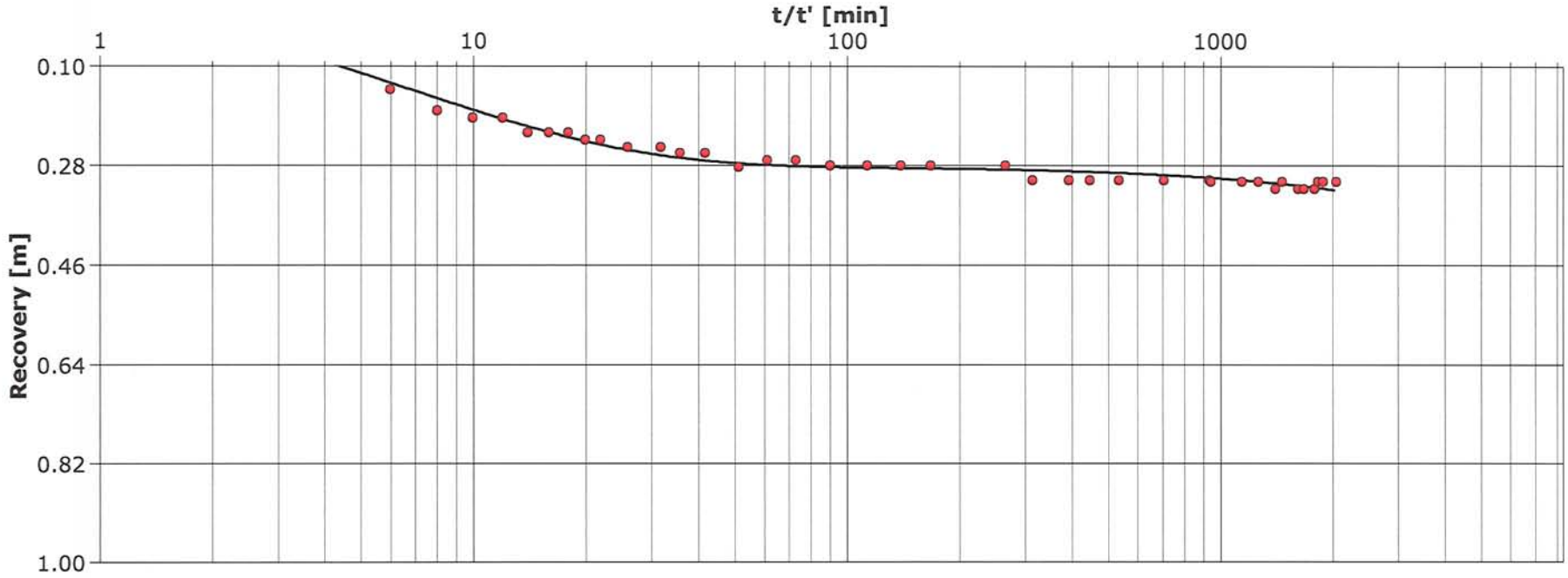
Pumping Test Analysis Report

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 [m²/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

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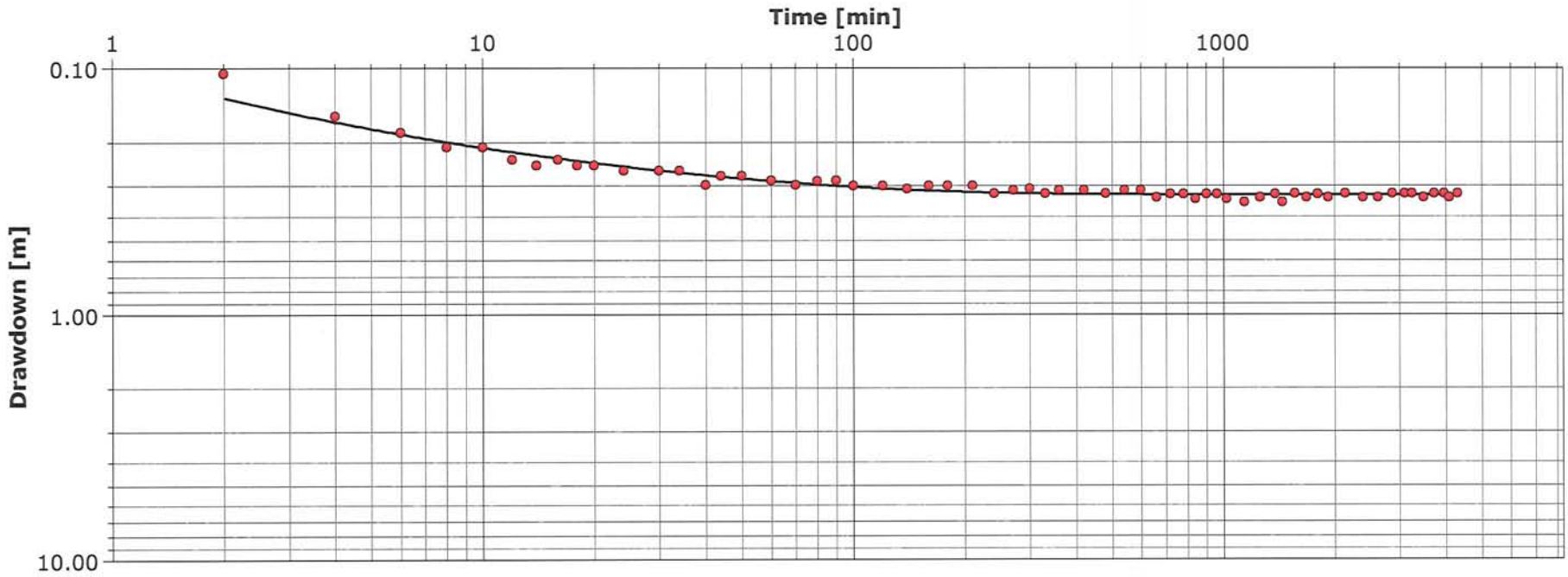
Pumping Test Analysis Report

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 Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
OB-1	7.05×10^{2}	6.78×10^{1}	5.77×10^{-5}	1.25×10^{3}	2.21×10^{-3}	55.04	

Figure 17. Time - drawdown log-log plot of well OB1 , using the double-porosity method

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Pumping Test Analysis Report

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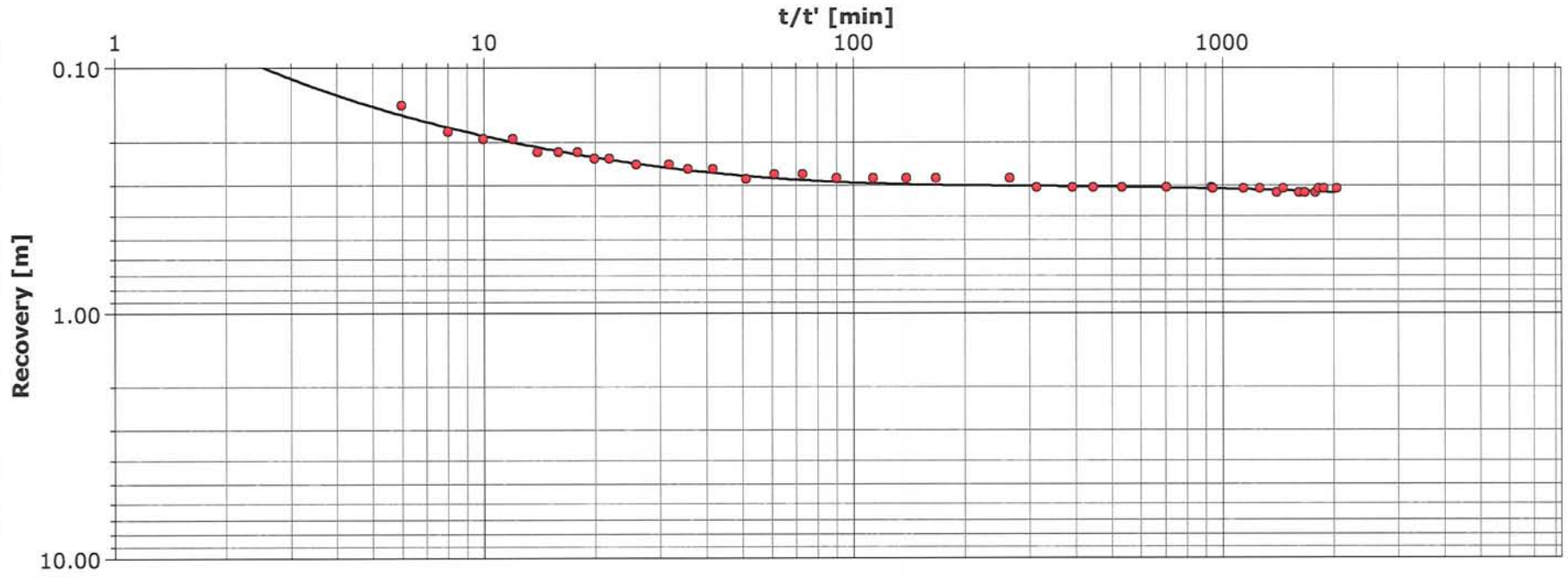
Test conducted by: Alken Basin Drilling Ltd.		Test date: 2/12/2010
Analysis performed by: Grant Nielsen		Date: 3/24/2010
Aquifer Thickness: 10.40 m	Discharge: variable, average rate 454.89 [m³/d]	



Calculation after AGARWAL + Double Porosity

Observation well	Transmissivity [m²/d]	K [m/d]	Specific storage	Sigma	Lambda	Radial distance to PW [m]	
OB-1	4.67×10^{2}	4.49×10^{1}	1.95×10^{-4}	9.51×10^{1}	2.75×10^{-2}	55.04	

Figure 18. Time - recovery log-log plot of well OB1 , using the double-porosity method

A transmissive capacity of 1110 m^2 /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 m^3 /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:

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

$$= 695\ m^3/day.$$

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 m^2/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.

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
NO3+NO2	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 m^3 /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.

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(mm)	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 m^3/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 m^3/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

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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: _____ Reviewed by: _____

Curtis Coe, CPG, PG *Grant Nielsen, P.Geol (AB), P.Geo (BC), Ph.D.*

PERMIT TO PRACTICE
STANTEC CONSULTING LTD.
Signature _____
Date June 9, 2010
PERMIT NUMBER: P 0258
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

CORPORATE AUTHORIZATION

PROFESSIONAL GEOLOGIST ALBERTA
GRANT L. NIELSEN

June 8, 2010

RESPONSIBLE ENGINEER

APPENDIX A

Alberta Environment

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 Received:	1995/06/26
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
WellOwner's Name: SABADOS, ALEX	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 42 MALIBU RD SW, CALGARY	Postal Code: T2V 1W8
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NW	33	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: Rotary
Flowing Well: No Rate: Liters
Gas Present: No Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 1324.89 Liters

4. Formation Log

Depth from ground level (meters)	Lithology Description
3.05	Brown Clay & Rocks
7.62	Brown Sandstone
11.58	Gray Shale
17.98	Brown Sandstone
19.2	Gray Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1995/06/08	Date Completed (yyyy/mm/dd): 1995/06/08
Well Depth: 19.2 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: 10.36 M	Top: 7.01 M Bottom: 19.2 M
Perforations from: 10.36 M to: 19.2 M from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 0.95 CM 0 CM x 0 CM 0 CM x 0 CM
Perforated by: Hand Drill	
Seal: Drive Shoe 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:
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 GROUND LEVEL: 2'.

6. Well Yield

Test Date (yyyy/mm/dd): 1995/06/08	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	8.23 M
Rate of water removal:	151.42 Liters/Min
Depth of pump intake:	19.2 M
Water level at end of pumping:	19.2 M
Distance from top of CM casing to ground level:	

Depth To water level (meters) Elapsed Time Drawdown Minutes:Sec	Recovery
2:00	19.2
3:00	14.63
4:00	10.97
5:00	8.23
7:00	8.23
12:00	8.23
30:00	8.23
60:00	8.23
120:00	8.23

Total Drawdown: 10.97 M

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

Recommended pumping rate: 37.85 Liters/Min

Recommended pump intake: 13.72 M

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

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 Received:	1976/05/28
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner'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 LSD	Sec	Twp	Rge	West of 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

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 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: Driven from: 0 M	to: 39.62 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:	

6. Well Yield

Test Date (yyyy/mm/dd): 1976/05/13	Start Time: 11:00 AM
Test Method: Pump	
Non pumping static level:	18.29 M
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 pumptest 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 Received:	1971/10/25
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: NELSON DRILLING & PLUMBING
Drilling Company Approval No.:
Mailing Address:
City or Town:
Postal Code:
WellOwner's Name: PARNEY
Well Location Identifier:
P.O. Box Number:
Mailing Address: COTTAGE @ N END OF SYLVAN LAKE, CALGARY
Postal Code:
City:
Province:
Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters
Method of Drilling: Rotary
Flowing Well: No
Gas Present:
Rate: Liters
Oil Present:

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
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:
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.

