

**SPY HILL PROVINCIAL AGGREGATE
OPERATION
HYDROGEOLOGICAL ASSESSMENT
33-025-2 W5M**

Project No. 0305-5300688

OCTOBER 2003

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33-025-2 W5M

Submitted to:

ALBERTA TRANSPORTATION
c/o BROWN AND ASSOCIATES PLANNING GROUP
Calgary, Alberta

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.
Calgary, Alberta

Project No. 0305-5300688

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was retained by Alberta Transportation, care of Brown and Associates Planning Group, to conduct a hydrogeological assessment of the proposed Spy Hill Lands gravel mining operation located at 33-025-2 W5M and the northern half of Section 28. The objective of the hydrogeological assessment is to determine whether the Spy Hill Lands Development Project will present any risk to the existing water wells in the vicinity of the mining operation, and to determine if the mining will affect the surface water bodies west of the site.

The scope of work included:

- reviewing available published geologic and hydrogeologic reports, to gain an understanding of the geologic and hydrogeological conditions in the general vicinity of site;
- collecting information from published hydrogeologic reports pertaining to surface water, water chemistry, water availability and local aquifers, as available;
- reviewing the Alberta Environment - Groundwater Information Centre (AE-GIC) water well database for information pertaining to nearby water well users within a 3 km radius;
- conducting a site visit to the gravel pits east of the proposed site location to “ground truth” geological and hydrogeological information; and
- preparation of a water balance for the site under the present conditions (undeveloped), and to identify potential changes to groundwater recharge under operating conditions.

Two distinct water-bearing units (i.e., aquifers) have been identified using information in the water well database, and various literary sources. They consist of a Tertiary Gravel unit and the bedrock Paskapoo Formation. The proposed Spy Hill aggregate operation will extract gravels from the Tertiary Gravel unit. The gravels at the site appear to be unsaturated; within the watershed, the gravel makes up an intermittent and largely unused aquifer. The extraction of the gravel for the proposed Spy Hill Land Development should have a minimal impact on portions of the gravel unit that do contain water. Extraction of the gravel is anticipated to minimally increase recharge to the underlying Paskapoo Aquifer.

The surface water is at a higher elevation than the water table in the underlying gravel; surface water bodies to the west (ponded on low permeability surface soils) should not be affected by the development. To the northeast, discharge to West Nose Creek should not be reduced. In addition, there should be no impact on the upper (gravel) aquifer. Recharge to any saturated portions of the gravel (and hence potential discharge to West Nose Creek) should not be affected. Recharge to the deeper bedrock (Paskapoo) aquifer should increase; there should be no negative impact on that aquifer. There is no apparent potential for an impact on domestic groundwater supplies resulting from the gravel extraction.

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1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) was retained by Brown and Associates Planning Group to conduct a hydrogeological assessment of the proposed Spy Hill Lands gravel mining operation, located at 33-025-02 W5M and the northern half of Section 28-025-02 W5M. The objective of the hydrogeological assessment is to determine whether the Spy Hill Lands Development Project will present a risk to the existing water wells in the vicinity of the mining operation, and to determine if the mining will affect the surface water bodies west of the site.

The scope of work included:

- reviewing available published geologic and hydrogeologic reports, to gain an understanding of the geologic and hydrogeological conditions in the general vicinity of site;
- collecting information from published hydrogeologic reports pertaining to surface water, water chemistry, water availability and local aquifers, as available;
- reviewing the Alberta Environment - Groundwater Information Centre (AE-GIC) water well database for information pertaining to nearby water well users, within a 3 km radius, whose water supply may be potentially affected;
- conducting a site visit to the gravel pits east of the proposed site location to “ground truth” geological and hydrogeological information; and
- preparation of a water balance for the site under the present conditions (undeveloped), and under operating conditions to identify potential changes to groundwater recharge.

The results of this work are described in Sections 3.0 to 5.0. Section 3.0 describes the geological and hydrogeological setting of the proposed aggregate operation. Section 4.0 and Section 5.0 describe groundwater users within the watershed boundary and the long-term water supply potential for the area, respectively.

This report was prepared based on data collected by EBA and by information reported by third parties. It was prepared under EBA’s Environmental Report – General Conditions for conducting Environmental work as presented in Appendix A.

2.0 SITE DESCRIPTION AND OPERATIONS

The Spy Hill Lands Development Project is located within the City of Calgary, adjacent to the northwest boundaries of the City (Figure 1). Full urban servicing and urban development has not yet occurred in this area. The area contains several aggregate operations, and institutional land use.

The proposed mining area includes the majority of Section 33 and the north half of Section 28 of 025-02 W5M (Figure 2). Based on data taken from on-site drill testing and preliminary assumptions about setback areas, the proposed mining area encompasses a gross area of six quarter sections. These quarter sections contain approximately 130 million tonnes of gravel.

It is understood that the extraction of the gravel will take place in six phases. Initially, the overburden will be removed and stockpiled, however, as the project progresses the overburden materials will be placed directly into previously mined areas prior to the cessation of a phase. The average depth of overburden within the proposed mining area is 13.2 m. The average depth of gravel is approximately 19.3 m. Extraction operations at the site are estimated to remove gravel to an average depth of 32 m. Upon completion of each phase, the overburden will be replaced (Brown and Associates Planning Group and Russ Gerrish Consulting, February 2003.).

3.0 GEOLOGIC AND HYDROGEOLOGIC SETTING

The geologic and hydrogeologic setting of the area has been evaluated to establish potential aquifers beneath the site and the probable yield of these aquifers. Sections 3.1 to 3.4 discuss the geology, hydrogeology, groundwater quality and flow regime, respectively.

3.1 Geology

The sediments overlying the gravel deposits that are to be mined are classified as Quaternary deposits of glacial and glaciolacustrine origin. Moran (1986) describes the material as pebble loam till, silts and sands. The thickness of the till ranges from 2 m to 30 m. At the proposed mining site the overlying till is approximately 13.2 m thick.

The gravel underlying the Quaternary deposits (the material proposed for extraction) is fluvial and lacustrine in origin, from the Tertiary era. The Tertiary gravel caps the uplands at the site. The gravel consists of well-rounded pebbles and cobbles of quartzite, and limestone (Moran, 1986). The gravel is approximately 10 m to 30 m thick and the base of the gravel deposit is generally 1,220 m (4,000 ft) in elevation. The gravel deposits cover approximately 48 km² of the Spy Hill area and are orientated northwest to southeast. The gravel deposits are shown in geological maps as not being continuous

throughout the Spy Hill Area. Figure 3 shows a plan view of the approximate extent of the gravel deposits at the site, although any lateral breaks in the deposits are small.

The Tertiary sediments are underlain by bedrock of the Paskapoo Formation. Hamilton et al. (1998) describes this formation as a grey to greenish grey, thick-bedded, calcareous, cherty sandstone; grey and green siltstone and mudstone; and minor conglomerates, thin limestone, coal and tuff beds of non-marine origin. This formation is believed to have been deposited on the floodplain east of the foothills. The sandstone beds of the Paskapoo Formation are of variable thickness, lens shaped, and are interbedded with dark, dense shale layers. Thin bentonitic shales and bentonite layers are also present and are the product of former volcanic activity. The thickness of the Paskapoo Formation is unknown at the site because historical drilling records did not extend into the bedrock. This formation may extend to a thickness of 600 m in the Calgary region (Osborn and Rajewicz, 1998).

The proposed mining site is located east of the eastern limit of structural deformation in the Rocky Mountain Foothills and thus the strata beneath the site are expected to be relatively flat lying. The lithology noted in water well logs, as found on the Alberta Environment water well database, indicate that stratigraphy is generally consistent throughout the proposed mining area.

3.2 Hydrogeology

The primary aquifers in the site area include the gravels and the sandstone layers of the Paskapoo Formation. For the purpose of this report, it is assumed that the thickness of the water bearing units represents the thickness of the aquifers.

3.2.1 Tertiary Gravel

Because the gravels have a limited thickness and lateral extent, the Tertiary gravel is expected to have a low groundwater yield. However, Ozoray and Barnes (1977) estimate that the gravel aquifer could form an aquifer that would yield an expected groundwater potential between 33 m³/day and 65 m³/day (5 to 10 Igpm). The maximum groundwater yield is representative of well-sorted sand and gravel deposits.

Wells completed within the silty sands and gravels record groundwater yields between 33 m³/day to 98 m³/day (5 to 15 Igpm) based on preliminary pump tests conducted after the wells were installed.

There have been no groundwater wells completed in the Tertiary gravel at the site. During a preliminary geotechnical investigation, 156 boreholes were advanced to define the depth and thickness of the gravel deposits and the depth to the water table. The maximum depth of the boreholes completed during this investigation was 21.3 m. Based on information provided by the client, three of the 156 boreholes intersected the water

table. The gravel deposits at the site appear to be unsaturated, and therefore are not considered to be an adequate aquifer for groundwater consumption.

3.2.2. Paskapoo Aquifer

The Paskapoo Aquifer in the Calgary area is described as a confined aquifer and is considered to be the interbedded sandstone layers of the Paskapoo Formation. Water wells completed in the Paskapoo Aquifer are expected to yield approximately 33 m³/day to 164 m³/day (5 to 25 Igpm) (Ozoray and Barnes, 1977). However, Meyboom (1961) anticipates that a water well that is developed in one or more of the sandstone aquifers could produce 6.5 m³/day to 26 m³/day (1 to 4 Igpm).

The primary lithologies of the water production interval for wells within a 1 km radius of the proposed mining site are predominantly shale and sandstone intervals of the Paskapoo Formation. The Paskapoo Aquifer has a water potential between 6.5 m³/day and 131 m³/day (1 to 20 Igpm) based on preliminary pump tests conducted after the wells were installed (Ozoray and Barnes, 1977).

3.3 Water Quality

Groundwater analyses from wells installed into the surficial deposits indicate the groundwater is generally chemically hard and high in dissolved iron. As water infiltrates into the ground it dissolves soluble materials. The most soluble minerals are dissolved first and as time progresses the less soluble materials come into solution (Ozoray and Barnes, 1978). Groundwater from the surficial aquifers can have a chemical hardness of greater than 200 mg/L and a total dissolved solids (TDS) concentration greater than 500 mg/L. Water from wells completed in the gravels does not have a dominant cation, but the water is mainly bicarbonate sulphate type (Agriculture and Agri-Foods Canada, 2002).

The Paskapoo Formation is dominated by a sodium-bicarbonate or sodium-sulphate type waters. The TDS concentrations in the Paskapoo Formation range from less than 500 mg/L to more than 3,000 mg/L. As depth increases, the TDS concentration increases (Agriculture and Agri-Foods Canada, 2002).

3.4 Flow Regime

The watershed area used for this study is shown on Figure 4. The southwest boundary is a surface water drainage divide that runs roughly northwest to southeast along the height-of-land (Ozoray and Barnes, 1978), the northern boundary is the Bigspring Creek, and the northeast boundary is West Nose Creek. The watershed area is divided into recharge and discharge areas, based on the assumptions that recharge coincides with topographic high areas, and discharge coincides with topographically low areas

(Domenico and Schwartz, 1990). The boundary between the recharge and discharge area is at approximately the 1,257 m topographic contour.

Above 1,257 m elevation in the southwest portion of the watershed, in the recharge area, surface water bodies comprise lakes, ponds, dugouts, sloughs and intermittent lakes ranging in area from 100 m² to 25,000 m². These surface water reside on the glacial and glaciolacustrine till layer. Below 1,257 m, in the discharge area, there are several northeastern-trending creeks that drain into West Nose Creek. The recharge area in the watershed area makes up 53,463,554 m².

The surface water to the west appears to be the result of precipitation ponding on low permeability surface soils. The surface water is at a significantly higher elevation than the water table in the underlying gravel (where a portion of the gravel is actually saturated). There is therefore little or no relationship between the surface water and the gravel unit (with the exception of some recharge to the gravel). Removal of the gravel would therefore not impact the surface water to the west.

On May 28, 2003, EBA conducted a site visit to the proposed Spy Hill Development location and to the gravel pits at a comparable elevation east of the proposed location. EBA observed pooled water at the bottom of the gravel pits, which the client attributed to remnant snow melt. EBA did not observe any groundwater seepage on the exposed walls of the gravel pits. This suggests that the groundwater surface does not intersect the pit bottom at this elevation. This is consistent with the previous geotechnical assessment of the site. The proposed development would be of a comparable depth. Dewatering of the pit should not be required, meaning that the local water table will not be drawn down.

4.0 REGIONAL WATER USAGE

The Alberta Environment – Groundwater Information Centre (AE-GIC) was reviewed for records of water wells located within the watershed. There are approximately 722 water wells in the area for domestic use in the watershed. The AE-GIC water well database indicates that there is one domestic well installed at the proposed Spy Hill Land Development site at SW 33-025-02 W5M. It is assumed that the well is no longer in use as the current landowner has no knowledge of the water well.

Water wells within the watershed boundary are summarised on Table 1. The following table summarises the classification of the wells in the database.

Table A
Water Wells Within the Watershed

	Domestic	Industrial	Stock	Unknown	Multiple Classifications	Total
Within the watershed.	648	5	19	25	25	722
Wells completed in the Gravels.	12	0	0	1	0	13
Wells completed in the Paskapoo Aquifer.	636	5	19	24	25	709

Table B summarises the number of wells completed in gravel; Figure 5 shows (by section) the location of these wells.

Table B
Water Wells Completed in the Gravel Aquifer

Radius	Domestic	Industrial	Investigative	Municipal	Stock	Unknown	Multiple Classifications	Total
Within the watershed	12	0	0	0	0	1	0	13

Three of the thirteen water wells completed in a gravel aquifer are not considered to be completed in the Tertiary gravel unit, based on their elevation and well completion depths. Therefore, there are 10 known wells completed in the Tertiary gravels in the watershed.

The water well data supports the regional hydrogeological information (Section 3.2). The gravel deposits do not form a significant local or regional aquifer.

5.0 WATER BALANCE

5.1 Basin Yield

Percolation recharges the soil, ultimately resulting in groundwater replenishment. Recharge to the Paskapoo Aquifer is considered in the water balance, as recharge to this aquifer is anticipated to change throughout the duration of the proposed aggregate operation. This prediction is based on the assumption that the Paskapoo Aquifer is recharged by precipitation (through vertical migration from the gravel deposits) and possibly by Nose Creek. Recharge to the gravel is not considered, as the gravel is either unsaturated (as appears to be the case in the site area), or does not form a significant aquifer.