6. Well Yield

Test Date (yyyy/mm/dd): 1971/08/01
Start Time: 11:00 AM
Test Method: Bailer
Non pumping static level: 8.23 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: 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 pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Alberta Environment

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
Drilling Company Approval No.:
Mailing Address:
City or Town:
Postal Code:
WellOwner's Name: RANAGHAN
Well Location Identifier:
P.O. Box Number:
Mailing Address: CABIN N SIDE OF SYLVAN LAKE, CALGARY
Postal Code:
City:
Province:
Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of 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:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters
Method of Drilling: Rotary
Flowing Well: No
Gas Present:
Rate: Liters
Oil Present:

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
Liner Type:
Size OD: 5.08 CM
Size OD: 0 CM
Wall Thickness: 0 CM
Wall Thickness: 0 CM
Bottom at: 30.48 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: 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.

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:
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 pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Alberta Environment

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 Received:	2002/11/29
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
WellOwner's Name: DEGROAT, RICHARD	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 300 509 8 AVE SW, CALGARY	Postal Code: T2P 1G1
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	33	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: Rotary
Flowing Well: No
Gas Present: No
Rate: Liters
Oil Present: No

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

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 0.95 CM 0 CM x 0 CM 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:	

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
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:Sec Recovery

9.61	0:00	11.39
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 pumptest 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 Received:	1985/06/14
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: MEDICINE VALLEY WATER WELLS		Drilling Company Approval No.: 119346
Mailing Address: RR 3	City or Town: ECKVILLE AB CA	Postal Code: T0M 0X0
WellOwner's Name: BUTTYNEN, DICK	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 5312 105 AVE, EDMONTON	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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: Materials Used:
Method of Drilling: Cable Tool
Flowing Well: No
Gas Present: Rate: Liters
Oil Present:

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

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 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: Driven from: 0 M	to: 29.57 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: M	Diameter: CM
Comments: Originally @ SW-33-39-2-W5.	

6. Well Yield

Test Date (yyyy/mm/dd): 1982/05/12	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	12.8 M
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 pumptest information?

7. Contractor Certification

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

Alberta Environment

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:
WellOwner'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 LSD	Sec	Twp	Rge	Westof 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:
Proposed well use: Domestic
Anticipated Water Requirements/day 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
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:
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: 0 Liters/Min
Recommended pump intake: 0 M
Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

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
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: 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:
MEDIUM HARD WATER.

7. Contractor Certification

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

Alberta Environment

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

Company Name: FORRESTER WATER WELL DRILLING (1981) LTD.
Drilling Company Approval No.:
Mailing Address:
City or Town:
Postal Code:
WellOwner's Name: URG, DEAN
Well Location Identifier:
P.O. Box Number:
Mailing Address: RR2, RED DEER
Postal Code: T4N 5E2
City:
Province:
Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NW	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: Cable Tool
Flowing Well: No
Gas Present:
Rate: Liters
Oil Present:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

6. Well Yield

Test Date (yyyy/mm/dd): 1979/03/01
Start Time: 11:00 AM
Test Method: Bailer
Non pumping static level: 18.29 M
Rate of water removal: 37.85 Liters/Min
Depth of pump intake: 30.48 M
Water level at end of pumping: 38.1 M
Distance from top of casing to ground level: CM
Depth To water level (meters)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 19.81 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 pumptest information?

4. Formation Log

Depth from ground level (meters)	Lithology Description
0.3	Topsoil
8.84	Light Brown Sandy Clay
10.06	Light Brown Hard Clay
11.58	Brown Soft Sandstone
12.5	Gray Soft Shale & Coal
13.11	Gray Shale
13.72	Gray Hard Sandstone
15.24	Blue Shale
19.2	Blue Bentonitic Sandstone
19.81	Blue Gray Hard Sandstone
21.95	Blue Sticky Shale
26.52	Blue Gray Sandy Shale
28.35	Blue Gray Hard Shale
31.7	Dark Gray Sticky Shale
35.05	Dark Gray Water Bearing Sandstone
37.8	Bluish Green Water Bearing Sandstone
38.1	Greenish Gray Sandy Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1979/02/26
Date Completed (yyyy/mm/dd): 1979/03/01
Well Depth: 38.1 M
Borehole Diameter: 0 CM
Casing Type: Steel
Liner Type:
Size OD: 13.97 CM
Size OD: 0 CM
Wall Thickness: 0.66 CM
Wall Thickness: 0 CM
Bottom at: 32 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: 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

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

Water Well Drilling Report

Alberta Environment

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 Received:	1984/10/02
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: MAGNUM DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner'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 LSD	Sec	Twp	Rge	Westof 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
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 2.54 CM x 30.48 CM 0 CM x 0 CM 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:	

6. Well Yield

Test Date (yyyy/mm/dd): 1984/07/31	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	7.62 M
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 pumptest 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 Received:	1950/07/21
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: OWNER DRILLED		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: ANDERSON, A.	Well Location Identifier:	
P.O. Box Number:	Mailing Address: BENTLEY	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SE	03	040	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot Block Plan

Well Elev: 997.31 M
How Obtain: Survey-Tra

3. Drilling Information

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

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

4. Formation Log

Depth from ground level (meters)	Lithology Description

5. Well Completion

Date Started(yyyy/mm/dd): 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
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:
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:

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.

6. Well Yield

Test Date (yyyy/mm/dd): Start Time:
Test Method:
Non pumping static level: M
Rate of water removal: Liters/Min
Depth of pump intake: M
Water level at end of pumping: M
Distance from top of casing to ground level: CM

Depth To water level (meters)
Elapsed Time
Drawdown Minutes:Sec Recovery

Total Drawdown: M

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

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

Type pump installed
Pump type:
Pump model:
H.P.:
Any further pumptest 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.:	0437631
Map Verified:	Map
Date Report Received:	1988/10/19
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
WellOwner'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 LSD	Sec	Twp	Rge	Westof 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
Gas Present: No
Rate: Liters
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 0.95 CM 0 CM x 0 CM 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: 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: 1	Documents Held: 2
Pitless Adapter Type: 230V Drop Pipe Type: GALV Length: 64.01 M	Diameter: 2.54 CM
Comments:	

6. Well Yield

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

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 pumptest 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

Company Name: LOUSANA WATER WELLS (1987) LTD.		Drilling Company Approval No.: 118963
Mailing Address: BOX 88	City or Town: LOUSANA AB CA	Postal Code: T0M 1KO
WellOwner's Name: BUIT BROS.	Well Location Identifier:	
P.O. Box Number:	Mailing Address: SYLVAN LAKE	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	03	040	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot Block Plan

Well Elev: 968.35 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
Proposed well use: Domestic & Stock
Anticipated Water Requirements/day 0 Liters

4. Formation Log

Depth from ground level (meters)	Lithology Description
0.91	Brown Clay
3.66	Brown Fractured Shale
6.71	Brown Sandstone
7.01	Hard Sandstone
17.07	Brown Sandstone
18.59	Brown Shale
23.77	Brown Sandstone
24.69	Hard Sandstone
25.6	Brown Sandstone
26.52	Hard Sandstone
33.22	Brown Sandstone
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: 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 REPORTS HARD WATER.

6. Well Yield

Test Date (yyyy/mm/dd): 1988/06/08	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	41.76 M
Rate of water removal:	63.64 Liters/Min
Depth of pump intake:	42.06 M
Water level at end of pumping:	42.06 M
Distance from top of CM casing to ground level:	

Depth To water level (meters)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 0.3 M

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

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 45.72 M

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

7. Contractor Certification

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

Alberta ENVIRONMENT — Water Well Drilling Report

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.

Well I.D.:
Map verified:
Date report received:

1 Contractor & Well Owner Information

Company Name: ALKEN BASIN DRILLING LTD. Approval No.: 966

Mailing Address: BOX 47 City or Town: BENTLEY Postal Code: T0C-0J0

Well Owner's Name: FRANK. WILSON Well Owner has a copy of this report: ☐ Yes ☐ No

Mailing Address: #8 - 10 Street City or Town: Sylvan lake. Postal Code: T4S-2P3.

2 Well Location

1/4 or LSD	Sec	Twp	Rge	West of Meridian
NE	34	39	2	W5

Location of Quarter: m/ft from ☐ N ☐ S; m/ft from ☐ E ☐ W

Lot: Block: Plan:

3 Drilling Information

Type of Work: ☐ Testhole ☑ New Well ☐ Reconstructed ☐ Deepened ☐ Decommissioned

Well ID (if applicable): Date Completed: Yr Mo Day

Casing or liner removed (specify): Amount: Length:

Plugging Material: ☐ Cement Amount: Length: ☐ High Solids Bentonite Amount: Length: ☐ Hydrated Bentonite Amount: Length:

Method of Drilling: ☐ Auger ☐ Boring ☐ Cable tool ☑ Rotary ☐ Combination ☐ Backhoe ☐ Other:

Proposed well use: ☐ Household (up to 1250 m³ per year with a residence on the property) ☑ Other Specify: CAMPGROUND

4 Formation Log

Depth from ground level (☐ metres ☐ feet)	Lithology Description	
0 - 15	clay brn	4.6
15 - 50	SS brn	15.2
50 - 60	SH gry	18.3
60 - 61	coal	18.6
61 - 65	SH gry	19.8
65 - 70	SH grn	21.3
70 - 75	SS gry	22.9
75 - 79	SH gry	24.1
79 - 95	SS gry	29.0
95 - 106	SH gry	32.3
106 - 110	SS gry	33.5
110 - 118	SH gry	36.0
118 - 139	SS gry	42.4
139 - 140	SH gry	42.7
	Grouted w/ 12 sacks. Bentonite grout.	

Water Used to Drill Well:
Location of Water Source: Previous well.
Water Diversion Date: Yr Mo Day 83 03 26 Time: 500 am/pm
Amount Water Taken: 600 Litres/Imp. Gallons

GPS Co-ordinates (Decimal Degrees): Latitude: 114°11.93 Longitude: 52°24.398 Elevation: 3233'
Level of GPS Accuracy:
☐ Diff. Corr. Hand Held 5-10m ☐ Surveyed GPS < 1m ☑ Hand Held Auto 20-30m

Geophysical Log taken: ☐ Electric ☐ Gamma

Did you encounter: ☐ Mineralized water more than 4000 ppm TDS ☐ Gas At what depth:

Remedial action taken:

Additional Comments:

5 Well Completion

Date Started: Yr Mo Day 83 03 27 Date Completed: Yr Mo Day 83 03 27

Are measurements in metric or imperial?

Casing Details:

	Surface Seal	Casing	Liner/Inner Casing
Diameter of borehole	17"	6 3/4	12.1 5"
Casing type		STEEL	PVC
Size OD		5 9/16	4 1/2
Wall thickness		.258	.237
Bottom at	36.9	118.	140' 42.7
Top at	61	2'	100' 30.5
Annular Sealant	☐ Cement ☐ Bentonite From: To:	☐ Cement ☑ Bentonite ☑ Driven ☐ Shale Trap From: 0 To: 118.	☐ Cement ☐ Bentonite ☐ Driven ☐ Shale Trap From: To:

Production Interval Details:

Perforations: from: 118 to: 140. from: 96 to: 42.7

Perforation size: 3/8 x 3/8

Perforated by: ☐ Saw ☐ Torch ☐ Machine ☑ Other: DRILL

Screen type: Size OD:

Intervals: from: to: slot size: from: to: slot size:

Installation: ☐ Attached to casing ☐ Telescoped

Fittings: Top ☐ Packer ☐ Coupler Bottom ☐ Wash-down ☐ Bell ☐ Plug

Pack: ☐ Artificial/Mechanical ☐ Natural Grain size: Amount:

6 Well Yield EAST WELL

Test Date: Yr Mo Day 83 03 27 Start Time:

Test method: ☑ Pump ☐ Bailer ☑ Air

Are measurements in metric or imperial?