To assess the current recharge and long term effects of aggregate extraction on the Paskapoo Aquifer a water balance was used. A water balance is a mathematical technique for keeping track of the water input to storage, water outputs to the atmosphere and for characterising the active features at the ground surface that influence the percolation of water into the soil (e.g., surface runoff, evapotranspiration and infiltration). The water balance described in this section has been compiled using the method described by McBean et al. (1995).

For the calculation of the water balance it is assumed that:

- 1) The Paskapoo aquifer extends throughout the watershed area. This was confirmed by looking at various water well reports to confirm the extent of the gravel aquifer.
- 2) Recharge from the various rivers and creeks within the watershed boundary was not considered.
- 3) All recharge percolates downwards and into the Paskapoo Aquifer.
- 4) Mining will remove all of the Tertiary gravel (to the bedrock).

Precipitation and daily mean temperatures for weather station at the University of Calgary was used to estimate the water balance for the site. The mean precipitation and daily mean temperatures were recorded from 1964 to 1990.

Figure 6 shows the water balance (calculated percolation and actual evapotranspiration) estimated for the watershed. The process used to generate this figure is summarised on Table 2.

The annual recharge per unit area (AR1) is calculated by summing the difference between actual evapotranspiration (AET) from percolation (PERC) for those months with a net surplus of water ($PERC > AET$) and subtracting AET for months of water deficit ($AET < 0$). The total annual recharge is estimated at approximately 95.87 mm per unit area.

5.2 Recharge and Discharge Areas

The recharge and discharge areas are shown on Figure 4. It is assumed that recharge coincides with topographic high areas and discharge coincides with topographically low areas. The entire area of the aggregate operations could be assumed to be a recharge area, as the work to date has shown the gravel to be unsaturated. Nonetheless, as a conservative estimate, the area of the site where the original ground is below 1,257 m (4,124 ft) (the site discharge area as shown on Figure 4) was not included in the calculated recharge area for each phase of the aggregate operation. The recharge area for

each phase of the aggregate operation and the total recharge area for the watershed basin are tabulated below.

Development and Watershed Recharge and Discharge

Aquifer	Total Area of Recharge (m²)	Volume of Recharge (m³)	Total Area
Phase 1	652,570	62,503	652,570
Phase 2	301,467	28,874	317,613
Phase 3	267,478	25,619	282,690
Phase 4	139,237	13,336	350,358
Phase 5	277,477	26,576	688,174
Phase 6	856,568	82,042	1,113,268
Overall Watershed	53,463,554	238,950	130,729,307

The recharge area of the Paskapoo aquifer within the watershed is estimated to be approximately 53,463,554 m². The volume of recharge prior to gravel extraction within the watershed was calculated by calculating the area of recharge within the watershed area and multiplying the area by the annual recharge value. The volume of recharge to the Paskapoo Aquifer prior to gravel excavation is approximately 238,950 m³/year.

5.3 Impacts of Gravel Extraction

Assuming that (as planned) each phase of the development will be reclaimed (overburden replaced) upon completion of a phase, or while work proceeds, no more than the approximate total area of a single phase will be unreclaimed at any time. As the gravel is extracted and the vegetation at the site is removed, precipitation will fall to the floor of the gravel pit and percolate downward into the Paskapoo Aquifer. As a result of a reduction of vegetation at the site, evapotranspiration will decrease therefore increasing the amount of recharge to the Paskapoo Aquifer. The maximum increase in recharge would occur if 100% of Phase 6 were open and unreclaimed at some point in time.

After reclamation, the existing surface (glacial and glaciolacustrine) material will be replaced and the area re-vegetated. At that point the recharge rate to the Paskapoo Aquifer should be similar to the present pre-disturbance condition. Recharge will tend to be directly into the Paskapoo Aquifer (as the intervening gravel unit will no longer be present), resulting in a long-term increase in recharge to that aquifer. The increase in recharge is difficult to quantify and should be slight.

Based on the available data it is anticipated that extraction of the aggregates will not negatively affect groundwater supplies. The gravel deposits at the site are unsaturated, and the underlying bedrock (Paskapoo) aquifer should receive slightly increased recharge.

5.4 Water Quality

The groundwater quality within the gravel will not be affected by the removal of the aggregates because the gravel in the site area appears to be unsaturated. Operational activities such as use of chemical agents for dust control, spills, fuel or chemical storage, have a potential to affect the underlying Paskapoo Aquifer. The Paskapoo is a large regional aquifer, and should not be significantly affected by development of the aggregate operation. The aquifer is an important resource, however, and to limit the possibility of adverse impacts to the water quality the following is recommended:

- quantities of calcium chloride or other chemical agents for dust control should be minimised, to the extent practical;
- chemicals or fuel stored onsite should be placed in appropriate above ground storage containers (with secondary containment); and
- a spill response plan should be prepared.

6.0 CONCLUSION

The proposed mining area includes the majority of Section 33 and the north half of Section 28 of 025-02 W5M (Figure 2). It is understood that the extraction of the gravel will take place in six phases. The depth to the top of the gravel is approximately 13.2 m. Extraction operations at the site are estimated to remove gravel to an average depth of approximately 32 m. The base of the pit should not intercept the water table.

Two distinct water-bearing units (i.e., aquifers) have been identified using information in the water well database, and various literary sources. The Tertiary gravels at the site appear to be unsaturated; within the watershed, the gravel makes up an intermittent and largely unused aquifer. The extraction of the gravel for the proposed Spy Hill Land Development should have a minimal impact on portions of the gravel unit that do contain water. Extraction of the gravel is anticipated to minimally increase recharge to the underlying Paskapoo Aquifer.

The surface water is at a higher elevation than the water table in the underlying gravel; surface water bodies to the west (ponded on low permeability surface soils) should not be affected by the development. To the northeast, discharge to West Nose Creek should not be reduced. In addition, there should be no impact on the upper (gravel) aquifer. Recharge to any saturated portions of the gravel (and hence potential discharge to West Nose Creek) should not be affected. Recharge to the deeper bedrock (Paskapoo) aquifer should increase; there should be no negative impact on that aquifer. There is no apparent potential for an impact on domestic groundwater supplies resulting from the gravel extraction.

7.0 LIMITATIONS OF LIABILITY

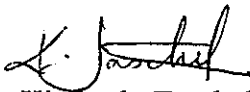
Conclusions and recommendations presented herein are based on an authorised groundwater assessment as described in Section 1.0. This report has been prepared for the use of Alberta Transportation and their approved agents for the specific application described above. It has been prepared in accordance with generally accepted environmental engineering practices. No other warranty is made, either express or implied. EBA's Environmental Report – General Conditions under which this work was performed are provided in Appendix A.

8.0 CLOSURE

We trust this information meets your present requirements. Should you have any questions, please contact Ms. Taschuk, Ms. Messing or Mr. Ratliffe at our Calgary Riverbend office.

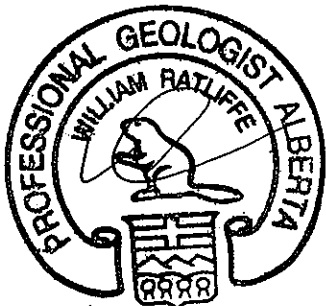
Respectfully submitted,

EBA Engineering Consultants Ltd.



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Signature	<i>W.A. Ratliffe</i>
Date	<i>Oct 7/03</i>
PERMIT NUMBER: P245 The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

KAT:CM:WR/kr

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TABLES

Table 1 – Alberta Environment – Summary of Regional Water Wells
Table 2 – Water Balance

**TABLE 1
ALBERTA ENVIRONMENT - SUMMARY OF REGIONAL WATER WELLS
SPY HILL LANDS DEVELOPMENT PROJECT**

WELL ID	LSD	SEC	TWP	RGE	M	WELL OWNER	DRILLER COMPANY	DATE COMPLETED	DEPTH	PROPOSED USE	CHM	DEPTH TO GRAVEL	SCREENED WITHIN GRAVEL
408657	SE	2	25	1	5	P&B FEEDERS	WESTERN WW	8/1/88	105	Stock	0	N/A	N/A
408658	NE	2	25	1	5	LEES, DOUG	DELS DRLG	10/1/84	155	Domestic	0	N/A	N/A
408659	NE	2	25	1	5	MCLAUREN, RICHARD	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	6/4/86	258	Domestic	0	N/A	N/A
408660	NE	2	25	1	5	KILOMATTIS, J	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	4/26/86	165	Domestic	0	N/A	N/A
408661	NE	2	25	1	5	SUNDERLAND, B	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	3/21/87	177	Domestic	0	N/A	N/A
408662	NE	2	25	1	5	BREAKENRIDGE, RICHARD L.	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	6/18/88	183	Domestic	1	N/A	N/A
469220	15	2	25	1	5	GRANT, CHERYL	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/18/97	262	Domestic	0	26	N
408663	SE	3	25	1	5	STOWELL, K.G.	UNKNOWN DRILLER		320	Domestic	1	No Lithological Description	N/A
408664	NE	3	25	1	5	DELTEX WINDPUMPS CORP	M&M DRILLING CO. LTD.	3/25/86	97	Industrial	0	0	N
408669	SW	15	25	1	5	PRAIRIE LANDS DEV LTD	DEN ALTA DRILLING CO. LTD.	7/26/73	90	Domestic & Stock	0	10	N
408670	SW	15	25	1	5	FLACKY, J.	TWO WAY DRLG	5/1/71	150	Domestic	0	30	UNKNOWN
408671	SW	15	25	1	5	SOUTHERN, MIKE	PARSONS, DELBERT	6/19/76	137	Domestic	0	N/A	N/A
408672	NW	15	25	1	5	MCMAHON, J.	UNKNOWN DRILLER		200	Domestic	1	No Lithological Description	N/A
408673	SE	16	25	1	5	POLE, JOHN	UNKNOWN DRILLER		70	Domestic	1	No Lithological Description	N/A
408674	SW	16	25	1	5	HEAL, C.C.	ANDERBURG & SONS	10/11/58	200	Domestic	0	0	UNKNOWN
408675	9	19	25	1	5	WOOLIAMS, CYRIL	ANDERSON C.G.	6/1/74	200	Stock	0	N/A	N/A
408676	NE	19	25	1	5	WOOLIAMS, R	UNKNOWN DRILLER		90	Domestic	1	No Lithological Description	N/A
408677	NE	19	25	1	5	WOOLIAMS BROS AND SONS	DIVERSIFIED DRILLING & EXPLORATION CO.	1/11/85	153	Stock	0	20	N
408678	NE	19	25	1	5	GOERTZ, AL	BIG IRON DRILLING LTD.	8/30/85	360	Domestic	0	N/A	N/A
352792	EH	20	25	1	5	IRVING, HARRY #1493	AARON/INTERPROVINCIAL WATERWELL DRILLING	10/16/90	40	Domestic	0	0	UNKNOWN
355936	SH	20	25	1	5	IRVING, JIM #1547	AARON/INTERPROVINCIAL WATERWELL DRILLING	2/22/91	33	Domestic	0	0	UNKNOWN
408679	SE	20	25	1	5	HANSON, G.L. #BARN WELL	UNKNOWN DRILLER		90	Domestic & Stock	1	No Lithological Description	N/A
408680	SE	20	25	1	5	HANSON, G.L. #HOUSE WELL	UNKNOWN DRILLER		180	Domestic	1	No Lithological Description	N/A
408681	SW	20	25	1	5	CRESTVIEW REAL EST	SCOTT, H.A. DRILLING	11/14/75	285	Stock	0	N/A	N/A
408682	NW	20	25	1	5	WOOLIAMS, C	ANDERSON C.G.	3/1/73	200	Domestic	1	N/A	N/A
410419	SE	20	25	1	5	SOIWAY, M	GOODISON WATER WELL DRILLING	7/15/74	55	Domestic	0	14	Y
408683	SE	21	25	1	5	BUSHFIELD, ARCHIE	UNKNOWN DRILLER		60	Domestic	1	No Lithological Description	N/A
408684	4	21	25	1	5	BUSHFIELD, ARCHIE	ANDERSON C.G.	10/1/72	100	Domestic	1	N/A	N/A
408685	SE	21	25	1	5	BUSHFIELD, ARCHIE #WELL 2	UNKNOWN DRILLER		70	Domestic	2	No Lithological Description	N/A
408686	SE	21	25	1	5	BUSHFIELD, ARCHIE	UNKNOWN DRILLER		80	Domestic	1	No Lithological Description	N/A
436544	SE	21	25	1	5	BUSHFIELD, ARCHIE	PEE WEE DRILLING LTD.	11/30/95	115	Domestic	0	0-Tentative (clay and rocks)	N
490036	SE	21	25	1	5	JACQUES WHITFORD CONSULTANTS	M&M DRILLING CO. LTD.	5/13/98	115	Domestic	0	No Lithological Description	N/A
387781	SE	29	25	1	5	HANSON, RON L.	UNKNOWN DRILLER		225	Domestic	1	No Lithological Description	N/A
387784	SW	29	25	1	5	BUILDER, W.	DELS DRLG	8/1/69	59	Domestic	0	N/A	N/A
387787	NW	30	25	1	5	ROLSTON, R.F.	NORTHERN WATER SUPPLY CO.	6/26/69	93	Domestic	0	1-21 and 30-58	N
388001	NW	30	25	1	5	MCDUGALL, VIRGINIA	NORTHERN WATER SUPP	6/30/69	140	Domestic	0	N/A	N/A
388002	NW	30	25	1	5	DHILLAN, J.S./PANNU, S.S	UNKNOWN DRILLER		0	Domestic	1	No Lithological Description	N/A
350565	WH	31	25	1	5	FAORO, V	DOLOMITE DRILLING	4/25/90	80	Domestic	0	N/A	N/A
388005	SE	31	25	1	5	MCLÉOD, CLINT	DEN ALTA DRILLING CO. LTD.	5/26/89	230	Domestic & Stock	0	N/A	N/A
388013	SW	31	25	1	5	GENOVY, JOE	DEN ALTA DRILLING CO. LTD.	6/10/88	100	Domestic	0	15	N
390480	NW	31	25	1	5	JUNGE, HEINZ	PARSONS DRLG	4/28/75	103	Domestic	1	29	N
363866	SW	6	26	1	5	JONES, LES	PEE WEE DRILLING LTD.	12/31/91	165	Domestic	1	0-48 and 73-80	N
389478	SE	6	26	1	5	EVANS CATTLE CO LTD	PEE WEE DRILLING LTD.	8/1/71	90	Domestic	2	N/A	N/A
389480	SW	6	26	1	5	JONES, LESLIE	UNKNOWN DRILLER		75	Domestic	1	No Lithological Description	N/A
389481	13	6	26	1	5		UNKNOWN DRILLER		0	Unknown	1	No Lithological Description	N/A
389483	NE	6	26	1	5	WILLIAMS, H.M.E.	DEN ALTA DRILLING CO. LTD.	9/10/85	115	Domestic & Stock	0	0-Tentative (clay and rocks)	N
390951	SW	6	26	1	5	SYMONS VALLEY REC	DEN ALTA DRILLING CO. LTD.	6/26/78	145	Domestic	1	N/A	N/A
466111	SW	6	26	1	5	JONES, LESTER	PEE WEE DRILLING LTD.	2/4/96	70	Domestic	0	0-50 and 61-65	YES (50-70)
467178	SW	6	26	1	5	SYMONS VALLEY BBQ RANCH	PEE WEE DRILLING LTD.	5/7/97	118	Domestic	0	0	N
408972	0	13	25	2	5	WEISS, OTTO	UNKNOWN DRILLER		400	Domestic	1	No Lithological Description	N/A
402730	NE	22	25	2	5	HEAD, MORRIS	PARSONS DRILLING	10/21/64	178	Domestic & Stock	0	47	UNKNOWN
402732	4	23	25	2	5	REILLY, C.	DIVERSIFIED DRILLING & EXPLORATION CO.	12/7/74	250	Stock	0	0	N
364665	SW	23	25	2	5	FIRST CITY DEV CORP LTD	SDS DRILLING LTD./DIVISION OF SDS INDUSTRIES LTD.	4/30/92	390	Unknown	0	No Lithological Description	N/A
376621	SW	24	25	2	5	MILLER, BILL	DEN ALTA DRILLING CO. LTD.	4/30/81	35	Stock	0	N/A	N/A
408706	NE	24	25	2	5	JANZEN	UNKNOWN DRILLER		0	Domestic	1	No Lithological Description	N/A
388074	NE	26	25	2	5	CALGARY, CITY OF#1	JAMES, WILLARD	9/5/68	103	Unknown	0	1	N
467175	NW	26	25	2	5	CHARRETTE, GREG	KAP'S DRILLING LTD.	9/8/95	180	Domestic	0	N/A	N/A
388065	SE	26	25	2	5	CALGARY, CITY OF#2	JAMES, WILLARD	10/2/68	258	Unknown	0	0	UNKNOWN
388069	SE	26	25	2	5	CALGARY, CITY OF#3	JAMES, WILLARD	10/17/68	208	Unknown	0	2	N
388071	SE	26	25	2	5	FIGEON, ERNIE	SKY LINE DRLG LTD	5/11/80	203	Domestic	0	N/A	N/A
388078	SW	27	25	2	5	CALGARY CORRECTIONAL CENTRE	UNKNOWN DRILLER		0	Domestic	1	No Lithological Description	N/A
388474	0	29	25	2	5	MCMECHAN, D.C.	UNKNOWN DRILLER		300	Domestic	1	No Lithological Description	N/A
367432	4	29	25	2	5	SEIDEL, K.	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/30/92	500	Domestic	0	62	N
407777	16	29	25	2	5	HAYES, GARTH	INTERPROVINCIAL DRLG	7/22/81	210	Domestic	0	62	N
376840	NE	29	25	2	5	LEMMER, MIKE	KRIEGER DRILLING LTD.	12/21/93	320	Domestic	0	35	N
386088	NE	29	25	2	5	LEMMER, MIKE	KRIEGER DRILLING LTD.	12/29/93	75	Domestic	0	64	UNKNOWN
388297	NE	29	25	2	5	EASTWOOD, R./BULMER CHARLES	DELS DRLG	2/21/83	301	Domestic	1	4-9 and 42-138	N
388468	NE	29	25	2	5	LEMMER, CHRIS	DELS DRLG	4/1/74	298	Domestic	0	63	N
388469	NE	29	25	2	5	WILSON, ROY	DELS DRLG	3/1/74	45	Domestic	1	N/A	N/A
388471	NE	29	25	2	5	FRASER, GORDON	UNKNOWN DRILLER		200	Domestic	1	No Lithological Description	N/A
388473	NE	29	25	2	5	THORSON	UNKNOWN DRILLER		0	Domestic	1	No Lithological Description	N/A
391013	NE	29	25	2	5	JAHN, MARGOT	UNKNOWN DRILLER		263	Domestic	1	No Lithological Description	N/A
391014	NE	29	25	2	5	KLETKI, A.	DELS DRLG	10/1/73	264	Domestic	1	23-32, 89-101, 122-127	N
350366	NW	29	25	2	5	WHITAKER, VAN	ALKEN BASIN DRILLING LTD.	3/22/90	430	Domestic	0	N/A	N/A
350567	NW	29	25	2	5	DIEGEL, GIL #1382	AARON/INTERPROVINCIAL WATERWELL DRILLING	4/17/90	390	Domestic	0	78	N
350568	NW	29	25	2	5	DIEGAL, GILBERT #1387	AARON/INTERPROVINCIAL WATERWELL DRILLING	4/24/90	460	Domestic	0	76	N
353416	NW	29	25	2	5	HICKS, W.R	UNKNOWN DRILLER		290	Domestic	2	No Lithological Description	N/A
388244	NW	29	25	2	5	PETERS, PETE	STAR DRLG CO	4/1/74	305	Unknown	0	No Lithological Description	N/A
388245	NW	29	25	2	5	FELTHAM HLDG	DELS DRLG	8/20/76	315	Domestic	1	88	N
388248	NW	29	25	2	5	DUBORG, KLAUS/UY, VICTOR	DELS DRLG	12/5/78	340	Domestic	0	29	N
388251	NW	29	25	2	5	JOUDRIE, H.E.	M&M DRILLING CO. LTD.	3/6/80	410	Domestic	0	0	UNKNOWN
388254	NW	29	25	2	5	JOUDRIE, H.E.	M&M DRILLING CO. LTD.	2/27/80	497	Domestic	0	0	UNKNOWN
388261	NW	29	25	2	5	D&S INVESTMENTS	NORTHERN WATER SUPP	7/2/80	345	Domestic & Stock	0	50	N
388265	NW	29	25	2	5	JOUDRIE, HE	M&M DRILLING CO. LTD.	3/12/80	397	Domestic	0	25	UNKNOWN
388272	NW	29	25	2	5	FELTMAN, DOUG	DELS DRLG	11/22/78	281	Domestic	0	64	N
388275	NW	29	25	2	5	HARRIS, DAVE	UNKNOWN DRILLER		300	Domestic	1	No Lithological Description	N/A
388277	NW	29	25	2	5	HICKS, BOB	DIVERSIFIED DRILLING & EXPLORATION CO.	10/22/87	395	Domestic	1	0	UNKNOWN
388281	NW	29	25	2	5	FELTMAN, DOUG	MANORA DRILLING SERVICE	7/30/87	188	Domestic	0	0-31, 47-147	YES (143-187)
388285	NW	29	25	2	5	EADIE, JOHN	ALKEN BASIN DRILLING LTD.	6/27/88	360	Domestic	1	90	N
388292	NW	29	25	2	5	EADIE, JOHN	ALKEN BASIN DRILLING LTD.	5/2/88	360	Domestic	0	90	UNKNOWN
388293	NW	29	25	2	5	GRAY, L.	DIVERSIFIED DRILLING & EXPLORATION CO.	9/13/89	290	Unknown	0	0	N
388296	NW	29	25	2	5	WASSON, JOHN W.	UNKNOWN DRILLER		395	Domestic	1	No Lithological Description	N/A
391011	NW	29	25	2	5	HICKS, W.R	UNKNOWN DRILLER		300	Domestic	1	No Lithological Description	N/A
407773	NW	29	25	2	5	FELTHEM, DOUG	INTERPROVINCIAL DRLG	7/26/74	350	Domestic	0	80	N
407774	NW	29	25	2	5	FELTHEM, DOUG	INTERPROVINCIAL DRLG	8/30/73	290	Domestic	0	80	N
407775	NW	29	25	2	5	MCMACHANS, DAVE	INTERPROVINCIAL DRLG	10/22/75	260	Domestic	0	76	N
407776	NW	29	25	2	5	FELTHEM, DOUG	INTERPROVINCIAL DRLG	1/1/74	300	Domestic	0	74	N
467802	NW	29	25	2	5	HARRIS, DAVE	ALKEN BASIN DRILLING LTD.	9/9/97	320	Domestic	0	70	N
467803	NW	29	25	2	5	HARRIS, DAVE	ALKEN BASIN DRILLING LTD.	9/11/97	300	Domestic	0	67	N
469222	NW	29	25	2	5	HARRIS, DAVE	ALKEN BASIN DRILLING LTD.	12/12/97	380	Domestic	0	0	N
366186	SE	29	25	2	5	BOWLEY, GEORGE P.	UNKNOWN DRILLER		235	Domestic	1	No Lithological Description	N/A
369593	SE	29	25	2	5	THORSON BUD	ROCKYVIEW DRILLING	2/11/93	400	Domestic	0	N/A	N/A
388079	SE	29	25	2	5	BARONE, GUIDO	UNKNOWN DRILLER		350	Domestic	1	No Lithological Description	N/A
388082	SE	29	25	2	5	HOWES, JAMES	DELS DRLG	4/1/73	368	Domestic	0	53-69, 78-147	UNKNOWN
388084	SE	29	25	2	5	SCRIBENS, P.	UNKNOWN DRILLER		188	Domestic	1	No Lithological Description	N/A
388085	SE	2											