Non pumping static water level: 38m

Rate of water removal: 32 g.p.m

Depth of pump intake if pump tested: 40m

Depth bailed or air tested from: 43m

Water level at end of water removal period: 38.98 m

Distance from top of casing to ground level: 0.61 m

Measurements taken from: casing

Depth to water level	Elapsed Time minutes	Recovery
Pumping		
38	0	38.98
38.9	1	38.25
38.95	2	38.15
38.96	3	38.09
38.96	4	38.05
38.97	5	38.03
38.97	6	38.02
38.97	7	38.02
38.98	8	38.01
38.98	9	38.01
38.98	10	38.00
38.98	12	38
38.98	14	38
38.98	16	38
38.98	20	
38.98	25	
38.98	30	
	35	
	40	
	50	
	60	
	75	
	90	
	105	
38.98	120	38

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

Recommended pumping rate: 10 g.p.m

Recommended pump intake: 130 ft.

Pump installed ☐ Yes Depth:

Type: Model: H.P:

7 Contractor Certification

Driller's Name: Kris Schindel

Certification No.: 40628

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: Yr Mo Day 83 03 27

Alberta ENVIRONMENT — Water Well Drilling Report

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.

Well I.D.
Map verified:
Date report received:

1 Contractor & Well Owner Information

Company Name: ALKEN BASIN DRILLING LTD. Approval No.: 966
Mailing Address: Box 47 City or Town: BENTLEY Postal Code: T0C-0J0
Well Owner's Name: FRANK WILSON. Well Owner has a copy of this report: ☐ Yes ☐ No
Mailing Address: #8 - 10 street. City or Town: SYLVAN LAKE Postal Code: T4S-2P3

2 Well Location

1/4 or LSD	Sec	Twp	Rge	W of Mer
NE	34	39	2	W5

Lot | Block | Plan
Location at Quarter: m/ft from ☐ N ☐ S; m/ft from ☐ E ☐ W
Boundary

3 Drilling Information

Type of Work: ☐ Testhole ☑ New Well ☐ Reconstructed ☐ Deepened ☐ Decommissioned
Well ID (if applicable): Date Completed: Yr Mo Day
Casing or liner removed (specify): Amount (metres/feet)
Plugging Material: ☐ Cement Amount (metres/feet) ☐ High Solids Bentonite Amount (metres/feet) ☐ Hydrated Bentonite Amount (metres/feet)
Method of Drilling: ☐ Auger ☐ Boring ☐ Cable tool ☑ Rotary ☐ Combination ☐ Backhoe ☐ Other:
Proposed well use: ☐ Household (up to 1250 m³ per year with a residence on the property) ☑ Other Specify: CAMP GROUND.

4 Formation Log

Depth from ground level (☐ metres ☐ feet)	Lithology Description	
0-9	clay brn	2.7
9-14	SH brn	4.3
14-49	SS brn	14.9
49-74	SH gry	22.6
74-76	coal	23.2
76-84	SH gry	25.6
84-118	SS gry	36.0
118-120	SH gry	36.6

Grouted with 12 sack / Bentonite Grout

5 Well Completion

Date Started: 08 03 26 Date Completed: 08 03 26
Are measurements in metric or imperial?

Casing Details:

	Surface Seal	Casing	Liner/Inner Casing
Diameter of borehole	17.1	6 3/4	12.5 cm
Casing type		STEEL	PVC
Size OD		5 9/16	4 1/2
Wall thickness		.258	.237
Bottom at	30.0	95'	120'
Top at	.61	2'	80'
Annular Sealant	☐ Cement ☐ Bentonite From: To:	☐ Cement ☑ Bentonite ☑ Driven ☐ Shale Trap From: 0 To: 95	☐ Cement ☐ Bentonite ☐ Driven ☐ Shale Trap From: To:

Production Interval Details:

Perforations: from: 95 to: 115
from: 28.9 to: 35.1
Perforation size: 3/8 x 3/8
Perforated by: ☐ Saw ☐ Torch ☐ Machine ☑ Other: Drill
Screen type: Size OD:
Intervals: from: to: slot size:
from: to: slot size:
Installation: ☐ Attached to casing ☐ Telescoped
Fittings: Top ☐ Packer ☐ Coupler Bottom ☐ Wash-down ☐ Bail ☐ Plug
Pack: ☐ Artificial/Mechanical ☐ Natural
Grain size: Amount:

6 Well Yield (West well)

Test Date: 08 03 26 Start Time:
Test method: ☑ Pump ☐ Bailer ☑ Air
Are measurements in metric or imperial?
Non pumping static water level: 27.30m
Rate of water removal: 70 g.p.m
Depth of pump intake if pump tested: 33m
Depth bailed or air tested from: 43m
Water level at end of water removal period: 28.59m
Distance from top of casing to ground level: 0.61m
Measurements taken from: casing

Depth to water level — Pumping	Elapsed Time (minutes)	Recovery
27.30	0	28.59
28.00	1	27.46
28.35	2	27.38
28.43	3	27.35
28.46	4	27.33
28.50	5	27.33
28.52	6	27.32
28.54	7	27.32
28.55	8	27.31
28.56	9	27.31
28.57	10	27.31
28.58	12	27.30
28.59	14	27.30
28.59	15	27.30
28.59	20	
28.59	25	
28.59	30	
28.59	35	
	40	
	50	
	60	
	75	
	90	
	105	
28.59	120	27.30

If water removal was less than 2 hr. duration, reason why:
Recommended pumping rate: 10 g.p.m
Recommended pump intake: 105 ft.
Pump installed ☐ Yes Depth:
Type: Model: H.P:

Water Used to Drill Well:
Location of Water Source: Shop
Water Diversion Date: 08 03 25 Time: 5:00 am/pm
Amount Water Taken: 1200 Litres/Imp. Gallons

GPS Co-ordinates (Decimal Degrees):
Latitude: 52°12.80 Longitude: 114°24.395 Elevation: 3194
Level of GPS Accuracy:
☐ Diff. Corr. Hand Held 5-10m ☐ Surveyed GPS < 1m
☑ Hand Held Auto 20-30m

Geophysical Log taken: ☐ Electric ☐ Gamma
Did you encounter: ☐ Mineralized water more than 4000 ppm TDS ☐ Gas At what depth:
Remedial action taken:
Additional Comments:

7 Contractor Certification

Driller's Name: Kris Schindel
Certification No.: 40628A
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: 08 03 26 (Yr Mo Day)

White copy: Alberta Environment Yellow copy: 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 Received:	1976/09/08
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: HANSEN DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner'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 LSD	Sec	Twp	Rge	Westof M
SW	34	039	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot Block Plan

Well Elev: 950.98 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:

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

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	Perforations Size:
from: 15.24 M to: 18.29 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: 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.

6. Well Yield

Test Date (yyyy/mm/dd): 1976/08/05	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	7.32 M
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 pumptest 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 Received:	1981/07/21
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: BIG QUILL DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: HICKS, R	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 6315 DALMARNOCK CRES NW, CALGARY	Postal Code: T3A 1H3
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	34	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

4. Formation Log

Depth from ground level (meters)	Lithology Description
9.45	Brown Clay & Rocks
23.77	Brown Water Bearing Sandstone
32.31	Gray Medium Grained Sandstone
35.05	Gray Shale
36.58	Light Blue Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1981/06/05	Date Completed (yyyy/mm/dd): 1981/06/05
Well Depth: 36.58 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: 27.74 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: 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:	

6. Well Yield

Test Date (yyyy/mm/dd): 1981/06/05	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	8.23 M
Rate of water removal:	136.38 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: 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 pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Water Well Drilling Report

Alberta Environment

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	34	039	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot	Block	Plan
21	9	8922703

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 1363.8 Liters

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 Started(yyyy/mm/dd): 1996/05/29	Date Completed (yyyy/mm/dd): 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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 1.59 CM x 10.16 CM 0 CM x 0 CM 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: 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: DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: .5 M.	

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
Rate of water removal:	227.3 Liters/Min
Depth of pump intake:	30.48 M
Water level at end of pumping:	M
Distance from top of casing to ground level:	CM

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 pumptest 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 Received:	1992/11/02
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
WellOwner's Name: TUMBACH, KEN	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 129 SUNNYVALE CRES, CALGARY	Postal Code: T2X 2S3
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 1.59 CM x 0 CM 0 CM x 0 CM 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.	

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:

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 pumptest 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

Company Name: STAR DRLG CO		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner'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 LSD	Sec	Twp	Rge	West of M
NE	34	039	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot Block Plan

Well Elev: 993.65 M
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:

Proposed well use: Stock
Anticipated Water Requirements/day 4546 Liters

Method of Drilling: Rotary

Flowing Well: No
Gas Present:
Rate: Liters
Oil Present:

6. Well Yield

Test Date (yyyy/mm/dd): 1978/03/13	Start Time: 11:00 AM
Test Method: Pump	
Non pumping static level:	45.72 M
Rate of water removal:	45.46 Liters/Min
Depth of pump intake:	0 M
Water level at end of pumping:	54.86 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:

Recommended pumping rate: 45.46 Liters/Min

Recommended pump intake: 60.96 M

Type Pump Installed
Pump Type:
Pump Model:
H.P.:

Any further pumptest information?

4. Formation Log

Depth from ground level (meters)	Lithology Description
9.14	Clay
45.72	Shattered Shale
77.72	Hard Shale Stringers

5. Well Completion

Date Started(yyyy/mm/dd): 1978/03/09	Date Completed (yyyy/mm/dd): 1978/03/13
Well Depth: 77.72 M	Borehole Diameter: 0 CM
Casing Type: Steel	Liner Type:
Size OD: 11.43 CM	Size OD: 0 CM
Wall Thickness: 0.36 CM	Wall Thickness: 0 CM
Bottom at: 65.53 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: Driven
from: 0 M to: 1.22 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.

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

Company Name: BROWN JIM		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: BROWN, GLEN	Well Location Identifier:	
P.O. Box Number:	Mailing Address: LAKE COTTAGE, N.S. OF SYLVAN LAKE	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	34	039	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot 21 | 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: Unknown
Flowing Well: No Rate: Liters
Gas Present: Oil Present:

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

4. Formation Log

Depth from ground level (meters)	Lithology Description
15.24	Clay & Sand
25.91	Clay & Rocks
33.53	Shale
42.67	Sandstone Stringers
45.72	Shale

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 1969/08/04
Well Depth: 45.72 M	Borehole Diameter: 0 CM
Casing Type: Unknown	Liner Type:
Size OD: 13.97 CM	Size OD: 0 CM
Wall Thickness: 0 CM	Wall Thickness: 0 CM
Bottom at: 28.04 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: 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.	

6. Well Yield

Test Date (yyyy/mm/dd): 1969/08/04	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	15.24 M
Rate of water removal:	54.55 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:
Pump Model:
H.P.:
Any further pumptest 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.:	0365978
Map Verified:	Not Verified
Date Report Received:	1992/09/21
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
WellOwner's Name: GRUDGEFIELD, GORD	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 169 WOODFORD DR SW, CALGARY	Postal Code: T2W 4C2
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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:
Materials Used:
Method of Drilling: Combination
Flowing Well: No
Gas Present: No
Rate: Liters
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 1.59 CM x 0 CM 0 CM x 0 CM 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.	

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:

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 pumptest 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 Received:	1972/09/18
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: BROWN JIM		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: MCCOOK	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 23 35 N.Y. SYLVAN LAKE NORTH SIDE	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	34	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

4. Formation Log

Depth from ground level (meters)	Lithology Description
15.24	Clay & Rocks
18.29	Shale
21.34	Blue Lost Circulation Shale
39.62	Lost Circulation Shale & Sandstone

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 1972/06/12
Well Depth: 39.62 M	Borehole Diameter: 0 CM
Casing Type: Steel	Liner Type:
Size OD: 11.43 CM	Size OD: 0 CM
Wall Thickness: 0 CM	Wall Thickness: 0 CM
Bottom at: 19.2 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: 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.	

6. Well Yield

Test Date (yyyy/mm/dd): 1972/06/12	Start Time: 11:00 AM
Test Method: Pump	
Non pumping static level:	21.34 M
Rate of water removal:	54.55 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: 25.91 M

Type Pump Installed
Pump Type: SUB
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Alberta Environment

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 Received:	1971/08/24
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: NELSON DRILLING & PLUMBING		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: SHAPKE, B.	Well Location Identifier:	
P.O. Box Number:	Mailing Address: CALGARY	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	34	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

4. Formation Log

Depth from ground level (meters)	Lithology Description
3.05	Brown Clay & Sand
17.07	Blue Clay
22.86	Sandstone Stringers
27.43	Blue Soft Shale
32.92	Water Bearing Shale
36.58	Blue Shale

5. Well Completion

Date Started(yyyy/mm/dd): Date Completed (yyyy/mm/dd): 1971/07/01
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: 30.18 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: 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.

6. Well Yield

Test Date (yyyy/mm/dd): 1971/07/01
Start Time: 11:00 AM
Test Method: Pump
Non pumping static level: 0.91 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: 0.91 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 pumptest 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.:	0362709
Map Verified:	Not Verified
Date Report Received:	1971/10/25
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: NELSON DRILLING & PLUMBING		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: STEVENS, OLIVA	Well Location Identifier:	
P.O. Box Number:	Mailing Address: CALGARY	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	34	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

4. Formation Log

Depth from ground level (meters)	Lithology Description
7.62	Brown Clay
17.37	Blue Clay
33.22	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: 27.43 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: 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:
COTTAGE @ MANOR INVESTMENTS NORTH SIDE OF SYLVAN LAKE. SOFT WATER.

6. Well Yield

Test Date (yyyy/mm/dd): 1971/08/01
Start Time: 11:00 AM
Test Method: Pump

Non pumping static level: 3.66 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: 3.96 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 pumptest 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.:	0362723
Map Verified:	Map
Date Report Received:	1979/10/09
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: SYLVAN LAKE DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner'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 LSD	Sec	Twp	Rge	West of 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:

Proposed well use: Stock
Anticipated Water Requirements/day 400 Gallons

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:
from: 0 FT to: 0 FT — Screen ID: 0 Inches, Slot Size: 0 Inches
Screen Type:
from: 0 FT to: 0 FT — Screen ID: 0 Inches, 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:

6. Well Yield

Test Date (yyyy/mm/dd): 1979/08/29	Start Time: 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: Inches

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:

Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 0 FT

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

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

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

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NE	34	039	02	5

Location in Quarter
0 M from Boundary
0 M from Boundary

Lot Block Plan

Well Elev: 994.87 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

4. Formation Log

Depth from ground level (meters)	Lithology Description

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 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: 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: M	Diameter: CM
Comments: PASKAPOO FORMATION.	

6. Well Yield

Test Date (yyyy/mm/dd): 1934/01/01	Start Time: 11:00 AM
Test Method: Unknown	
Non pumping static level:	21.34 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 casing to ground level:	CM

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 pumptest 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.:	0362715
Map Verified:	Not Verified
Date Report Received:	1970/11/05
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: LAWSON, M.E. WATER WELLS		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: RICHARSON, JACK	Well Location Identifier:	
P.O. Box Number:	Mailing Address: NORTH END SYLVAN LAKE, OLDS	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NW	34	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 Rate: Liters
Gas Present: Oil Present:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

4. Formation Log

Depth from ground level (meters)	Lithology Description
5.18	Sandy Clay
6.1	Sand
15.24	Clay & Boulders
18.29	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 1970/08/18
Well Depth: 18.29 M	Borehole Diameter: 0 CM
Casing Type: Steel	Liner Type:
Size OD: 12.7 CM	Size OD: 0 CM
Wall Thickness: 0 CM	Wall Thickness: 0 CM
Bottom at: 15.54 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: 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: M	Diameter: CM
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1970/08/18	Start Time: 11:00 AM
Test Method: Pump	
Non pumping static level:	5.79 M
Rate of water removal:	90.92 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: 6.4 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 pumptest information?

7. Contractor Certification

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

Water Well Drilling Report

Alberta Environment

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 Received:	1976/09/03
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: WEINMAN, GARRY	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 1312 CRAIG RD SW, CALGARY	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of 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

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
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: 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:
MEDIUM HARD WATER.

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 pumptest 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.:	0362717
Map Verified:	Not Verified
Date Report Received:	
Measurements:	Metric

1. Contractor & Well Owner Information

Company Name: RICHMOND WW DRLG		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: PIERSON, GORDON	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 12 VARNA PLACE NW, CALGARY	Postal Code: T3A 0E8
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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

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
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: Driven
from: 0 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: 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.

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 pumptest 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.:	0362718
Map Verified:	Not Verified
Date Report Received:	1981/05/20
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
WellOwner's Name: REID, WILF	Well Location Identifier:	
P.O. Box Number:	Mailing Address: 23 BAINES CRES, RED DEER	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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
Gas Present: Rate: Liters Oil Present:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

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
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: Driven from: 0 M to: 37.19 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.

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 casing to ground level:	CM

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 pumptest 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.:	0362720
Map Verified:	Not Verified
Date Report Received:	
Measurements:	Metric

1. Contractor & Well Owner Information

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
NW	34	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 Rate: Liters
Gas Present: Oil Present:
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Liters

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): Date Completed (yyyy/mm/dd): 1963/06/27

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: 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.

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:

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 13.41 M

Type Pump Installed
Pump Type: HAND
Pump Model:
H.P.:
Any further pumptest 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.:	0362728
Map Verified:	Map
Date Report Received:	1975/01/03
Measurements:	Metric

1. Contractor & Well Owner Information

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof
NW	35	039	02	5 M

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

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 15.24 CM 0 CM x 0 CM 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: 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.	

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:

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 0 M

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

7. Contractor Certification

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

Water Well Drilling Report

Alberta Environment

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 Received:	1980/09/03
Measurements:	Metric

1. Contractor & Well Owner Information

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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: Materials Used:
Method of Drilling: Cable Tool
Flowing Well: No
Gas Present: Rate: Liters Oil Present:
Proposed well use: Stock
Anticipated Water Requirements/day 0 Liters

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 15.24 CM 0 CM x 0 CM 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:	

6. Well Yield

Test Date (yyyy/mm/dd): 1980/06/12	Start Time: 11:00 AM
Test Method: Bailer	
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:

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 0 M

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest 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:
WellOwner'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 LSD	Sec	Twp	Rge	West of 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 (yyyy/mm/dd): 1932/01/01
Start Time: 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 casing to ground level: CM

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 pumptest 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	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: 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: 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

Alberta Environment

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 Received:	1980/09/03
Measurements:	Metric

1. Contractor & Well Owner Information

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

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof 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: Materials Used:
Method of Drilling: Cable Tool
Flowing Well: No
Gas Present:
Rate: Liters
Oil Present:
Proposed well use: Domestic & Stock
Anticipated Water Requirements/day 0 Liters

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 from: 0 M to: 0 M from: 0 M to: 0 M	Perforations Size: 0.95 CM x 15.24 CM 0 CM x 0 CM 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.

6. Well Yield

Test Date (yyyy/mm/dd): 1980/06/09	Start Time: 11:00 AM
Test Method: Bailer	
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:

Recommended pumping rate: 0 Liters/Min

Recommended pump intake: 0 M

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest 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 Janner Phone 403-748-4180

Owner's Address RR1 Site 1 Box 1x Bentley T0C 0J0

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

Location, GPS: 11U0690800 UTM 5809844 Elev. _____

Well location: Pit ✓, Inside building ___, Near Dugout ___, Near barn ___

Other _____

Total depth _____ Casing Diam. 8" 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 ___ ^{0} 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, Horst Weselley Phone 748-419-6061 (Doug)

Owner's Address Site 1 RR1 Box 30 Bentley T0C 0J0

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

Location, GPS: 11U0690770 UTM 5809859 Elev. _____

Well location: Pit ✓, Inside building ____, Near Dugout ____, Near barn ____

Other located on Tanner Property

Total depth ____ Casing Diam. 5&5" Casing Material Steel Height above gnd 0

Casing wall thickness _____ Completion zone _____ to _____

Depth to water, measured _____ Reported _____

Driller Arcan 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 ____ ^{0} 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 ø

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 ___ ^{0} 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: 11U0688881 UTM 5809990 Elev. _____

Well location: Pit ____, Inside building ✓, Near Dugout ____, Near barn ____

Other _____

Total depth ____ Casing Diam. ____ Casing Material Steel Height above gnd Ø

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 ____ ^{0} 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 Noyes Phone 748-2222

Owner's Address Box 1 Site 1 RR1 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 ____ ^{0} 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 Scerpnck Phone 748-2491

Owner's Address RR1 Box 177 Bentley Tocoto

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

Location, GPS: 11U0490599 UTM5810144 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 ____ ^{0} 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

Water Well Drilling Report

Alberta Environment

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 I.D.
GoA Well Tag No.
Date Report Received

① Well Identification and Location

Owner Name: Qualico Palm Cove | Address: | Town: | Postal Code: OB-1

Location 1/4 or LSD: NW | SEC: 34 | TWP: 39 | RGE: 2 | W of MER: 5 | Lot: | Block: | Plan: | Additional Description: West Waterwell

Measured from Boundary of: ☐ Quarter ☐ Lot
|_|_|_|_| m/ft from ☐ N ☐ S |_|_|_|_| m/ft from ☐ E ☐ W

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

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:
Plugged with: ☐ 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 licenced 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 (silty)
77-97	7 GPM	SS Grey
97-116		Shale Grey
116-150	✓	SS Grey
150-160		Shale Grey

④ 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 9/16"
Wall Thickness: .258"
Bottom at: 113'

Well Casing/Liner:
☐ Steel ☐ Galvanized Steel ☑ PVC ☐ Fiberglass ☐ Other:
Size OD: 4½" Wall Thickness: .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:

⑤ Yield Test

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

Test Date: 10/02/12 | 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 Rate: L/min or Igpm
☐ Yes, flow control installed Describe:

Method of Water Removal:
☑ Pump Pumping Rate: 43 L/min Igpm Depth Pumped From: 130 m/ft
☐ Bailer Water Removal Rate: L/min / Igpm Depth Bailed From: m/ft
☑ Air Water Removal Rate: 43 L/min Igpm Depth Air Tested From: 160 m/ft

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

Recommended Pump Rate: 10 L/min or Igpm
Recommended Pump Intake Depth (From TOC): 130 m/ft
Pump installed ☐ Yes Depth:
Type: Model: H.P:

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: m/ft ☐ Gas Depth: m/ft
Remedial Action Taken:

Additional Comments on Well:

☑ Well Disinfected Upon Completion
Geophysical Log Taken: ☐ Electric ☐ Gamma ☐ Other (Specify):
Sample Collected for Potability: ☐ Yes (☐ Result Attached) ☐ No

Depth to water level

Elapsed Time (Minutes)	Pumping	Recovery
0	104.2	130.0
1	119.1	120.1
2	122.6	115.4
3	124.1	111.1
4	125.2	108.6
5	126.3	108.0
6	126.9	107.5
7	127.5	107.1
8	128.4	106.8
9	129.1	106.0
10	130.0	105.4
12	130.0	105.1
14	130.0	104.9
16		104.6
18		104.3
20		104.2
25		
30		
35		
40		
50		
60		
75		
90		
105		
120		

⑥ Water Diverted for Drilling

Water Source: Shop | Amount Taken: 1200 | Diversion Date: 10/02/12 | Time: 7:00 am/pm

⑦ Contractor Certification

☑ Copy of Drilling Report Given to Owner

Name of Journeyman responsible for drilling/construction of well: Kirby Pearson | Certification No: 83061A

Company Name: Aiken Basin Drilling LTD | 9166

☑ *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: 10/02/12

Water Well Drilling Report

Alberta Environment

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 I.D.
GoA Well Tag No.
Date Report Received

① Well Identification and Location

Owner Name: Qualco Palm Cove | Address: | Town: | Postal Code:

Location: 1/4 or LSD: NW | SEC: 34 | TWP: 39 | RGE: 2 | W of Mer: 5 | Lot: | Block: | Plan: | Additional Description: PW-1

Measured from Boundary of: ☐ Quarter ☐ Lot
|_|_|_|_| m/ft from ☐ N ☐ S |_|_|_|_| m/ft from ☐ E ☐ W

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 52.40601 Longitude: 114.20737° Elevation: 990m
☑ 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:
Plugged with: ☐ Bentonite Slurry ☐ Bentonite Chips ☐ Cement
☐ Other (Specify):
Amount Used:
☐ Deepened Well - Well ID (if applicable):
☐ Reconstructed Well

Proposed Well Use:
☐ Household (up to 1250 m3/yr with residence on property)
☐ Other (Specify):

(Note: All wells, except household wells, must be licenced 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
12-22		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	7 GPM	SS Grey Brown
105-121		Shale Grey
121-147		SS Grey
147-160		Shale Grey

Loss Circulation while Drill Water 80'

④ Well Completion

Measurements in: ☐ Metric ☑ Imperial

Total Depth Drilled:	Finished Well Depth:	Start Date	End Date
160	160	10/02/11	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
Size OD: 5 9/16"
Wall Thickness: .258"
Bottom at: 117'

Well Casing/Liner:
☐ Steel ☐ Galvanized Steel
☑ PVC ☐ Fiberglass
☐ Other:
Size OD: 4 1/2" Wall Thickness: .257"
Top at: 100' Bottom at: 160'
Perforations:
From: 120 To: 145'
From: To:
Size: 3/8" X 18"
Perforated by: ☐ Machine ☐ Saw ☑ Drill ☐ Other:

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 ☐ Bail ☐ Plug

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

⑤ Yield Test

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

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

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

Method of Water Removal:
☑ Pump Pumping Rate: 40 L/min / igpm Depth Pumped From: 120 m/ft
☐ Bailer Water Removal Rate: L/min / igpm Depth Bailed From: m/ft
☑ Air Water Removal Rate: ~~120~~ 80 L/min / igpm Depth Air Tested From: 160 m/ft

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

Recommended Pump Rate: 10 L/min or igpm
Recommended Pump Intake Depth (From TOC): m/ft
Pump installed ☐ Yes Depth:
Type: Model: H.P:

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: m/ft ☐ Gas Depth: m/ft
Remedial Action Taken:

☑ Well Disinfected Upon Completion
Geophysical Log Taken:
☐ Electric ☐ Gamma
☐ Other (Specify):

Additional Comments on Well:

Sample Collected for Potability:
☐ Yes (☐ Result Attached)
☐ No

Depth to water level	Elapsed Time Minutes	Recovery
Pumping		
110.9	0	113.6
112.8	1	112.9
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	

⑥ Water Diverted for Drilling

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

⑦ Contractor Certification

☑ Copy of Drilling Report Given to Owner

Name of Journeyman Responsible for drilling/construction of well: Mike Isaacson | 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: Date: 10/02/11

Alberta ENVIRONMENT

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 I.D.:
GoA Well Tag No.:
Date Report Received:

1 Well Identification and Location

Owner Name: Qualico (Palm Cove)
Address: c/o EOS Group Inc. Suite 300, 3203-93 St.
Town: Edmonton
Postal Code: T6N 0B2

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

Measured from Boundary of: ☐ Quarter ☐ Lot
|__|__|__|__ m/ft from ☐ N ☐ S |__|__|__|__ m/ft from ☐ E ☐ W

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 52.40601 Longitude: 114.20737 Elevation: 970m
☐ 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:
☐ 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 licenced Alberta Environment to divert and use groundwater)

3 Formation Log

Measurements in: ☐ Metric ☑ Imperial

Depth from ground level	Indicate if Water Bearing	Lithology Description
0-17		Clay Brown
17-22		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	7 GPM	SS Grey / Brown
105-121		Shale Grey
121-147	✓	SS Grey
147-160		Shale Grey

4 Well Completion

Measurements in: ☐ Metric ☑ Imperial

Total Depth Drilled: 160
Finished Well Depth: 160
Start Date: 10 MAR 09
End Date: 10 MAR 1[illegible]

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: .258"
Bottom at: 117'

Well Casing/Liner:
☐ Steel ☐ Galvanized Steel
☐ PVC ☐ Fiberglass
☐ Other:
Size OD: 4 1/2 Wall Thickness: .237
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: 12
☑ 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 ☐ Bail ☐

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

5 Yield Test

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

Test Date: 10 / 03 / 09
Start Time: 3:30 am/pm
Distance From Top of Casing to Ground Level: 2 m/ft
Static Water Level: 111 m/ft

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

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

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

Recommended Pump Rate: 10 L/min or igpm
Recommended Pump Intake Depth (From TOC): m/ft
Pump Installed ☐ Yes Depth:
Type: Model: H.P.:

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: m/ft
☐ Gas Depth: m/ft
Remedial Action Taken:

Additional Comments on Well:

☐ Well Disinfected Upon Completion
Geophysical Log Taken:
☐ Electric ☐ Gamma
☐ Other (Specify):
Sample Collected for Potability:
☐ Yes (☐ Result Attached)
☐ No

Depth to water level

Pumping	Elapsed Time Minutes	Recovery
110.9	0	113.6
112.8	1	114.9
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	

6 Water Diverted for Drilling

Water Source: Shop
Amount Taken: 1200
Diversion Date: 10 / 03 / 09
Time: 7:00 am/pm

7 Contractor Certification

☐ Copy of Drilling Report Given to Owner
Name of Journeyman responsible for drilling/construction of well: Riley Jenson
Certification No: 83061A
Company Name: Aiken 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 / 03 / 09

(ENVIR 03/09) White copy: Alberta Environment Yellow copy: Well Owner Pink copy: Contractor

PW 1

Alberta ENVIRONMENT

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.

GOA Well Tag No:
Date Report Received

1 Well Identification and Location

Owner Name: Quality (Palm Cove) | Address: c/o EDS Group Inc, Suite 200, 3203-93 St. | Town: Edmonton | Postal Code: T6N 0B2

Location: 1/4 or LSD: NW | SEC: 34 | TWP: 39 | RGE: 2 | W of MER: 5 | Lot: | Block: | Plan: | Additional Description: West Waterwell

Measured from Boundary of: ☐ Quarter ☐ Lot

|__|__|__|__ m/ft from ☐ N ☐ S |__|__|__|__ m/ft from ☐ E ☐ W

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: 52.4061° Longitude: 114.20817° Elevation: 968 m
☐ 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:
☐ 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 licenced 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 (silty)
77-97	7 GPM	SS Grey
97-116		Shale Grey
116-150	✓	SS Grey
150-160		Shale Grey

4 Well Completion

Measurements in: ☐ Metric ☑ Imperial

Total Depth Drilled: 160 | Finished Well Depth: 160 | Start Date: 10/Jan/08 | End Date: 10/Jan/08

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: .058" Bottom at: 113'

Well Casing/Liner: ☐ Steel ☐ Galvanized Steel ☑ PVC ☐ Fiberglass ☐ Other:
Size OD: 4½ Wall Thickness: .237" Top at: 80' Bottom at: 160'
Perforations: From: 115 To: 143" 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 ☐ Bail ☐ Plug

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

5 Yield Test

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

Test Date: 10/Jan/08 | Start Time: 9:30 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 igpm

Method of Water Removal:
☑ Pump Pumping Rate: 43 L/min / igpm Depth Pumped From: 130 m/ft
☐ Bailer Water Removal Rate: L/min / igpm Depth Bailed From: m/ft
☐ Air Water Removal Rate: 43 L/min / igpm Depth Air Tested From: 160 m/ft

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

Recommended Pump Rate: 20 L/min or igpm
Recommended Pump Intake Depth (From TOC): 130 m/ft
Pump installed ☐ Yes Depth: Type: Model: H.P.:

Did you Encounter: ☐ Saline Water (>4000 ppm TDS) Depth: m/ft ☐ Gas Depth: m/ft
Remedial Action Taken:

Additional Comments on Well:

☐ Well Disinfected Upon Completion
Geophysical Log Taken: ☐ Electric ☐ Gamma ☐ Other (Specify):
Sample Collected for Potability: ☐ Yes (☐ Result Attached) ☐ No

Depth to water level

Pumping	Elapsed Time Minutes	Recovery
104.3	0	130.0
119.1	1	120.1
122.6	2	115.1
124.1	3	111.1
125.2	4	108.6
126.3	5	108.0
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	104.9
	16	104.6
	18	104.3
	20	104.2
	25	
	30	
	35	
	40	
	50	
	60	
	75	
	90	
	105	
	120	

6 Water Diverted for Drilling

Water Source: Shop | Amount Taken: 1200 | Diversion Date: 10/Jan/08 | Time: 7:00 am/pm

7 Contractor Certification

☐ Copy of Drilling Report Given to Owner
Name of Journeyman responsible for drilling/construction of well: Riley Pearson 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/Jan/08

(ENVIR 03/09) White copy: Alberta Environment Yellow copy: Well Owner Pink copy: Contractor

081

APPENDIX D

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

Pumping Test - Water Level Data

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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Tel. 403-341-3320

Stantec

Pumping Test - Water Level Data

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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Red Deer, AB T4N 1X5
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Pumping Test - Water Level Data

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

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

Pumping Test - Water Level Data

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

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

Pumping Test - Water Level Data

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

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

Pumping Test - Water Level Data

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

WSH Labs (1992) Ltd.

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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Alken Basin Drilling
Box 47
Bentley, AB T0C 0J0

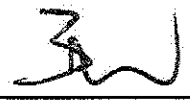
Phone: (403) 748-4340
Fax: (403) 748-2880
Email:

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

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

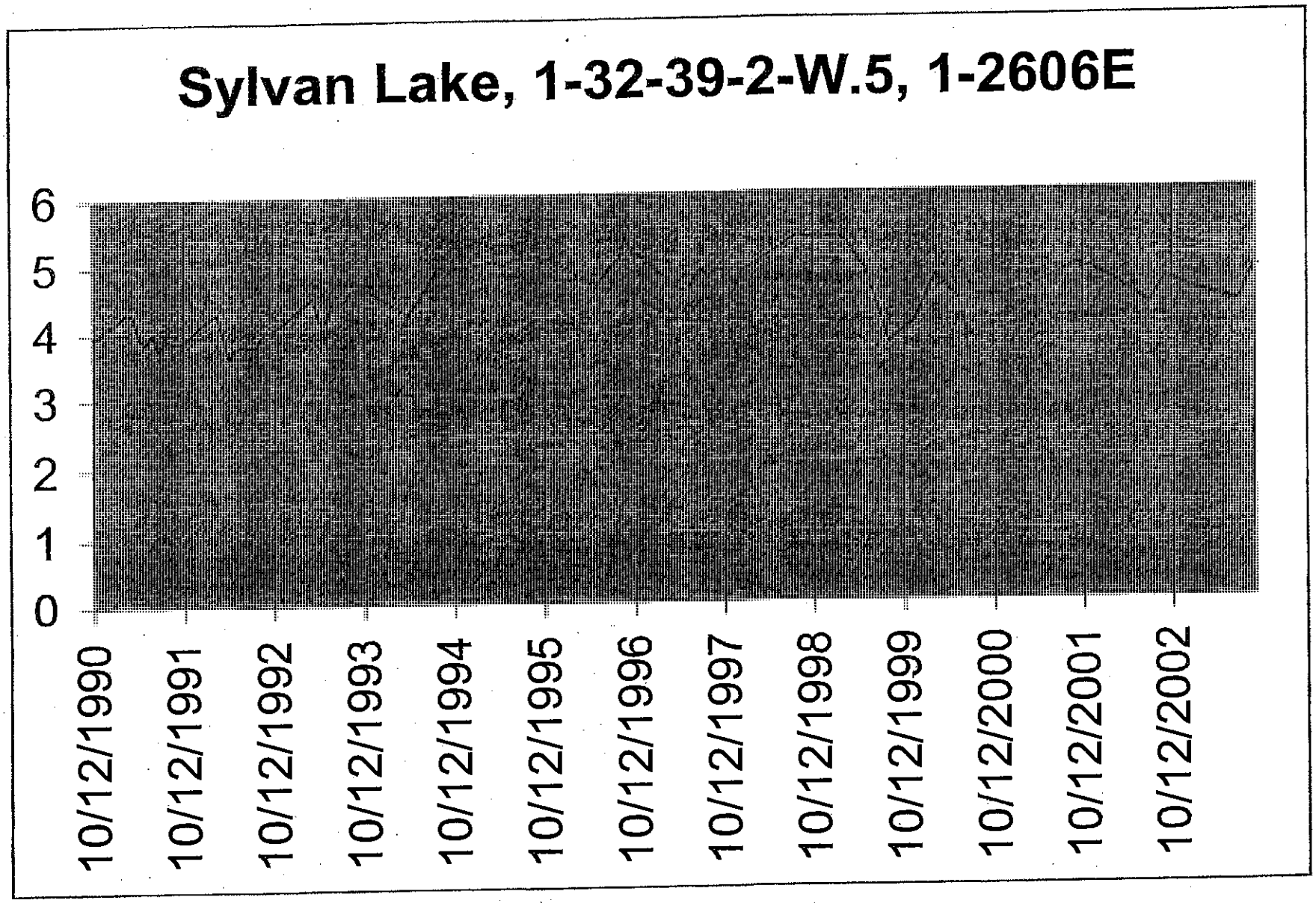
Certified By: 