**TABLE 1
ALBERTA ENVIRONMENT - SUMMARY OF REGIONAL WATER WELLS
SPY HILL LANDS DEVELOPMENT PROJECT**

WELL ID	LSD	SEC	TWP	RGE	M	WELL OWNER	DRILLER COMPANY	DATE COMPLETED	DEPTH	PROPOSED USE	CHM	DEPTH TO GRAVEL	SCREENED WITHIN GRAVEL
388750	NE	32	25	2	5	NU WEST HOMES LTD	DIVERSIFIED DRILLING & EXPLORATION CO.	11/30/73	171	Domestic	0	128	N
388752	NE	32	25	2	5	NU WEST HOMES	DIVERSIFIED DRILLING & EXPLORATION CO.	8/1/73	248	Domestic	0	36	N
388754	NE	32	25	2	5	BOYD, N.D.	UNKNOW DRILLER		290	Domestic	1	No Lithological Description	N/A
388755	NE	32	25	2	5	PETRYSHEN, DIANE/JOHN	ELGIN EXPLORATION COMPANY LIMITED	3/1/78	240	Domestic	0	44	UNKNOWN
388759	NE	32	25	2	5	BRAR, B	M&M DRILLING CO. LTD.	11/18/80	420	Domestic	0	47	UNKNOWN
388761	NE	32	25	2	5	BRAR, B #2	M&M DRILLING CO. LTD.	12/1/80	165	Domestic	0	55	N
388763	NE	32	25	2	5	DU WORS, ROBERT J.	UNKNOW DRILLER		0	Unknown	1	No Lithological Description	N/A
388764	NE	32	25	2	5	MILLER, EVELYN	UNKNOW DRILLER		120	Domestic	1	No Lithological Description	N/A
388765	NE	32	25	2	5	BHATT, VIPIN	KRIEGER DRILLING LTD.	7/23/88	275	Domestic	1	45	N
388767	NE	32	25	2	5	BHATT, VIPIN	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	5/30/89	380	Domestic	1	51	N
391024	NE	32	25	2	5	NU WEST HOMES	DIVERSIFIED DRILLING & EXPLORATION CO.	4/1/73	161	Domestic	1	0	N
391026	NE	32	25	2	5	PETRYSHEN, DIANE/JOHN #2	ELGIN EXPLORATION COMPANY LIMITED	3/1/78	380	Domestic	0	40	UNKNOWN
349165	NW	32	25	2	5	ALEXANDER, PERCY #1474 2	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/7/91	230	Domestic	0	1	YES (R2-132)
349667	NW	32	25	2	5	ALEXANDER, PERCY #2484	AARON/INTERPROVINCIAL WATERWELL DRILLING	7/26/94	208	Domestic	0	1	N
352123	NW	32	25	2	5	CLAYDEN, NANCY	ALKEN BASIN DRILLING LTD.	9/11/90	290	Domestic	1	N/A	N/A
352738	NW	32	25	2	5	ALEXANDER, PERCY	AARON/INTERPROVINCIAL WATERWELL DRILLING	10/15/90	240	Domestic	0	30	N
355937	NW	32	25	2	5	DALTORIO, ELISEO #1474	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/11/91	230	Domestic & Stock	0	30	N
372402	NW	32	25	2	5	DALTORIO, ELISEO	KRIEGER DRILLING LTD.	6/10/93	220	Domestic	0	47	N
388728	NW	32	25	2	5	FORBES, LAURIE	DELS DRLG	3/27/75	213	Domestic	0	63	N
388730	NW	32	25	2	5	NOVAK, MIKE	STAR DRLG CO	6/1/70	270	Domestic	1	35	N
388732	NW	32	25	2	5	REZANSOFF, A.	UNKNOW DRILLER		180	Domestic	1	No Lithological Description	N/A
388733	NW	32	25	2	5	MANNING, JOHN	KRIEGER DRILLING LTD.	5/12/88	195	Domestic	0	50	N
388736	NW	32	25	2	5	CLAYDEN, DWAYNE	ALKEN BASIN DRILLING LTD.	10/5/89	240	Domestic	0	67	N
350179	SE	32	25	2	5	BÜCHWITZ, ALFRED #1322	AARON/INTERPROVINCIAL WATERWELL DRILLING	2/25/90	340	Domestic	0	35	N
350180	SE	32	25	2	5	BÜCHWITZ, ALFRED #1320	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/5/90	360	Domestic	0	28	N
354519	SE	32	25	2	5	JOHNSTON, YVONNE	ALKEN BASIN DRILLING LTD.	11/22/90	360	Domestic	0	55	N
354520	SE	32	25	2	5	JOHNSTON, YVONNE	ALKEN BASIN DRILLING LTD.	11/21/90	240	Domestic	0	71	N
356376	SE	32	25	2	5	MORROW, ROBERT	UNKNOW DRILLER		220	Domestic	1	No Lithological Description	N/A
361460	SE	32	25	2	5	SIRUCEK, RUSSEL	UNKNOW DRILLER		300	Domestic	1	No Lithological Description	N/A
362061	SE	32	25	2	5	MUNROE, D.	AERO DRILLING & CONSULTING LTD.	1/8/92	400	Domestic	0	53	N
388643	SE	32	25	2	5	LEKOUX, J.	STAR DRLG CO	9/1/71	98	Domestic	0	45	UNKNOWN
388645	SE	32	25	2	5	PEDERSON, LORNE A.	UNKNOW DRILLER		245	Domestic	1	No Lithological Description	N/A
388646	SE	32	25	2	5	STOCKWOOD, HERB	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/4/88	495	Domestic	0	2	N
388704	SE	32	25	2	5	STOCKWOOD, H.	MANORA DRILLING SERVICE	10/7/88	280	Domestic	0	68	UNKNOWN
391020	SE	32	25	2	5	METZ, K.	STAR DRLG CO	9/1/71	286	Domestic	0	0	N
391021	SE	32	25	2	5	BÜCHWITZ, ALFRED	UNKNOW DRILLER		280	Domestic	1	No Lithological Description	N/A
388705	SH	32	25	2	5	RICHARDS, BRUCE	STAR DRLG CO	4/1/72	215	Domestic	0	N/A	N/A
388706	SH	32	25	2	5	METZ, CARL M.	UNKNOW DRILLER		260	Domestic	1	No Lithological Description	N/A
415994	SH	32	25	2	5	DE GRAFF, W.	INTERPROVINCIAL DRLG	4/15/72	280	Domestic	0	42	N
349193	SW	32	25	2	5	FELTHAM HLDG LTD #1033	AARON/INTERPROVINCIAL WATERWELL DRILLING	2/8/89	260	Domestic	0	0	N
349194	SW	32	25	2	5	FELTHAM HLDG LTD #994	AARON/INTERPROVINCIAL WATERWELL DRILLING	12/21/89	300	Domestic	0	0	N
349195	SW	32	25	2	5	FELTHAM HLDG#1032	AARON/INTERPROVINCIAL WATERWELL DRILLING	2/13/89	285	Domestic	0	0	N
349196	SW	32	25	2	5	FELTHAM HLDG#1026	AARON/INTERPROVINCIAL WATERWELL DRILLING	1/19/89	300	Domestic	0	0	N
349197	SW	32	25	2	5	FELTHAM HLDG#995	AARON/INTERPROVINCIAL WATERWELL DRILLING	1/2/89	300	Domestic	0	0	N
349276	SW	32	25	2	5	STOCKWOOD, DONALD	AARON/INTERPROVINCIAL WATERWELL DRILLING	5/12/88	300	Domestic	0	10	N
356081	SW	32	25	2	5	SMITH, BOB	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	5/26/89	220	Domestic	1	70	N
358746	SW	32	25	2	5	SWHART, GARRET	AERO DRILLING & CONSULTING LTD.	6/20/91	320	Domestic	1	81	N
359643	SW	32	25	2	5	SWHART, GARRET	AERO DRILLING & CONSULTING LTD.	7/4/91	400	Domestic	0	71	N
366428	SW	32	25	2	5	LYONS, MICHAEL/MICHELE	UNKNOW DRILLER		0	Domestic	1	No Lithological Description	N/A
388707	SW	32	25	2	5	GATHERCOLE, DON	UNKNOW DRILLER		300	Domestic	1	No Lithological Description	N/A
388708	SW	32	25	2	5	MORFORD, B.S.	UNKNOW DRILLER	4/1/72	200	Domestic	1	No Lithological Description	N/A
388709	SW	32	25	2	5	HALTMAN, MIKE	UNKNOW DRILLER		200	Domestic	1	No Lithological Description	N/A
388710	SW	32	25	2	5	SMITH, BOB	DIVERSIFIED DRILLING & EXPLORATION CO.	8/31/84	180	Domestic	1	79	N
388712	SW	32	25	2	5	HALTMAN, MIKE	DIVERSIFIED DRILLING & EXPLORATION CO.	11/18/85	317	Domestic	0	0	UNKNOWN
388714	SW	32	25	2	5	HALTMAN, MIKE	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	12/11/85	337	Domestic	0	78	N
388716	SW	32	25	2	5	GATHERCOLE, DON	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/9/87	280	Domestic	1	45	N
388720	SW	32	25	2	5	HEINZIG, DENNIS	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/6/87	450	Domestic	0	2	N
388725	SW	32	25	2	5	HEINZIG, DENNIS #2	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	10/6/87	460	Domestic	0	60	N
415997	SW	32	25	2	5	LARSEN, HANS	INTERPROVINCIAL DRLG	8/30/71	330	Domestic	1	0	N
415998	SW	32	25	2	5	LUHOFF, JOHN	INTERPROVINCIAL DRLG	8/1/72	330	Domestic	1	60	N
388770	SW	33	25	2	5	JAMES WILLARD	UNKNOW DRILLER	7/1/73	126	Domestic	1	7	N
388772	NW	34	25	2	5	WILTSHIRE FARMS	UNKNOW DRILLER		140	Domestic	2	No Lithological Description	N/A
384995	6	35	25	2	5	VOLKER STEVIN CONTRACTING LTD	PEE WEE DRILLING LTD.	10/26/93	195	Domestic	0	N/A	N/A
388787	NE	35	25	2	5	MERRELLS, BARRY J.	WARD E DRLG CO LTD	2/1/72	154	Domestic	0	N/A	N/A
388782	NW	35	25	2	5	FAIRWEATHER, GEO	FARROW STEWART	4/25/74	230	Domestic	1	8	N
388785	NW	35	25	2	5	CAMPBELL, IAN F. #1	UNKNOW DRILLER		130	Domestic	1	No Lithological Description	N/A
388786	NW	35	25	2	5	FAIRWEATHER, GEO	FARROW STEWART	4/18/74	128	Domestic	0	N/A	N/A
388773	SW	35	25	2	5	CAHOON, T	DELS DRLG	2/1/73	280	Domestic	0	41	N
388774	SW	35	25	2	5	CAHOON, TOM	DELS DRLG	2/1/73	310	Domestic	0	11	UNKNOWN
388775	SW	35	25	2	5	CAHOON, TOM	FARROW STEWART	12/6/73	263	Domestic	0	17	N
388788	SW	36	25	2	5	TOMILSON, RALPH	FORRESTER ROY	7/11/73	265	Domestic	0	0	N
349177	NW	3	26	2	5	DIEGLE, GIL #1989	AARON/INTERPROVINCIAL WATERWELL DRILLING	10/26/92	175	Domestic	0	N/A	N/A
349780	NW	3	26	2	5	DIEGLE, GILBERT	AARON/INTERPROVINCIAL WATERWELL DRILLING	9/16/87	200	Domestic & Stock	0	N/A	N/A
389870	NW	3	26	2	5	BLACK, DAVID	UNKNOW DRILLER		75	Unknown	1	No Lithological Description	N/A
389869	SE	3	26	2	5	FAIRWEATHER, J.M.	UNKNOW DRILLER		16	Domestic	1	No Lithological Description	N/A
350739	NE	4	26	2	5	MOSCHENROSS, CARL	ALKEN BASIN DRILLING LTD.	5/3/90	300	Domestic	0	N/A	N/A
356388	NE	4	26	2	5	UPSHAW, BLAINE	UNKNOW DRILLER		175	Domestic	1	No Lithological Description	N/A
357653	NE	4	26	2	5	UPSHAW, BLAINE	AERO DRILLING & CONSULTING LTD.	5/16/91	400	Domestic	0	N/A	N/A
360076	NE	4	26	2	5	RICHTER, CHRIS	KRIEGER DRILLING LTD.	8/3/91	480	Domestic	1	N/A	N/A
360655	NE	4	26	2	5	RICHTER, CHRIS	KRIEGER DRILLING LTD.	7/31/91	160	Domestic	0	N/A	N/A
385002	NE	4	26	2	5	RICHTER, H. CHRIS	PEE WEE DRILLING LTD.	5/30/94	180	Domestic	0	0	N
389872	NE	4	26	2	5	MOSCHENROSS, C.J.	UNKNOW DRILLER		168	Domestic	1	No Lithological Description	N/A
389873	NE	4	26	2	5	CRANE, J.D.T.	UNKNOW DRILLER		215	Domestic	3	No Lithological Description	N/A
389874	NE	4	26	2	5	MOLBAK, NEIL	M&M DRILLING CO. LTD.	4/1/73	386	Domestic & Stock	0	N/A	N/A
389875	NE	4	26	2	5	MOLBAK, NEIL	M&M DRILLING CO. LTD.	4/1/73	225	Domestic & Stock	1	N/A	N/A
389877	NE	4	26	2	5	MYERS DEV LTD	UNKNOW DRILLER		180	Domestic	1	No Lithological Description	N/A
389879	NE	4	26	2	5	WAGER, KIETH	STAR DRLG CO	9/1/70	259	Domestic	0	N/A	N/A
389880	NE	4	26	2	5	STYLES PROPERTIES	M&M DRILLING CO. LTD.	7/14/71	180	Domestic	0	38	UNKNOWN
389885	NE	4	26	2	5	STYLES PROPERTIES	M&M DRILLING CO. LTD.	7/8/77	165	Domestic	0	37	N
390966	NE	4	26	2	5	SCHULD, B.	UNKNOW DRILLER		160	Domestic	1	No Lithological Description	N/A
390967	NE	4	26	2	5	SAVOIA, MARIO	FARROW STEWART	1/27/73	160	Domestic	0	N/A	N/A
405065	NE	4	26	2	5	GIEKIE, STEWART	INTERPROVINCIAL DRLG	12/2/76	200	Domestic	0	N/A	N/A
363678	SE	4	26	2	5	LOUDEN, LONA	UNKNOW DRILLER		0	Domestic	1	No Lithological Description	N/A
389886	SW	5	26	2	5	ROLAND, ERIC	FARARI HOLDINGS	7/16/77	305	Domestic	0	20	N
389887	SW	5	26	2	5	VAN ES, R	UNKNOW DRILLER		315	Domestic	1	No Lithological Description	N/A
390970	SW	5	26	2	5	GOOD WATER UTILITIES CO	UNKNOW DRILLER		350	Domestic	2	No Lithological Description	N/A
389949	0	6	26	2	5	BAMLETT, J.	STAR DRLG CO	8/1/73	228	Domestic	0	35	Y
358493	3	6	26	2	5	LAING, R #WELL 1	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	7/4/91	180	Domestic	0	47	N
358494	3	6	26	2	5	LAING, R #WELL 2	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	7/23/91	500	Domestic	0	34	N
376576	NE	6	26	2	5	D&S INVESTMENTS/HARVEY PLACE	NORTHERN WATER SUPP	7/31/75	166	Domestic	3	41	N
389221	NE	6	26	2	5	ALTA ENV	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	3/20/86	260	Domestic	2	27	N
389222	NE	6	26	2	5	ALTA ENV	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	3/19/86	300	Domestic	0	30	N
389906	NW	6	26	2	5	TERRELL, R.K.	DELS DRLG	7/25/72	250	Domestic	1	26	N
389907	NW	6	26	2	5	CULVER	TAKS & SONS DRILLING LTD.	1/1/70	300	Domestic	0	0	N
389908	NW												