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
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2

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
9.4
9.2
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2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5
4
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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, 1-19-39-1-W.5, 2-2609E
10/14/1990
4/14/1991
10/14/1991
4/14/1992
10/14/1992
4/14/1993
10/14/1993
4/14/1994
10/14/1994
4/14/1995
10/14/1995
4/14/1996
10/14/1996
4/14/1997
10/14/1997
5.5
5.4
5.3
5.2
5.1
5.0
4.9
4.8
4.7
4.6
4.5
4.4

Sylvan Lake, 1-19-39-1-W.5, 2-2610E
10/12/1990
4/12/1991
10/12/1991
4/12/1992
10/12/1992
4/12/1993
10/12/1993
4/12/1994
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4/12/1995
10/12/1995
4/12/1996
10/12/1996
4/12/1997
10/12/1997
0
1
2
3
4
5
6

Sylvan Lake, 1-19-39-1-W.5, 2-2611-E
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4/14/1991
10/14/1991
4/14/1992
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4/14/1993
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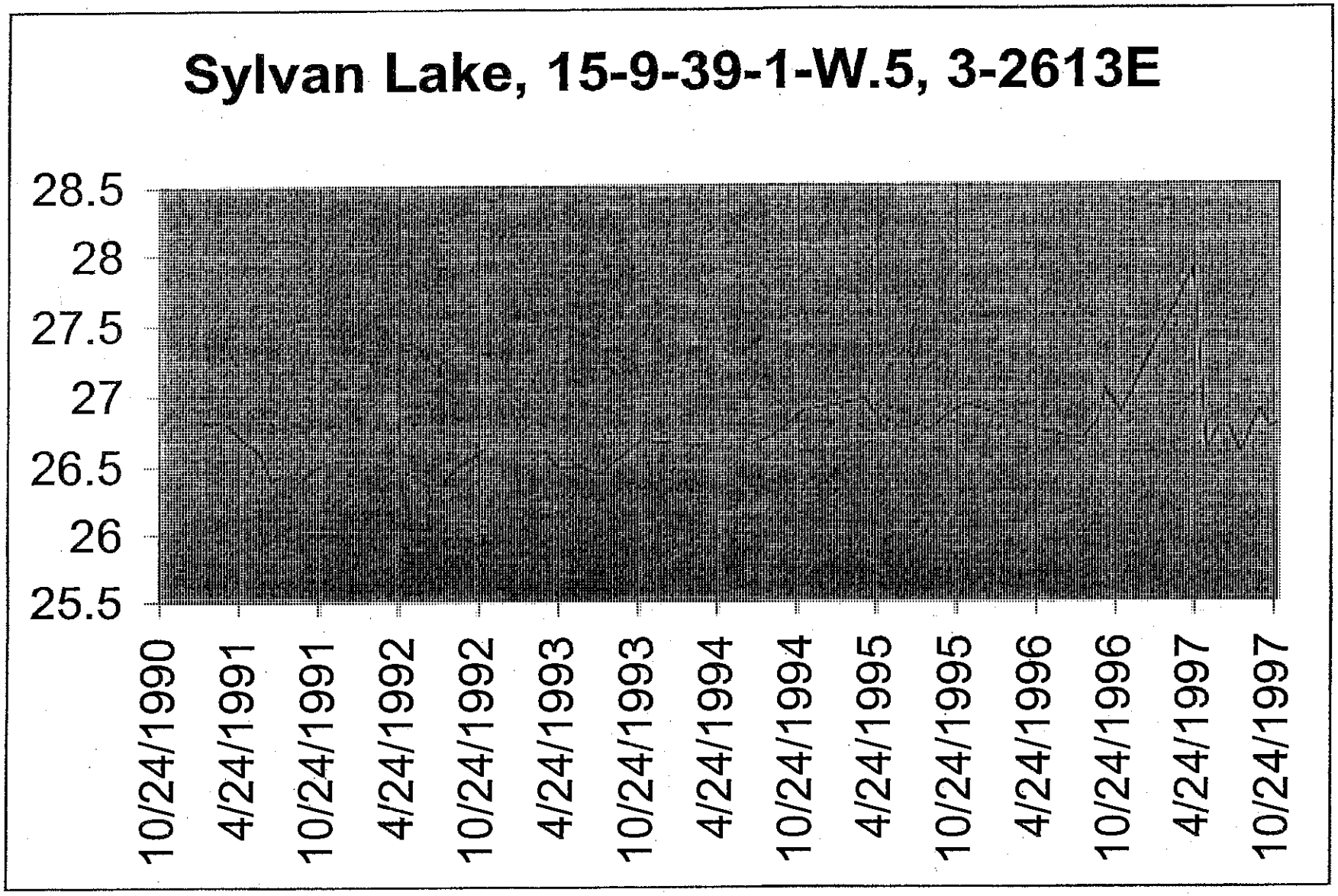
3
4
5
6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27.5
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26.5
26
25.5
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10/24/1991
4/24/1992
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4/24/1993
10/24/1993
4/24/1994
10/24/1994
4/24/1995
10/24/1995
4/24/1996
10/24/1996
4/24/1997
10/24/1997

Sylvan Lake, 13-26-39-2-W.5, 4-2616-E
16.3
16.2
16.1
16
15.9
15.8
15.7
15.6
15.5
15.4
15.3
10/27/1990
4/27/1991
10/27/1991
4/27/1992
10/27/1992
4/27/1993
10/27/1993
4/27/1994
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4/27/1995
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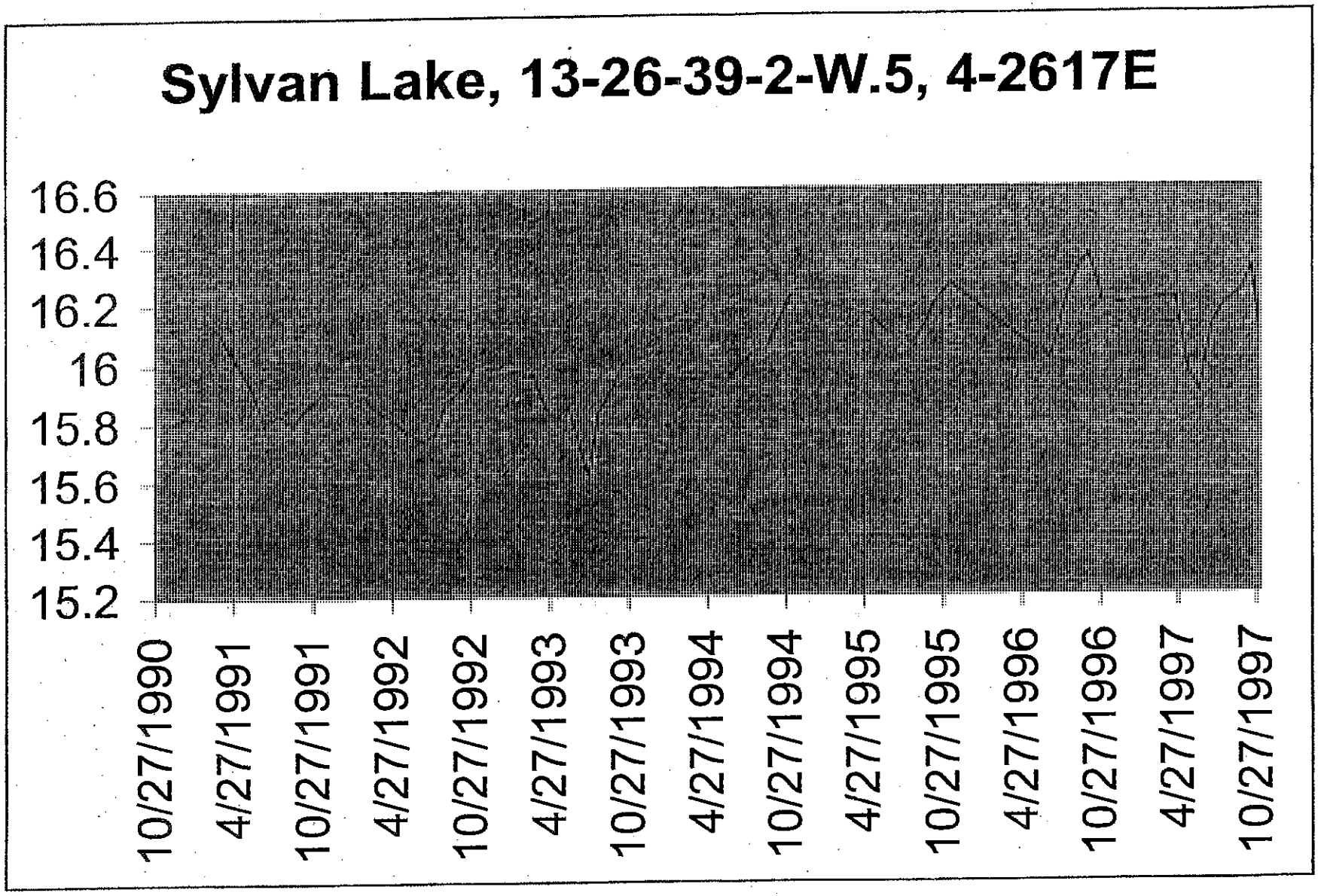
4/27/1996
10/27/1996
4/27/1997
10/27/1997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16.4
16.2
16
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15.6
15.4
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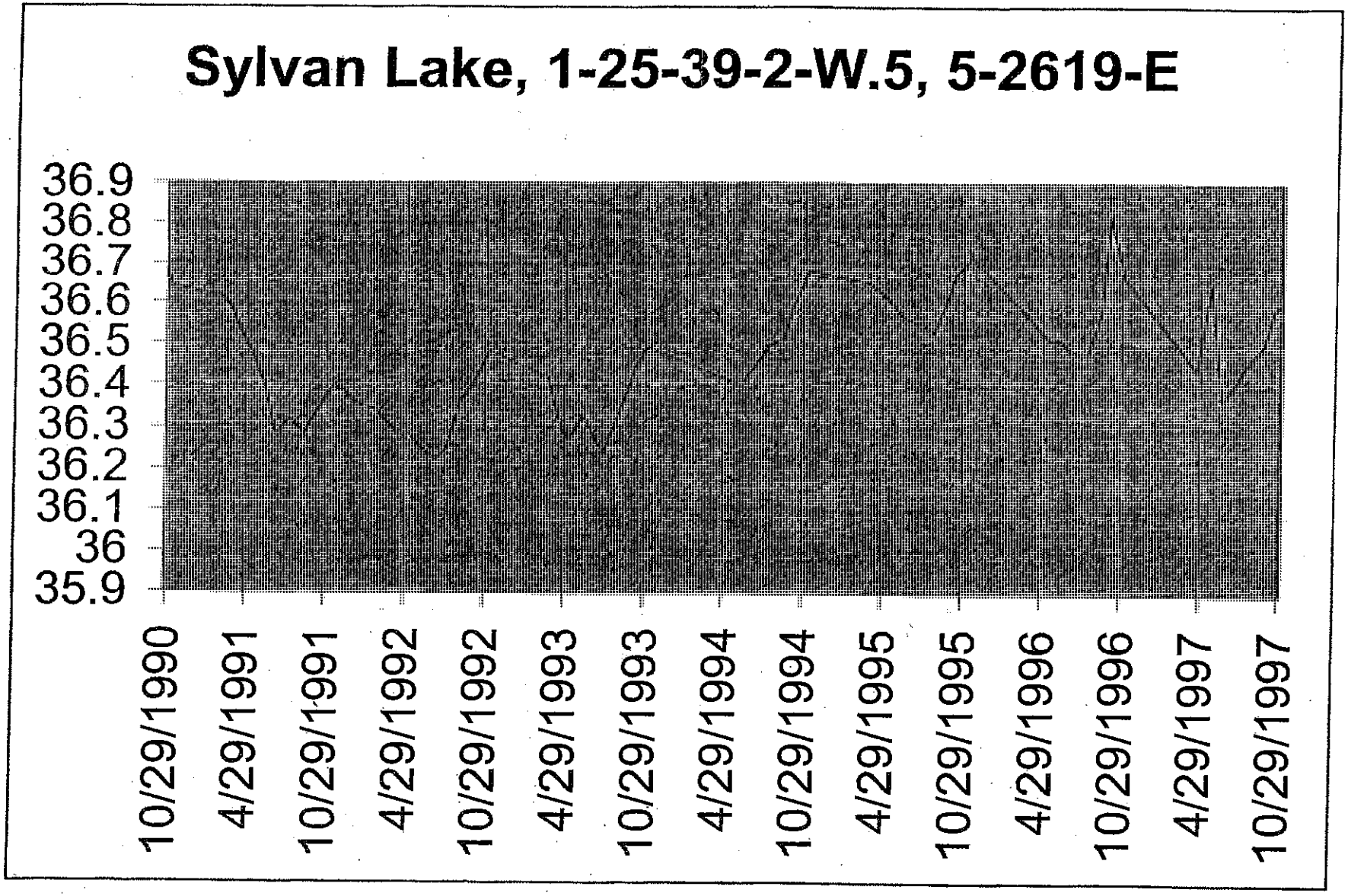
4/27/1991
10/27/1991
4/27/1992
10/27/1992
4/27/1993
10/27/1993
4/27/1994
10/27/1994
4/27/1995
10/27/1995
4/27/1996
10/27/1996
4/27/1997
10/27/1997