**TABLE 1
ALBERTA ENVIRONMENT - SUMMARY OF REGIONAL WATER WELLS
SPY HILL LANDS DEVELOPMENT PROJECT**

WELL ID	LSD	SEC	TWP	RGE	M	WELL OWNER	DRILLER COMPANY	DATE COMPLETED	DEPTH	PROPOSED USE	CHM	DEPTH TO GRAVEL	SCREENED WITHIN GRAVEL
364092	4	9	26	2	5	MILLER, VIC	DEN ALTA DRILLING CO. LTD	4/8/92	200	Stock	0	N/A	N
364093	4	9	26	2	5	MILLER, VIC	DEN ALTA DRILLING CO. LTD	4/8/92	115	Stock	1	N/A	N
351515	SE	9	26	2	5	SCHULTZ, LEN	DEN ALTA DRILLING CO. LTD	12/15/89	200	Domestic	0	N/A	N
351516	SE	9	26	2	5	SCHULTZ, LEN	DEN ALTA DRILLING CO. LTD	12/18/89	150	Domestic	0	N/A	N
389982	SE	9	26	2	5	DUL, JOHN	DEN ALTA DRILLING CO. LTD	7/10/87	155	Domestic	1	N/A	N
389989	NW	10	26	2	5	DOUBLE A DRLG	SIEBEL GEO		115	Domestic	0	10	N
389991	NW	10	26	2	5	EVANS, H	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
389984	SE	10	26	2	5	BLACK, DAVE	PARSONS DRILLING	2/27/67	71	Domestic	0	40	Y
389986	SW	10	26	2	5	CRANE, J.D.T.	FLINN DRILLING LTD.	4/15/71	215	Domestic	0	N/A	N
389984	SE	10	26	2	5	BLACK, DAVE	PARSONS DRILLING	2/27/67	71	Domestic	0	N/A	N/A
389986	SW	10	26	2	5	CRANE, J.D.T.	FLINN DRILLING LTD.	4/15/71	215	Domestic	0	N/A	N/A
389989	NW	10	26	2	5	DOUBLE A DRLG	SIEBEL GEO		115	Domestic	0	10	UNKNOWN
363680	SE	11	26	2	5	BRENNAN, JAMES D.	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
389993	SH	11	26	2	5	FAIR, DOROTHY M.	PEE WEE DRLG	4/1/71	85	Domestic	0	N/A	N/A
389995	NE	11	26	2	5	RANCHLAND HOLIDAY PROPERTIES	GOODISON WATER WELL DRILLING	6/28/77	65	Domestic	0	0	N
349750	SE	12	26	2	5	DALE, GRACE	AARON/INTERPROVINCIAL WATERWELL DRILLING	6/3/85	200	Domestic	0	N/A	N
351407	NW	12	26	2	5	SNIDER, KEN	DOLOMITE DRILLING	2/3/90	160	Domestic	1	N/A	N
351517	SE	12	26	2	5	BRYSON, STUART #TH 1	KRIEGER DRILLING LTD.	1/19/90	160	Domestic	0	N/A	N
351518	SE	12	26	2	5	BRYSON, STUART	KRIEGER DRILLING LTD.	1/18/90	97	Domestic	1	N/A	N
351519	SE	12	26	2	5	BRYSON, STUART #TH 2	KRIEGER DRILLING LTD.	1/20/90	160	Domestic	0	N/A	N
356082	SE	12	26	2	5	BISSELL, D.	DEN ALTA DRILLING CO. LTD.	5/7/84	75	Domestic	2	N/A	N
357372	NE	12	26	2	5	HAASE, G.R.	DOLOMITE DRILLING	5/6/91	150	Domestic	1	N/A	N
358141	NW	12	26	2	5	FARR, KAN/LINDA	DOLOMITE DRILLING	5/31/91	130	Domestic	1	N/A	N
358142	NW	12	26	2	5	FAAR, KEN/LINDA	DOLOMITE DRILLING	6/14/91	260	Domestic	0	N/A	N
358143	NW	12	26	2	5	FARR, KEN/LINDA	DOLOMITE DRILLING	7/4/91	230	Domestic	0	N/A	N
361262	NE	12	26	2	5	SNIDER, H	PARSONS, DELBERT	4/20/89	74	Domestic	0	N/A	N
361468	NE	12	26	2	5	CRUICKSHANKS, WILLIAM	UNKNOWN DRILLER		92	Domestic	1	No Lithological description	N/A
361469	NE	12	26	2	5	CERATO, LUCY	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
361791	NE	12	26	2	5	PEICINER, FRANK	ROCKVIEW DRILLING	8/23/90	179	Domestic	0	No Lithological description	N/A
362752	NW	12	26	2	5	DOEL, RICHARD	PEE WEE DRILLING LTD.	11/29/91	195	Domestic	1	N/A	N
362753	NW	12	26	2	5	DOEL, RICHARD	PEE WEE DRILLING LTD.	11/26/91	105	Domestic	1	N/A	N
362754	NW	12	26	2	5	DOEL, RICHARD	PEE WEE DRILLING LTD.	11/25/91	130	Domestic	1	N/A	N
363240	NW	12	26	2	5	STRACHEY, MICHAEL	UNKNOWN DRILLER		180	Domestic	2	No Lithological description	N/A
364132	NE	12	26	2	5	KONDRAI, STEVE A	UNKNOWN DRILLER		215	Domestic	1	No Lithological description	N/A
366430	SE	12	26	2	5	WILDMAN, TERRY	PEE WEE DRILLING LTD.	10/1/92	235	Domestic	1	N/A	N
367652	NW	12	26	2	5	VAN DYK, ARIE	PEE WEE DRILLING LTD.	6/19/92	250	Domestic	0	N/A	N
367653	NW	12	26	2	5	VANDYK, ARIE	PEE WEE DRILLING LTD.	6/14/92	195	Domestic	0	No Lithological description	N/A
369154	NW	12	26	2	5	LOEWEN, CONNIE	HERTZ DRILLING COMPANY LTD.	4/10/93	213	Domestic	0	N/A	N
389996	SE	12	26	2	5	SIML, N.	FOOTHILLS DRLG		0	Domestic & Stock	0	N/A	N
389998	SE	12	26	2	5	MCCURDY, JOHN	UNKNOWN DRILLER		50	Domestic	2	No Lithological description	N/A
390001	SE	12	26	2	5	MCCURDY, J.	UNKNOWN DRILLER		140	Domestic	1	No Lithological description	N/A
390002	SE	12	26	2	5	O'ROURKE	UNKNOWN DRILLER		120	Domestic	1	No Lithological description	N/A
390003	SE	12	26	2	5	SIML, NILO	UNKNOWN DRILLER		165	Domestic	1	No Lithological description	N/A
390004	SE	12	26	2	5	NOVA BUILDERS LTD	PEE WEE DRILLING LTD.	4/1/71	145	Stock	0	N/A	N
390005	SE	12	26	2	5	SMITH, M/NOVA BUILDERS	PEE WEE DRILLING LTD.	4/1/71	45	Stock	0	N/A	N
390006	SE	12	26	2	5	FARR, DOROTHY	PEE WEE DRILLING LTD.	2/1/71	100	Unknown	0	N/A	N
390009	SE	12	26	2	5	FARR, DOROTHY	PEE WEE DRILLING LTD.	2/1/71	60	Domestic	0	N/A	N
390011	SE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.	2/1/71	45	Domestic	0	N/A	N
390012	SE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.	2/1/71	50	Domestic	0	N/A	N
390014	SE	12	26	2	5	FARR, DOROTHY, M.	PEE WEE DRILLING LTD.	4/1/71	170	Domestic	0	N/A	N
390016	SE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.	4/1/71	125	Domestic	0	N/A	N
390017	SE	12	26	2	5	VINCENT, GORD	UNKNOWN DRILLER		85	Domestic	1	No Lithological description	N/A
390019	SE	12	26	2	5	BISSELL, D.	DEN ALTA DRILLING CO. LTD.	5/7/84	155	Stock	0	N/A	N
390022	SE	12	26	2	5	MCCURDY, JOHN #2	ELGIN EXPLORATION COMPANY LIMITED	1/1/85	160	Domestic	1	N/A	N
390023	SE	12	26	2	5	MCCURDY, JOHN #1	ELGIN EXPLORATION COMPANY LIMITED	1/1/85	300	Domestic	0	N/A	N
390024	SE	12	26	2	5	THOMPSON, HAROLD	KRIEGER DRILLING LTD.	3/5/87	215	Domestic	1	N/A	N
390025	SE	12	26	2	5	THOMPSON	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
390026	SE	12	26	2	5	VINCENT, G.	PARSONS DRILLING	5/16/89	131	Domestic	2	N/A	N
390027	SE	12	26	2	5	BRYSON, STUART	KRIEGER DRILLING LTD.	6/9/89	160	Domestic	0	No Lithological description	N/A
390028	I	12	26	2	5	KARCHER, G.	UNKNOWN DRILLER		92	Domestic & Industrial	1	20	N
390029	SW	12	26	2	5	FARR, DOLLY	PEE WEE DRILLING LTD.	4/1/71	120	Domestic	0	No Lithological description	N/A
390030	SW	12	26	2	5	WILDMAN, T.A.	UNKNOWN DRILLER		160	Domestic	1	N/A	N
390031	SW	12	26	2	5	DALE	DEN ALTA DRILLING CO. LTD.	4/22/77	235	Domestic	0	No Lithological description	N/A
390032	SW	12	26	2	5	DALE #2	DEN ALTA DRILLING CO. LTD.		120	Domestic	0	No Lithological description	N/A
390033	SW	12	26	2	5	DALE #3	DEN ALTA DRILLING CO. LTD.		140	Domestic	0	No Lithological description	N/A
390034	SW	12	26	2	5	DALE #4	DEN ALTA DRILLING CO. LTD.		140	Domestic	0	No Lithological description	N/A
390035	SW	12	26	2	5	DALE #5	DEN ALTA DRILLING CO. LTD.		140	Domestic	0	No Lithological description	N/A
390036	SW	12	26	2	5	DALE #6	DEN ALTA DRILLING CO. LTD.		120	Domestic	0	No Lithological description	N/A
390037	SW	12	26	2	5	DALE	DEN ALTA DRILLING CO. LTD.	5/9/77	140	Domestic	1	No Lithological description	N/A
390038	WH	12	26	2	5	FARR, DOROTHY	PEE WEE DRILLING LTD.	4/1/71	90	Domestic	0	N/A	UNKNOWN
390039	NW	12	26	2	5	BECKNER, CLIFF	PEE WEE DRILLING LTD.	4/1/71	125	Domestic	2	N/A	UNKNOWN
390040	NW	12	26	2	5	DANIALS, D.W.	UNKNOWN DRILLER		250	Domestic	1	No Lithological description	N/A
390041	NW	12	26	2	5	FARR, GORDON L.	UNKNOWN DRILLER		132	Domestic	1	No Lithological description	N/A
390042	NW	12	26	2	5	DANIALS, DEXTER	DEN ALTA DRILLING CO. LTD.	6/13/73	300	Domestic	1	N/A	N
390043	NW	12	26	2	5	SIMON VALLEY DEV CO	PEE WEE DRILLING LTD.	10/1/71	150	Domestic	0	N/A	N
390044	NW	12	26	2	5	TERRY, LARRY/HARDWELL, HILTON	PEE WEE DRILLING LTD.	6/1/71	81	Domestic	0	N/A	N
390045	NW	12	26	2	5	DOEL, RICHARD	UNKNOWN DRILLER		125	Domestic	2	No Lithological description	N/A
390046	NW	12	26	2	5	FARR, KEN	DEN ALTA DRILLING CO. LTD.	10/26/81	195	Domestic	3	N/A	N
390047	NW	12	26	2	5	SMITH, MARY M.	DEN ALTA DRILLING CO. LTD.	6/20/84	175	Domestic	0	N/A	N
390048	NW	12	26	2	5	MINHINETT, TOM	DEN ALTA DRILLING CO. LTD.	6/27/88	230	Domestic	0	N/A	N
390049	NW	12	26	2	5	MINHINETT, TOM	DEN ALTA DRILLING CO. LTD.	6/28/88	155	Domestic	0	N/A	N
390050	NW	12	26	2	5	MINHINETT, TOM	DEN ALTA DRILLING CO. LTD.	6/28/88	155	Domestic	0	N/A	N
390051	NH	12	26	2	5	FARR, DOROTHY	PEE WEE DRILLING LTD.	4/1/71	135	Domestic	0	N/A	N
390075	NE	12	26	2	5	GREEN, R.	SCOTT, H.A. DRILLING	7/1/75	66	Domestic	0	N/A	N
390076	NE	12	26	2	5	FARR, DOROTHY	PEE WEE DRILLING LTD.		60	Domestic	0	N/A	UNKNOWN
390077	NE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.		40	Domestic	0	N/A	UNKNOWN
390079	NE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.	2/1/71	35	Domestic	0	N/A	UNKNOWN
390080	NE	12	26	2	5	HAASE, J.	UNKNOWN DRILLER		74	Domestic	2	No Lithological description	N/A
390081	NE	12	26	2	5	BELL, WALTER	DEN ALTA DRILLING CO. LTD.	11/1/85	115	Domestic	0	N/A	N
390082	NE	12	26	2	5	SNIDER, H.	PARSONS DRILLING	5/4/89	77	Domestic	2	32	N
390083	NE	12	26	2	5	SNIDER, H.	PARSONS DRILLING	4/17/89	96	Domestic	0	N/A	N
390085	NE	12	26	2	5	STEWART	UNKNOWN DRILLER		200	Domestic	1	No Lithological description	N/A
390086	0	12	26	2	5	MOSSFELDT, K.	UNKNOWN DRILLER		80	Domestic	1	No Lithological description	N/A
390076	NW	12	26	2	5	MINHINETT,	UNKNOWN DRILLER		114	Domestic	1	No Lithological description	N/A
390077	NW	12	26	2	5	MINHINETT, TOM	PEE WEE DRILLING LTD.	10/1/71	125	Domestic	1	N/A	N
390079	NE	12	26	2	5	PIKE, J.	UNKNOWN DRILLER		60	Domestic	1	No Lithological description	N/A
390080	NE	12	26	2	5	FARR, DOROTHY M.	PEE WEE DRILLING LTD.	2/1/71	60	Domestic	0	N/A	N
390081	NE	12	26	2	5	SNIDER, H.	PARSONS, DELBERT	4/29/89	93	Domestic	0	N/A	N
404717	SW	12	26	2	5	CARRIGY, BRENDON	M&M DRILLING CO. LTD.	1/5/95	120	Domestic	0	40	N
406612	6	12	26	2	5	BRAUN, JOHN	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	3/15/95	420	Domestic	2	0	N
406613	SW	12	26	2	5	BRAUN, JOHN	KRIEGER DRILLING LTD.	2/17/95	300	Domestic	2	1	N
497714	NE	12	26	2	5	SMITH, MARY #1	PEE WEE DRILLING LTD.	4/21/01	220	Domestic	0	N/A	N
497715	NE	12	26	2	5	SMITH, MARY #3	PEE WEE DRILLING LTD.	4/25/01	56	Domestic	0	N/A	N
497716	NE	12	26	2	5	SMITH, MARY #2	PEE WEE DRILLING LTD.	4/24/01	50	Domestic	0	N/A	N
374078	SW	15	26	2	5	JOHNSTON, BRIAN	STAVELY WATER WELLS	10/28/93	136	Stock	1	N/A	N
390109	SW	15	26	2	5	JOHNSTON, BRIAN	FARROW STEWART	7/12/74	112	Domestic	0	23	N
390111	SW	15	26	2	5	JOHNSTON, R.L.	PARSONS DRILLING	2/23/67	100	Domestic & Stock	0	41	N
390112	SW	15	26	2	5	JOHNSTON	UNKNOWN DRILLER		175	Domestic			

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SPY HILL LANDS DEVELOPMENT PROJECT**

WELL ID	LSD	SEC	TWP	RGE	M	WELL OWNER	DRILLER COMPANY	DATE COMPLETED	DEPTH	PROPOSED USE	CHM	DEPTH TO GRAVEL	SCREENED WITHIN GRAVEL
390294	NE	2	26	3	5	NAGEL, BRUCE	DELS DRLG	12/4/79	277	Domestic	0	24	N
399548	16	2	26	3	5	FAIR, BERNICE	M&M DRILLING CO. LTD.	11/21/94	420	Domestic	0	20	N
401223	NE	2	26	3	5	GREEN, WINSTON/ELAINE	ALKEN BASIN DRILLING LTD.	2/23/95	400	Domestic	0	21	N
402329	NE	2	26	3	5	GREEN, WINSTON	ALKEN BASIN DRILLING LTD.	3/28/95	280	Domestic	0	12	N
416404	SE	2	26	3	5	SMITH, DARREL G.	INTERPROVINCIAL DRLG	1/1/71	270	Domestic	0	35	N
416405	SE	2	26	3	5	WILKINS, JOHN	INTERPROVINCIAL DRLG	5/4/72	160	Domestic	0	36	N
416406	SE	2	26	3	5	VERRALL, PETER	INTERPROVINCIAL DRLG	2/17/72	260	Domestic	1	N/A	N
416407	SE	2	26	3	5	WILKENS HLDG LTD	INTERPROVINCIAL DRLG	11/1/77	160	Domestic	0	25	N
416408	NE	2	26	3	5	KIMBER, R.L.	INTERPROVINCIAL DRLG	3/1/72	140	Domestic	1	32	N
416409	NE	2	26	3	5	RUGGLES, KEN	INTERPROVINCIAL DRLG	3/21/72	110	Domestic	0	20	N
436552	NE	2	26	3	5	FARR, BERNICE	PEE WEE DRILLING LTD	11/16/95	300	Domestic	0	0	N
436572	NE	2	26	3	5	FARR, BERNICE	PEE WEE DRILLING LTD	11/29/95	290	Domestic	0	0	N
436576	NE	2	26	3	5	REID, DOUGLAS	PEE WEE DRILLING LTD	10/3/94	170	Domestic	0	0	N
436582	NE	2	26	3	5	REID, DOUGLAS	PEE WEE DRILLING LTD	11/17/95	175	Domestic	0	0	N
391030	9	10	26	3	5	PRODANCHUK, MARILYN/DON	UNKNOWN DRILLER		160	Domestic	1	No Lithological description	N/A
391322	NW	10	26	3	5	RUGGLES, PAUL	DELS DRLG	4/17/78	201	Domestic	0	N/A	N
391323	NW	10	26	3	5	HUDSON, B.L.	DIVERSIFIED DRILLING & EXPLORATION CO.	5/3/86	210	Domestic	0	N/A	N
391324	14	10	26	3	5	SLIND, LEE	DELS DRLG	10/7/77	204	Domestic	0	24	N
391325	NE	10	26	3	5	ZENGER, H.A.	UNKNOWN DRILLER		230	Domestic	1	No Lithological description	N/A
391326	NE	10	26	3	5	MARICA, CAROL	UNKNOWN DRILLER		150	Domestic	1	No Lithological description	N/A
391327	NE	10	26	3	5	HOREL, KIRSTEN	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
416426	12	10	26	3	5	LAMB, BOB	INTERPROVINCIAL DRLG	10/18/77	290	Domestic	0	N/A	N
416427	15	10	26	3	5	PITTS, BOB	INTERPROVINCIAL DRLG	6/28/72	160	Domestic	1	12	N
349561	SE	11	26	3	5	RATSLAFF, HAL	AARON/INTERPROVINCIAL WATERWELL DRILLING	4/15/87	230	Domestic	0	N/A	N
351258	SE	11	26	3	5	MACFARLANE, D. #1296	AARON/INTERPROVINCIAL WATERWELL DRILLING	1/22/90	225	Domestic	1	N/A	N
351281	SE	11	26	3	5	MACFARLANE, D. #1298	AARON/INTERPROVINCIAL WATERWELL DRILLING	2/2/90	255	Domestic	1	11	N
364094	2	11	26	3	5	MAGUIRE, ROY	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	2/26/92	200	Domestic	0	3	N
364095	2	11	26	3	5	CHAMBERS, CLIVE S.	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	2/27/92	200	Domestic	0	16	N
370095	SE	11	26	3	5	PACKER, TERRY	HERTZ DRILLING COMPANY LTD.	8/24/93	215	Domestic	0	N/A	N
370096	SE	11	26	3	5	PACKER, TERRY	HERTZ DRILLING COMPANY LTD.	8/23/93	255	Domestic	0	0	N
391043	SE	11	26	3	5	MAGUIRE, ROY	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	1/13/89	182	Domestic	1	3	N
391045	SE	11	26	3	5	MACFARLANE, D.	STAR DRLG CO	12/1/76	180	Domestic	2	0	N
391328	SE	11	26	3	5	CHALUS CONSTR LTD	NORTHERN WATER SUPP	4/1/74	222	Domestic	0	N/A	N
391329	SE	11	26	3	5	RATSLAFF, HAL	DELS DRLG	9/30/78	196	Domestic	2	N/A	N
391330	SE	11	26	3	5	MAGUIRE, R.	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	7/31/89	265	Domestic	0	1	N
391428	SW	11	26	3	5	THOMPSON, ALLISON	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
391430	NE	11	26	3	5	D&S INVESTMENTS LTD	DIVERSIFIED DRILLING & EXPLORATION CO.	10/18/78	194	Domestic	0	N/A	N
391431	NE	11	26	3	5	HORSESHOE BEND/SHAWA S.M.	UNKNOWN DRILLER		170	Domestic	2	No Lithological description	N/A
391432	NE	11	26	3	5	HOAR, CHARLIE	DELS DRLG	9/1/84	266	Stock	0	N/A	N
391433	NE	11	26	3	5	WATER UTILITY CO/JANUSZKOWSKI	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
391434	NE	11	26	3	5	HORSESHOE BEND WATER UTILITY	UNKNOWN DRILLER		180	Domestic	1	No Lithological description	N/A
416429	SE	11	26	3	5	VIEBRUKR, PETER	INTERPROVINCIAL DRLG	2/27/74	260	Domestic	0	0	N
416430	SE	11	26	3	5	JARSEN, E.	INTERPROVINCIAL DRLG	7/8/74	242	Domestic	0	0	N
416431	SE	11	26	3	5	REED, GLEN	INTERPROVINCIAL DRLG	12/13/77	130	Domestic	0	2	N
466120	7	11	26	3	5	CHERWAYKO, BILL	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	7/18/96	260	Domestic	0	17	N
491239	SE	11	26	3	5	LARSEN, ERNSI	ALKEN BASIN DRILLING LTD.	2/10/99	260	Domestic	0	3	N
491240	SE	11	26	3	5	REED, JOAN	ALKEN BASIN DRILLING LTD.	2/11/99	295	Domestic	0	17	N
495539	SE	11	26	3	5	LARSEN, ERNIE	ALKEN BASIN DRILLING LTD.	3/28/00	500	Domestic	0	5	N
495540	SE	11	26	3	5	LARSEN, ERNIE	ALKEN BASIN DRILLING LTD.	3/30/00	260	Domestic	0	0	N
349726	SW	12	26	3	5	MCGREGOR, DALE	AARON/INTERPROVINCIAL WATERWELL DRILLING	1/13/95	420	Domestic	0	45	N
349869	SW	12	26	3	5	ADAMS, ERNIE	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/18/96	400	Domestic	0	38	N
349870	SW	12	26	3	5	ADAMS, ERNIE #2902	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/25/96	330	Domestic	0	30	N
349871	SW	12	26	3	5	ADAMS, ERNIE	AARON/INTERPROVINCIAL WATERWELL DRILLING	3/20/96	300	Domestic	0	25	N
350742	SE	12	26	3	5	SINCLAIR, DAVID	ALKEN BASIN DRILLING LTD.	5/2/90	440	Domestic	0	55	N
351813	SE	12	26	3	5	SINCLAIR, DAVID	ALKEN BASIN DRILLING LTD.	4/27/90	380	Domestic	0	0	N
363241	SW	12	26	3	5	COOKE, BRIAN	UNKNOWN DRILLER		310	Domestic	3	No Lithological description	N/A
376329	SE	12	26	3	5	ALTA ENV #TH 1	BIG QUILL DRILLING LTD.	3/9/85	320	Unknown	0	77	N
376330	SE	12	26	3	5	ALTA ENV #WELL 2	BIG QUILL DRILLING LTD.	2/15/85	37	Domestic	0	28	Y
376332	SE	12	26	3	5	ALTA ENV #TH 1	BIG QUILL DRILLING LTD.	2/14/85	140	Unknown	0	100	Y
376333	SE	12	26	3	5	ALTA ENV #TH 2	BIG QUILL DRILLING LTD.	3/11/85	400	Unknown	0	88	N
391041	SE	12	26	3	5	YAKIMISHYN, M.	UNKNOWN DRILLER		100	Domestic	5	No Lithological description	N/A
391436	SE	12	26	3	5	D&S INVESTMENTS LTD	NORTHERN WATER SUPPLY CO.	5/28/75	415	Domestic	0	29	N
391437	SE	12	26	3	5	D&S INVESTMENTS LTD	NORTHERN WATER SUPP	6/14/75	277	Domestic	0	32	N
391438	SE	12	26	3	5	BUNNYHOLLOW SUBDIV/LEHMAN	UNKNOWN DRILLER		220	Domestic	1	No Lithological description	N/A
391439	SE	12	26	3	5	DICKEY, E.	UNKNOWN DRILLER		140	Domestic	2	No Lithological description	N/A
391440	SE	12	26	3	5	BUNNYHOLLOW DEV	KENS AIRTECH SERVICE	4/12/79	350	Domestic	0	110	N
391441	SE	12	26	3	5	HOWARTH, B. #3	UNKNOWN DRILLER		140	Domestic	1	No Lithological description	N/A
391442	SE	12	26	3	5	BALDWIN, DALE	UNKNOWN DRILLER		180	Domestic	1	No Lithological description	N/A
391443	SE	12	26	3	5	MACMILLAN, J.	UNKNOWN DRILLER		280	Domestic	1	No Lithological description	N/A
391444	SE	12	26	3	5	MOFFAT, ROSEMARY/GORDON	UNKNOWN DRILLER		156	Domestic	1	No Lithological description	N/A
391445	SE	12	26	3	5	WHITE, GENE	M&M DRILLING CO. LTD.	6/5/89	345	Stock	0	42	N
391446	SE	12	26	3	5	WHITE, GENE #2	M&M DRILLING CO. LTD.	6/9/89	300	Stock	0	55	N
391447	1	12	26	3	5	BUNNEY, GEORGE	UNKNOWN DRILLER	5/1/72	4180	Domestic	1	No Lithological description	N/A
391448	SE	12	26	3	5	D&S INVESTMENTS LTD	NORTHERN WATER SUPP	11/15/75	233	Industrial	1	47	N
391449	SW	12	26	3	5	BRAUL, PETER	FARROW STEWART	9/9/72	280	Domestic	0	0	N
391450	SW	12	26	3	5	SCHINTZ, NICK	DIVERSIFIED DRILLING & EXPLORATION CO.	10/29/73	278	Domestic	0	26	N
391451	SW	12	26	3	5	HEWITT, ERIC	DELS DRLG	3/2/79	330	Domestic	0	No Lithological description	N/A
391452	SW	12	26	3	5	WIENS, GARRY	FARROW STEWART	10/2/73	130	Domestic	0	N/A	N
391453	SW	12	26	3	5	FRIESEN, ARNOLD	FARROW STEWART	9/16/72	275	Domestic	1	45	N
391454	SW	12	26	3	5	GREEN, R.	DIVERSIFIED DRILLING & EXPLORATION CO.	6/3/75	241	Domestic	2	33	N
391455	SW	12	26	3	5	GREEN, RICHARD	M&M DRILLING CO. LTD.	8/28/78	257	Domestic	1	0	N
391456	SW	12	26	3	5	COOKE, BRIAN	UNKNOWN DRILLER		260	Domestic	1	No Lithological description	N/A
391457	SW	12	26	3	5	SPINDLER, REX	DIVERSIFIED DRILLING & EXPLORATION CO.	3/6/75	60	Domestic	0	45	Y
391458	0	12	26	3	5	MACMILLAN, JOAN	UNKNOWN DRILLER		277	Domestic	1	No Lithological description	N/A
406860	16	12	26	3	5	LOCKE STOCK & BARREL LTD	DEN ALTA DRILLING CO. LTD.	5/11/95	190	Domestic & Stock	0	N/A	N
416433	SW	12	26	3	5	BRAUN, JOHN	INCH BILL	11/1/73	300	Domestic	0	60	N
416434	SW	12	26	3	5	FOWLER, BRUCE	INTERPROVINCIAL DRLG	11/28/72	250	Domestic	1	40	N
467188	SW	12	26	3	5	KNIGHT, TERRY	KRIEGER DRILLING LTD.	3/25/97	300	Domestic	0	45	N
494899	NE	12	26	3	5	GLEN HAVEN STABLES	ALKEN BASIN DRILLING LTD.	6/23/99	136	Domestic	0	No Lithological description	N/A
350189	SE	13	26	3	5	WADHWA, I.S. #TEST HOLE 2	DOERING DRILLING LTD.	1/22/90	385	Domestic	0	38	N
350190	SE	13	26	3	5	WADHWA, I.S.	DOERING DRILLING LTD.	1/25/90	540	Domestic	0	44	N
350191	SW	13	26	3	5	CALDWELL, TOM	ALKEN BASIN DRILLING LTD.	3/13/90	280	Domestic	0	0	N
350192	SW	13	26	3	5	CALDWELL, TOM	ALKEN BASIN DRILLING LTD.	3/15/90	220	Domestic	0	N/A	N
350193	SW	13	26	3	5	CALDWELL, TOM	ALKEN BASIN DRILLING LTD.	3/16/90	280	Domestic	0	0	N
352005	SE	13	26	3	5	DELLAROSE, L.	KRIEGER DRILLING LTD.	8/23/90	320	Domestic	1	23	N
352205	SW	13	26	3	5	WAGNER, S.	DOLOMITE DRILLING	9/4/90	235	Domestic	1	20	N
354363	NW	13	26	3	5	NELSON, VALERIE	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
356394	NW	13	26	3	5	GARDINER, ANISA/RON	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
357373	SW	13	26	3	5	WAGNER, S.	DOLOMITE DRILLING	4/24/91	430	Domestic	0	25	N
361031	SW	13	26	3	5	WAGNER, SIEGFRIED/LYDIA	DOLOMITE DRILLING	8/19/91	220	Domestic	0	15	N
363946	SW	13	26	3	5	CALDWELL, TOM	AERO DRILLING & CONSULTING LTD.	3/4/92	380	Domestic	0	0	N
363947	SW	13	26	3	5	CALDWELL, TOM	AERO DRILLING & CONSULTING LTD.	3/7/92	460	Domestic	0	0	N
364134	NE	13	26	3	5	NEUFELD, HUGH	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
366384	6	13	26	3	5	RICHARDS, GERRY	ALBERTA SOUTHERN EXPLORATION DRILLING LTD.	9/14/92	420	Domestic	0	27	N
391037	SW	13	26	3	5	CALDWELL	UNKNOWN DRILLER		0	Domestic	1	No Lithological description	N/A
391038	SW	13	26	3	5	SANDS, K.H.	FLINN DRILLING LTD.	4/					