Sylvan Lake, 13-26-39-2-W.5, 4-2618-E
3.5
3
2.5
2
1.5
1
0.5
0
10/27/1990
4/27/1991
10/27/1991
4/27/1992
10/27/1992
4/27/1993
10/27/1993
4/27/1994
10/27/1994
4/27/1995
10/27/1995
4/27/1996
10/27/1996
4/27/1997
10/27/1997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36.9
36.8
36.7
36.6
36.5
36.4
36.3
36.2
36.1
36
35.9
10/29/1990
4/29/1991
10/29/1991
4/29/1992
10/29/1992
4/29/1993
10/29/1993
4/29/1994
10/29/1994
4/29/1995
10/29/1995
4/29/1996
10/29/1996
4/29/1997
10/29/1997

Sylvan Lake, 1-25-39-2-W.5, 5-2620-E
10/29/1997
4/29/1997
10/29/1996
4/29/1996
10/29/1995
4/29/1995
10/29/1994
4/29/1994
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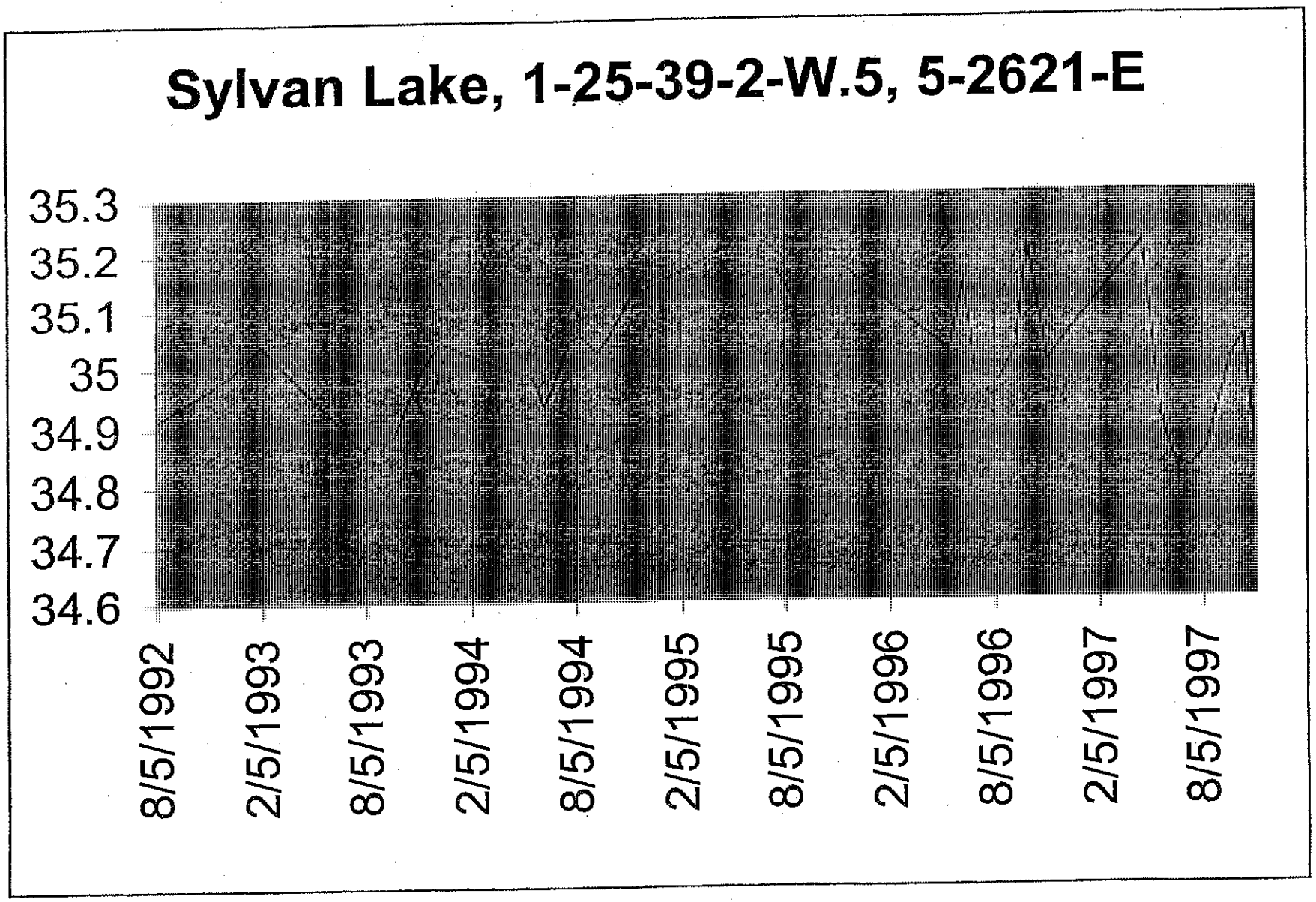
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35.2
35.1
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34.9
34.8
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34.6
8/5/1992
2/5/1993
8/5/1993
2/5/1994
8/5/1994
2/5/1995
8/5/1995
2/5/1996
8/5/1996
2/5/1997
8/5/1997

Sylvan Lake, 15-9-39-1-W.5, 3-2622-E
27.8
27.6
27.4
27.2
27
26.8
26.6
26.4
11/7/1990
5/7/1991
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11/7/1992
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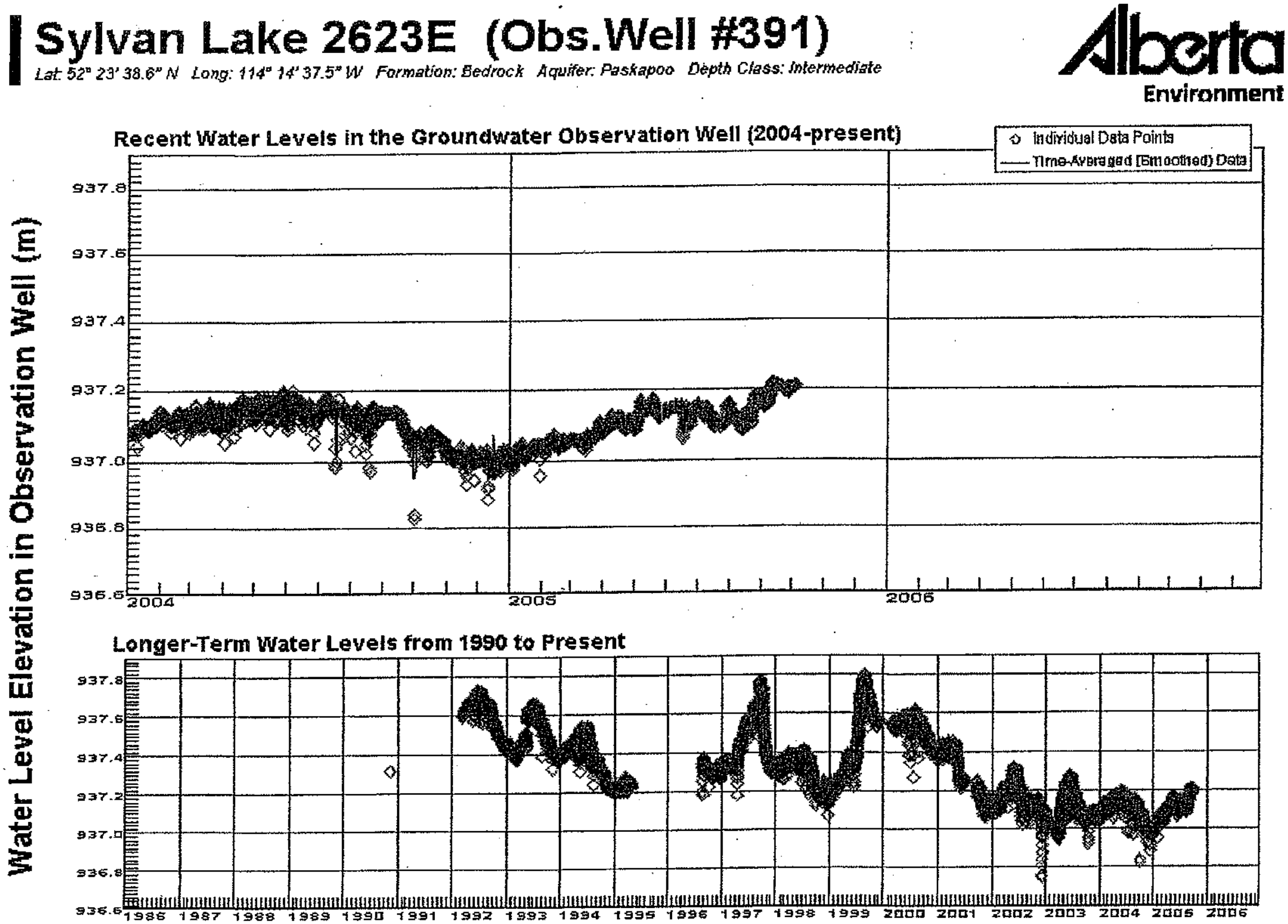
5/7/1997


Sylvan Lake 2623E (Obs.Well #391)
Lat: 52° 23' 38.6" N Long: 114° 14' 37.5" W Formation: Bedrock Aquifer: Paskapoo Depth Class: Intermediate
Alberta
Environment
Recent Water Levels in the Groundwater Observation Well (2004-present)
Individual Data Points
Time-Averaged (Smoothed) Data
Water Level Elevation in Observation Well (m)
937.8
937.6
937.4
937.2
937.0
936.8
936.6
2004
2005
2006
Longer-Term Water Levels from 1990 to Present
1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006