**TABLE 1
ALBERTA ENVIRONMENT - SUMMARY OF REGIONAL WATER WELLS
SPY HILL LANDS DEVELOPMENT PROJECT**

WELL ID	LSD	SEC	TWP	RGE	M	WELL OWNER	DRILLER COMPANY	DATE COMPLETED	DEPTH	PROPOSED USE	CHM	DEPTH TO GRAVEL	SCREENED WITHIN GRAVEL
34923	SE	15	26	3	5	HEWITT, SUSAN #3008	AARON/INTERPROVINCIAL WATERWELL DRILLING	8/23/96	90	Domestic	0	1	N
351127	NE	15	26	3	5	SCHMALTZ, DAN #1359	AARON/INTERPROVINCIAL WATERWELL DRILLING	5/26/90	340	Domestic	0	N/A	N
351128	NE	15	26	3	5	SCHMALTZ, DAN	AARON/INTERPROVINCIAL WATERWELL DRILLING	5/30/90	340	Domestic	0	11	N
351129	NE	15	26	3	5	SCHMALTZ, DAN #1360	AARON/INTERPROVINCIAL WATERWELL DRILLING	6/3/90	295	Domestic	0	N/A	N/A
351493	NE	15	26	3	5	GURRING, RON #1406	AARON/INTERPROVINCIAL WATERWELL DRILLING	6/25/90	260	Domestic	0	19	N
353419	NW	15	26	3	5	MILLER, PETER	DIVERSIFIED DRILLING & EXPLORATION CO.	8/13/87	235	Domestic	2	49	N
353977	NW	15	26	3	5	LOWRY, JB-CAROL	LOUS WATER WELL DRILLING LTD.	7/20/90	225	Domestic	0	20	N
356395	NE	15	26	3	5	COMER, PAT	UNKNOWN DRILLER		340	Domestic	2	No Lithological Description	N/A
361475	SW	15	26	3	5	RITCHIE, DAN	UNKNOWN DRILLER		142	Domestic	1	No Lithological Description	N/A
369199	NW	15	26	3	5	CAMERON, RANDY	KRIEGER DRILLING LTD.	4/28/93	160	Domestic	1	11	N
389419	SW	15	26	3	5	PAWCHUK, BERNARD	UNKNOWN DRILLER		0	Domestic & Stock	1	No Lithological Description	N/A
391509	SW	15	26	3	5	METCALFE, KIETH/RUTH	UNKNOWN DRILLER		190	Domestic	1	No Lithological Description	N/A
391510	SW	15	26	3	5	BRINK, BILL	DELS DRLG	10/1/73	149	Domestic	0	15	N
391511	SW	15	26	3	5	GAENT, ERNIE	TAKS & SONS DRILLING LTD.		305	Unknown	0	11	UNKNOWN
391512	SW	15	26	3	5	CORAL CONSTR LTD	TAKS & SONS DRILLING LTD.	9/1/73	97	Domestic	0	0	UNKNOWN
391513	SW	15	26	3	5	ROSINE, SHIRLEY	NORTHERN WATER SUPPLY CO.	11/23/77	346	Domestic	0	N/A	N/A
391514	SW	15	26	3	5	ALLEN DOUGLAS RANCH	KRIEGER DRILLING LTD.	10/16/82	320	Domestic	0	N/A	N/A
391515	NW	15	26	3	5	WIRTH, LOU	NORTHERN WATER SUPPLY CO.	3/20/79	402	Domestic	3	12	UNKNOWN
391516	NW	15	26	3	5	CHALUS CONSTR LTD	NORTHERN WATER SUPP	9/1/73	301	Domestic	0	22	N
391517	NW	15	26	3	5	SMITH, DENNIS	DELS DRLG	10/9/78	366	Domestic	0	N/A	N/A
391518	NW	15	26	3	5	CHALUS CONSTR	NORTHERN WATER SUPP	5/1/74	275	Domestic	0	N/A	N/A
391519	NW	15	26	3	5	RANSKI, ED	DELS DRLG	3/16/78	340	Domestic	0	N/A	N/A
391520	NW	15	26	3	5	SMEDELY, FRANK	TWO WAY DRLG	4/24/75	315	Domestic	0	N/A	N/A
391521	NW	15	26	3	5	KORBY, DON	DELS DRLG	6/4/80	321	Domestic	0	N/A	N/A
391522	NW	15	26	3	5	KHOSA, HARCHANB	NORTHERN WATER SUPP	10/5/79	191	Domestic	0	11	N
391523	NW	15	26	3	5	SCHABLE, C.	UNKNOWN DRILLER		380	Domestic	1	No Lithological Description	N/A
391524	NE	15	26	3	5	FEHLER, WALLACE	DELS DRLG	2/16/76	203	Domestic	0	21	N
391525	NE	15	26	3	5	FEDORUK, JIM	PARSONS DRILLING	6/11/75	285	Domestic & Stock	1	45	N
391526	NE	15	26	3	5	FOSTER, DAN	UNKNOWN DRILLER		335	Domestic	1	No Lithological Description	N/A
391527	NE	15	26	3	5	BOURNES, MIKE	KRIEGER DRILLING LTD.	10/15/86	347	Domestic	0	1	N
391528	0	15	26	3	5	CARGILL, GORDON	UNKNOWN DRILLER		420	Domestic	1	No Lithological Description	N/A
416441	SW	15	26	3	5	D&S INVESTMENTS	INTERPROVINCIAL DRLG	5/22/73	160	Domestic	0	32	N
416442	6	15	26	3	5	MYERS, C.V.	INTERPROVINCIAL DRLG	4/26/74	180	Domestic	0	N/A	N/A
416443	SW	15	26	3	5	MYERS, BILL	INTERPROVINCIAL DRLG	5/7/74	160	Domestic	0	26	N
416444	SW	15	26	3	5	PETERSON, BEN	INTERPROVINCIAL DRLG	11/8/78	293	Domestic	0	N/A	N/A
416453	NW	15	26	3	5	HEZSELY, C.B.	INTERPROVINCIAL DRLG	10/20/79	300	Domestic	0	N/A	N/A
391529	SE	16	26	3	5	MADSZCZAK, W.E.	UNKNOWN DRILLER		145	Domestic	1	No Lithological Description	N/A
391530	SE	16	26	3	5	LOWE, BARRY	CHAPPELL, W. DRILLING	6/1/75	180	Domestic	0	N/A	N/A
391531	SE	16	26	3	5	FLAMEN, RAY	DELS DRLG	8/1/72	250	Domestic	1	N/A	N/A
391532	SE	16	26	3	5	KLAUS CONSTR	DELS DRLG	3/1/72	90	Domestic	0	N/A	N/A
391533	SE	16	26	3	5	KRAHN, JAKE	DELS DRLG	5/1/72	110	Domestic	0	N/A	N/A
391534	SE	16	26	3	5	KLAUS CONSTR	UNKNOWN DRILLER	3/1/72	136	Domestic	0	N/A	N/A
391535	SE	16	26	3	5	KLAUS CONSTR	DELS DRLG	3/1/72	140	Domestic	0	N/A	N/A
391536	SE	16	26	3	5	MASON,	UNKNOWN DRILLER		70	Domestic	1	No Lithological Description	N/A
391537	SE	16	26	3	5	DILLABOUGH, GARRY	NORTHERN WATER SUPP	5/1/79	237	Domestic	0	N/A	N/A
391538	SE	16	26	3	5	MCALLISTER, VICTOR	UNKNOWN DRILLER		0	Domestic	1	No Lithological Description	N/A
391539	1	16	26	3	5	HART, E.	UNKNOWN DRILLER		70	Unknown	1	No Lithological Description	N/A
394069	SE	16	26	3	5	KLINSPOR, A.M.	INTERPROVINCIAL DRLG	12/15/73	200	Domestic	1	10	N
394073	SE	16	26	3	5	KLINSPOR, ARTHUR	DELS DRLG	3/13/79	260	Domestic	0	N/A	N/A
416446	SE	16	26	3	5	BIRCHALL, LARRY	INTERPROVINCIAL DRLG	3/25/81	280	Domestic	0	22	N
391561	SE	21	26	3	5	MCGRAW, DAVID	UNKNOWN DRILLER		140	Domestic	2	No Lithological Description	N/A
391562	SW	21	26	3	5	MACGREGOR, STEWART	UNKNOWN DRILLER		60	Domestic	1	No Lithological Description	N/A
391563	SE	22	26	3	5	CLIFFORD, GEORGE	UNKNOWN DRILLER		160	Domestic	1	No Lithological Description	N/A
391565	NE	22	26	3	5	BEEBY, LANCE	DELS DRLG	10/4/76	237	Domestic & Stock	1	N/A	N/A
391566	NW	23	26	3	5	MCELROY, MORTON	NORTHERN WATER SUPP	6/15/62	165	Domestic	0	115	UNKNOWN
391566	NW	23	26	3	5	MCELROY, MORTON	NORTHERN WATER SUPP	6/15/62	165	Domestic	0	115	UNKNOWN
391567	SE	24	26	3	5	LOCKE, C.	UNKNOWN DRILLER		120	Domestic	1	No Lithological Description	N/A
391569	NW	24	26	3	5	LOCKE, CHARLES	SIMENSEN GEORGE	10/1/73	317	Unknown	0	11	N

**TABLE 2
WATER BALANCE
SPY HILL LAND DEVELOPMENT PROJECT**

			January	February	March	April	May	June	July	August	September	October	November	December	Year	Source
Percipitation (mm)			18.3	13.7	18.6	29.6	59.1	75	68.4	54.2	48.5	16.5	14.1	15.9	431.9	
Monthly Temperature in (°C)	TEMP		-9.3	-6.1	-2.2	4.2	9.6	13.7	16.1	15.3	10.3	5.8	-2.7	-7.7		
Monthly Temperature (°F)	TEMP		15.3	21.0	28.0	39.6	49.3	56.7	61.0	59.5	50.5	42.4	27.1	18.1		
Heat Index	I					0.77	2.69	4.6	5.87	5.44	2.99	1.25				
Actual Potential Evporation (inches of water)	PET		0	0	0	1.18	2.52	1.77	1.69	1.85	0.12	0	0	0	9.13	
Actual Potential Evporation (mm of water)	PET		0	0	0	30	64	45	43	47	3	0	0	0	232	Summer potential evaptranspiration for Aspen Parkland from Strong and Leggat (1992)
Average Monthly Percipitation (inches of water)	P		0.72	0.54	0.73	1.17	2.33	2.95	2.69	2.13	1.91	0.65	0.56	0.63	17	
Average Montly percipitation (mm of water)	P		18.3	13.7	18.6	29.6	59.1	75	68.4	54.2	48.5	16.5	14.1	15.9	431.9	
Runoff Coefficint	C r/o		0.95	0.95	0.95	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.95	0.95		McBean, Rovers, and Rarquhar (1995). Solid Waste Landfill Engineering and Design (Table C.1)
Monthly Runoff (inches of water)	r/o	P*C r/o	0.68	0.51	0.69	0.18	0.35	0.44	0.40	0.32	0.29	0.10	0.53	0.60	5.0955	
Monthly Runoff (mm of water)	r/o	P*C r/o	17.39	13.02	17.67	4.44	8.87	11.25	10.26	8.13	7.28	2.48	13.40	15.11	129.27	
Monthly Infiltration (inches of water)	I	P-r/o	0.04	0.03	0.04	0.99	1.98	2.51	2.29	1.81	1.62	0.55	0.03	0.03	11.9145	
Monthly Infiltration (mm of water)	I	P-r/o	0.91	0.69	0.93	25.16	50.24	63.75	58.14	46.07	41.23	14.03	0.71	0.80	302.635	
Water Available for Storage (inches of water)	I-PET	I-PET	0.04	0.03	0.04	-0.19	-0.54	0.74	0.60	-0.04	1.50	0.55	0.03	0.03	2.78	
Water Available for Storage (mm of water)	I-PET	I-PET	0.91	0.69	0.93	-4.84	-13.77	18.75	15.14	-0.93	38.23	14.03	0.71	0.80	70.64	
Cummulative Water Loss (inches of water)	ACC WL	Add negative I-PET on a cummlative basis to obtain cuumlative water loss. Note: Start the summation with zero accumulated water loss for the last monthly having I-PET>0.			0	-0.19	-0.73	0.01	0.61	0.57	2.07					
Cummulative Water Loss (mm of water)	ACC WL					-4.84	-18.61	0.15	15.29	14.36	52.58					
Monthly Soil Moisture Storage (inches of water)	ST	Estimated initial soil moisture storage for the soil depth and type, assign this value to the last month having I-PET>0. Determine ST for each subsequent month having I-PET<0. For month I-PET>=0, add I-PET to the preceeding month's storage. Do not exceed the field capacity. Enter the field capacity if the sum exceeds this maximum.	5.00	5.00	5.00	3.92	2.99	3.73	5.00	3.42	4.92	5.00	5.00	5.00	53.98	McBean, Rovers, and Rarquhar (1995). C.W. Thornthwaite and J.R. Mather Instructions and Tables for Computing Potential Evapotranspariton and the Water Balance (Table 16)
Change in soil Mositure Storage (inches of water)	DST	Subtract ST for each month from the preceeding month	0.00	0.00	0.00	1.08	0.93	-0.74	-1.27	1.58	-1.50	-0.08	0.00	0.00	0.00	
Actual Evapotranspiration (inches of water)	AET	Wet months, I-PET>=0: AET =PET; Dry months, I-PET<0:AET=PET +(I-PET-DST)	0	0	0	-0.09	1.05	1.77	1.69	0.23	0.12	0.00	0.00	0.00	4.78	
Actual Evapotranspiration (mm of water)	AET	Wet months, I-PET>=0: AET =PET; Dry months, I-PET<0:AET=PET +(I-PET-DST)	0.00	0.00	0.00	-2.17	26.68	44.96	42.93	5.85	3.05	0.00	0.00	0.00	121.30	
Percolation (inches of water)	PERC	Dry months, I-PET<0: PERC = 0; Wet months, I-PET>=0: PERC = (I-PET-DST)	0.04	0.03	0.04	0	0	1.475	1.869	0	3.007	0.629	0.028	0.0315	7.14	
Percolation (mm of water)	PERC	Dry months, I-PET<0: PERC = 0; Wet months, I-PET>=0: PERC = (I-PET-DST)	0.91	0.69	0.93	0.00	0.00	37.47	47.47	0.00	76.38	15.98	0.71	0.80	181.33	
Recharge (inches of water)	R		0.04	0.03	0.04	-0.09	0	0	0.179	0	2.887	0.629	0.028	0.0315	3.7745	
Recharge (mm of water)	R		1.016	0.762	1.016	-2.286	0	0	4.5466	0	73.3298	15.9766	0.7112	0.8001	95.8723	
P (inches of water)	P	P = PERC+AET+DST+r/o	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	Calculation Check

Notes: Runoff Coefficient, C r/o = 0.95 for winter months (T<00C). For the growing season, C r/o = 0.15 for silt and clay loam in aspen parkland.