Sylvan Lake, 8-10-39-2-W.5, 6-2693-E
8/6/1992
2/6/1993
8/6/1993
2/6/1994
8/6/1994
2/6/1995
8/6/1995
2/6/1996
8/6/1996
2/6/1997
8/6/1997
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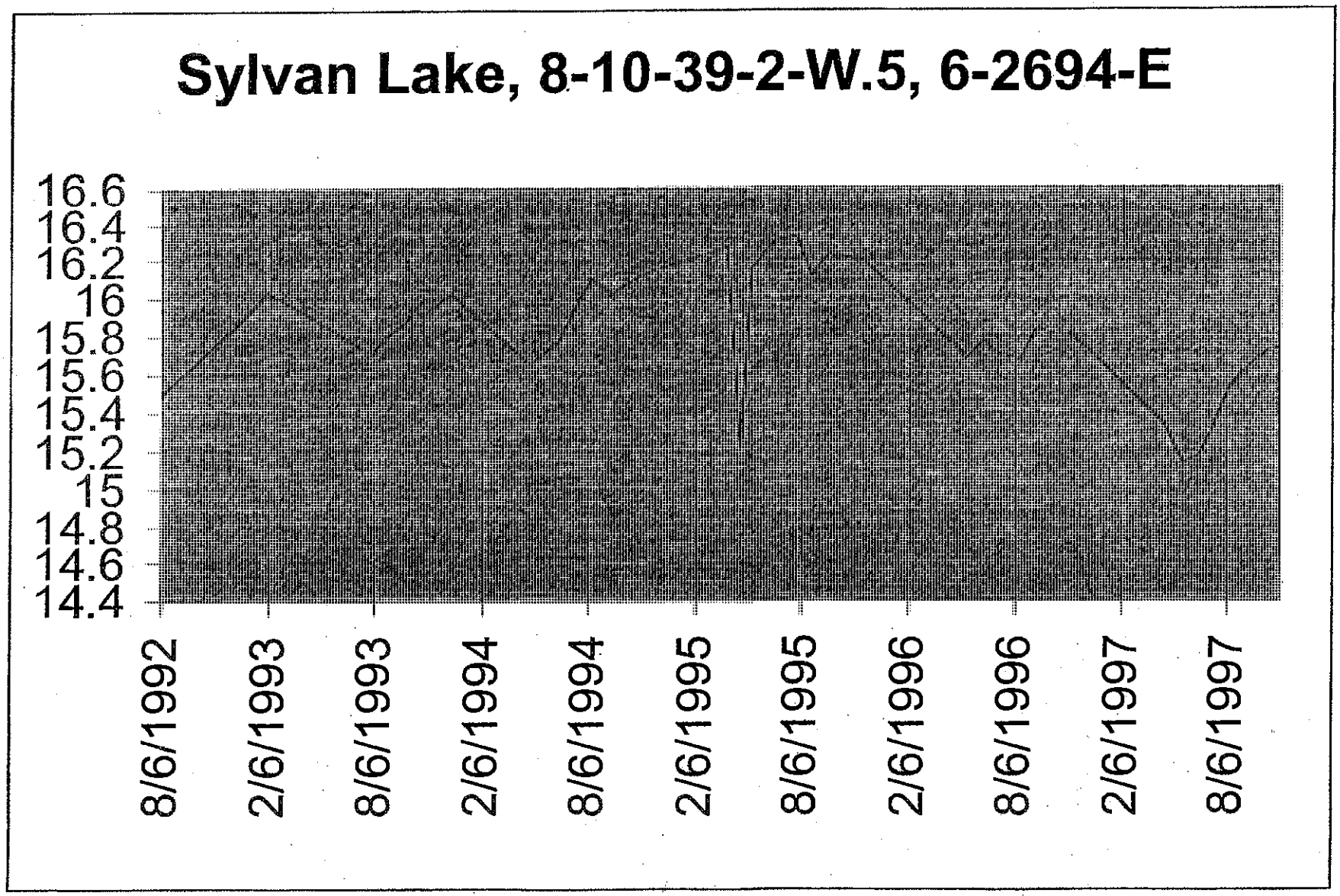
31.5
31
30.5
30
29.5
29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16.4
16.2
16
15.8
15.6
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15.2
15
14.8
14.6
14.4
8/6/1992
2/6/1993
8/6/1993
2/6/1994
8/6/1994
2/6/1995
8/6/1995
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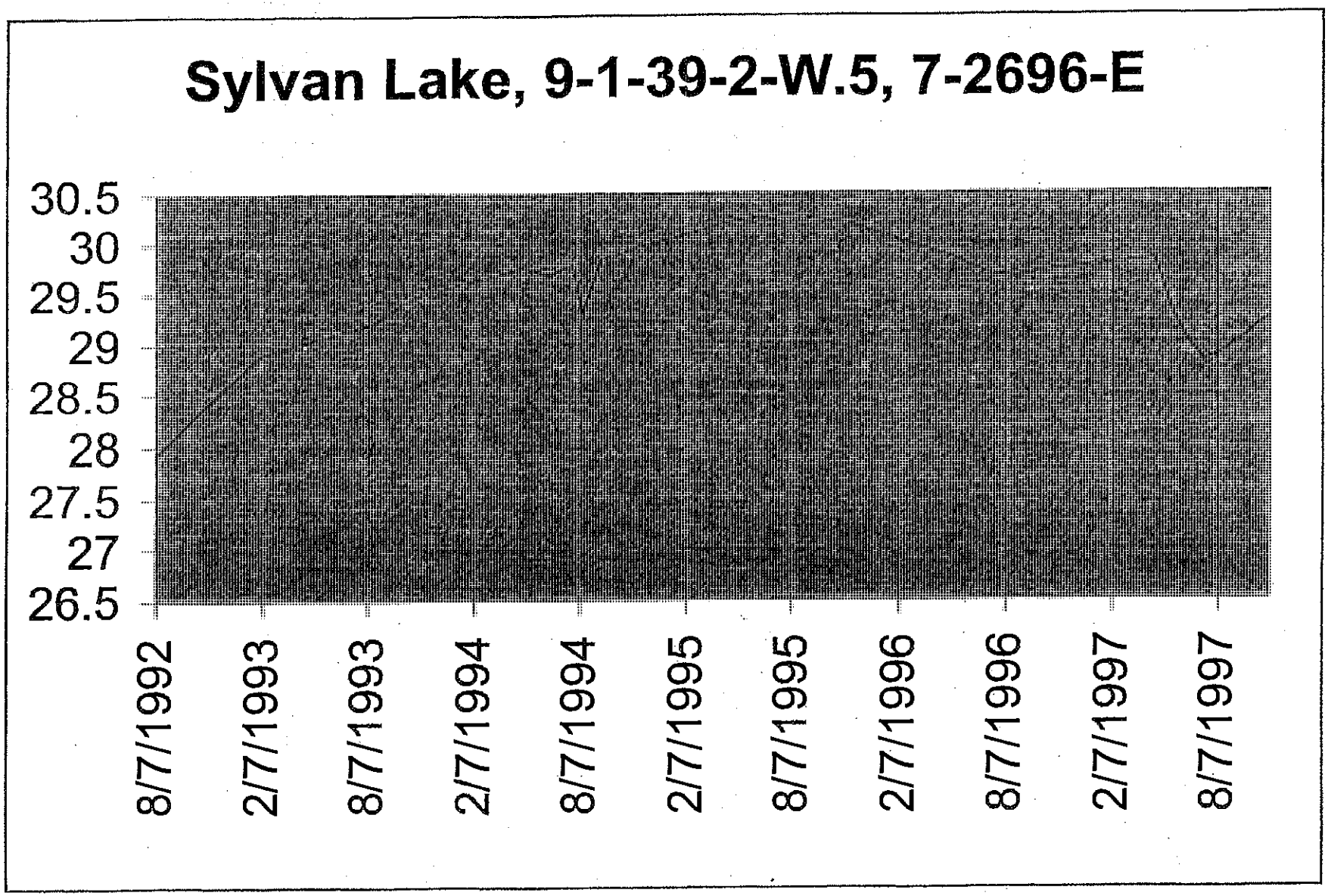
8/6/1996
2/6/1997
8/6/1997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28.5
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27.5
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2/7/1993
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8/7/1995
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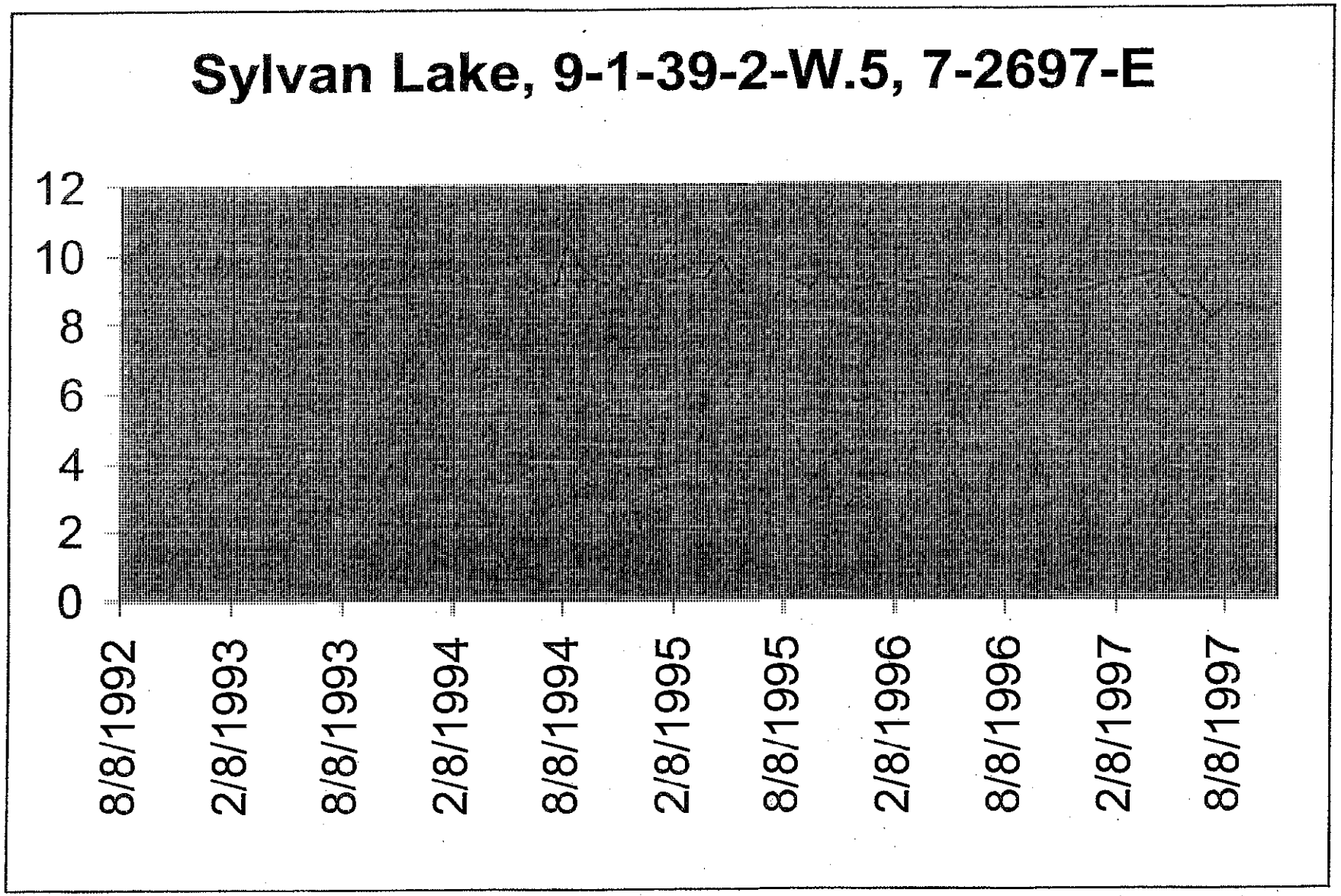
8/7/1996
2/7/1997
8/7/1997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8/8/1992
2/8/1993
8/8/1993
2/8/1994
8/8/1994
2/8/1995
8/8/1995
2/8/1996
8/8/1996
2/8/1997
8/8/1997

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8/8/1992
2/8/1993
8/8/1993
2/8/1994
8/8/1994
2/8/1995
8/8/1995
2/8/1996
8/8/1996
2/8/1997
8/8/1997
0
1
2
3
4
5
6
7
8
9
10