The field capacity was estimated at 8 inches for the montly soil mositure storage by McBean et al. (1995). A conservative field capacity of 5 inches was used in the water balance.



FIGURES

Figure 1 – Site Location Plan

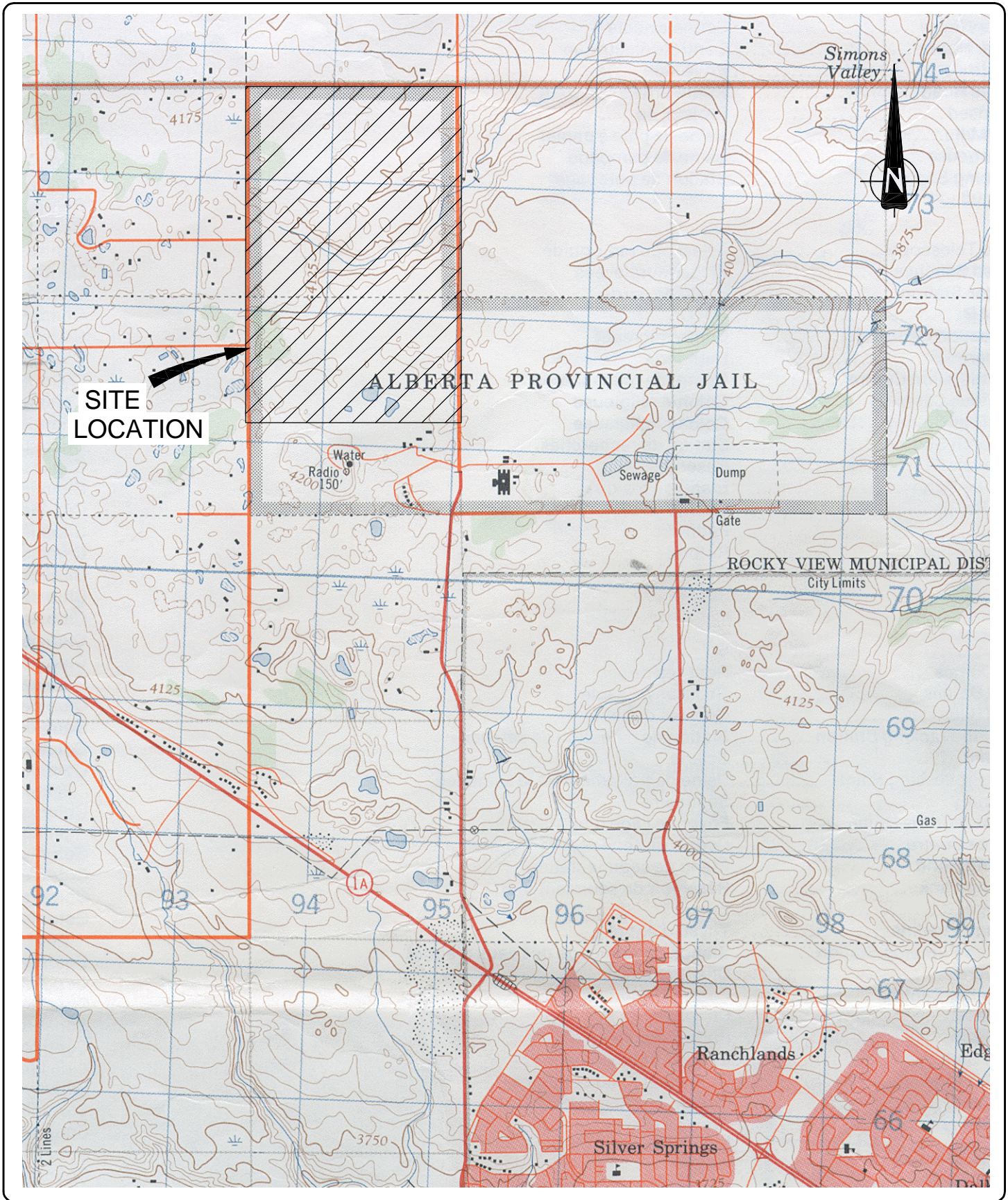
Figure 2 – Site Plan

Figure 3 – Gravel Pit Test Hole Locations

Figure 4 – Watershed Boundary and Recharge/Discharge Zones

Figure 5 – Groundwaters Users With Well Completed In The Aquifer

Figure 6 – Water Balance



CLIENT/PROJECT DESCRIPTION
BROWN & ASSOCIATES PLANNING GROUP
 SPY HILL LANDS DEVELOPMENT PROJECT

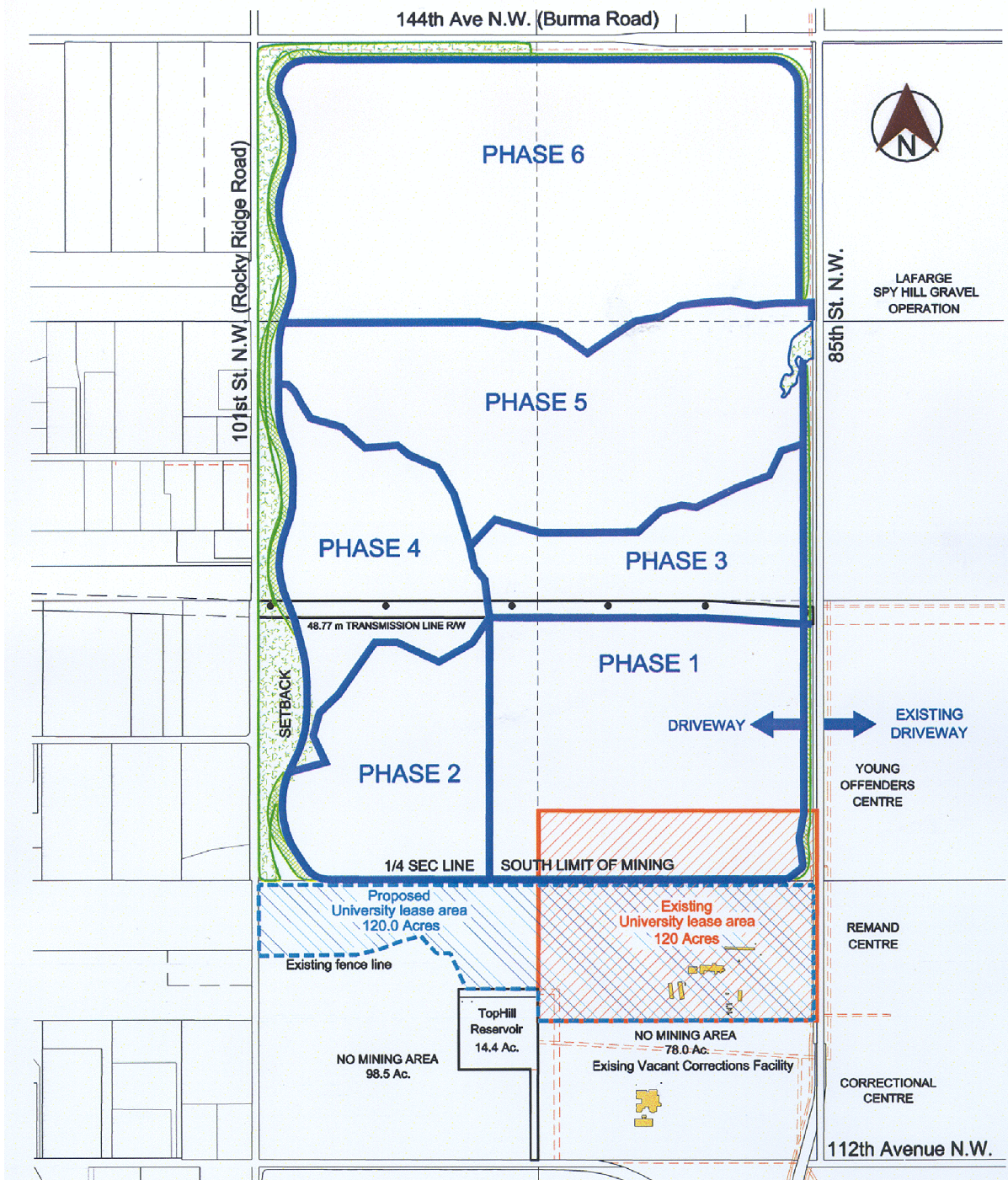


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 03/07/28
 MEA/KAT




TITLE/EBA DRAWING NO.
SITE LOCATION PLAN
FIGURE 1



prepared for: ALBERTA TRANSPORTATION
ALBERTA INFRASTRUCTURE
prepared by: BROWN AND ASSOCIATES
PLANNING GROUP
DECEMBER 2002

SPY HILL LANDS DEVELOPMENT PROJECT

LEGEND

-  LANDSCAPED BERM
(HEIGHT VARIES TO 4 m)
-  EXTRACTION PHASE LINE
-  LINEAR OPEN SPACE

MAP 12: EXTRACTION CONCEPT PLAN

CLIENT/PROJECT DESCRIPTION
BROWN & ASSOCIATES PLANNING GROUP
SPY HILL LANDS DEVELOPMENT PROJECT



EBA Engineering Consultants Ltd.

SCALE/EBA PROJECT NO.

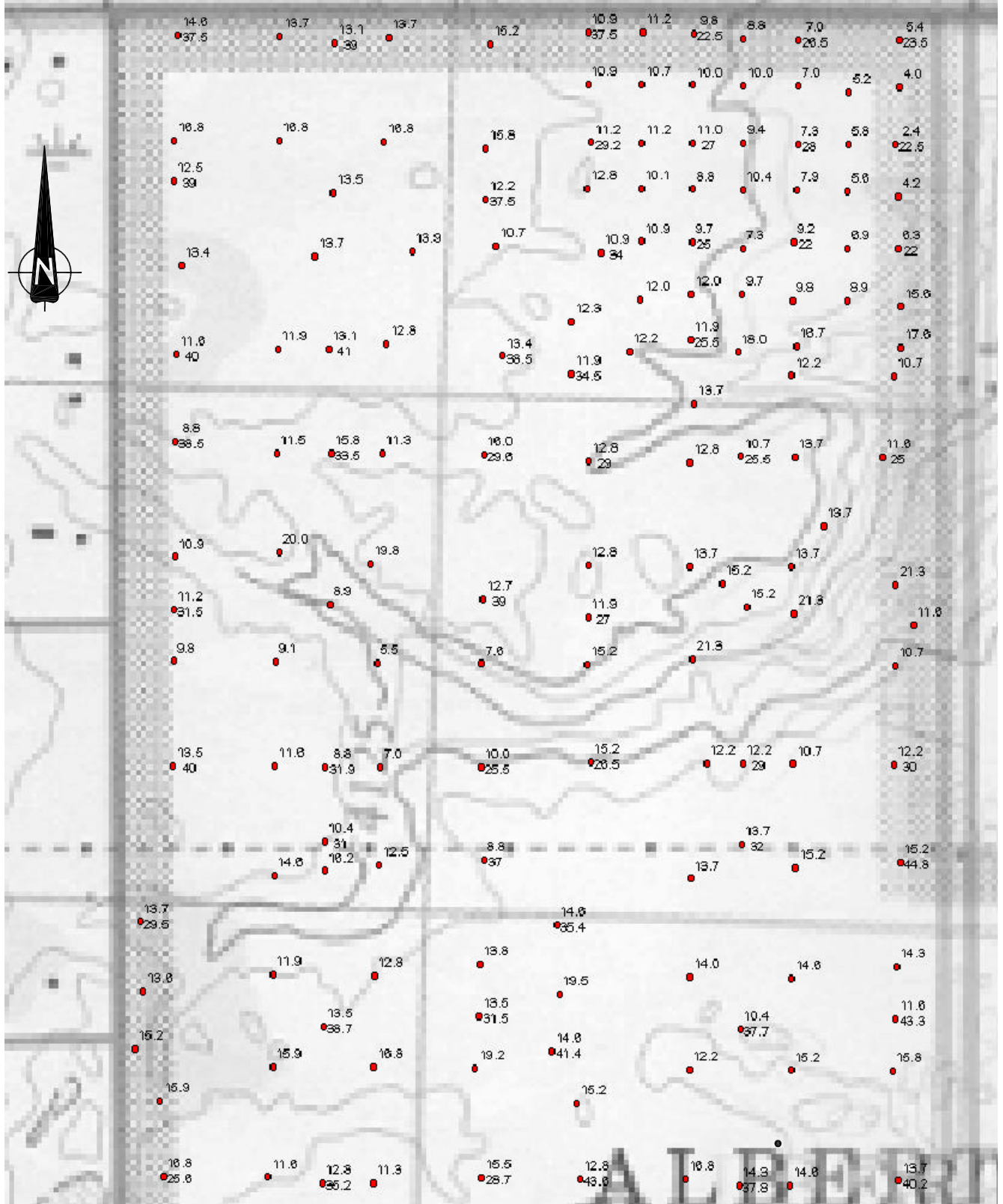
N.T.S.
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DATE/DRAWN BY:

03/07/28
MEA/KAT

TITLE/EBA DRAWING NO.

SITE PLAN
FIGURE 2



- LEGEND:
- 1.25 DEPTH TO GRAVEL
 - 1.25 DEPTH TO BEDROCK

CLIENT/PROJECT DESCRIPTION
BROWN & ASSOCIATES PLANNING GROUP
 SPY HILL LANDS DEVELOPMENT PROJECT

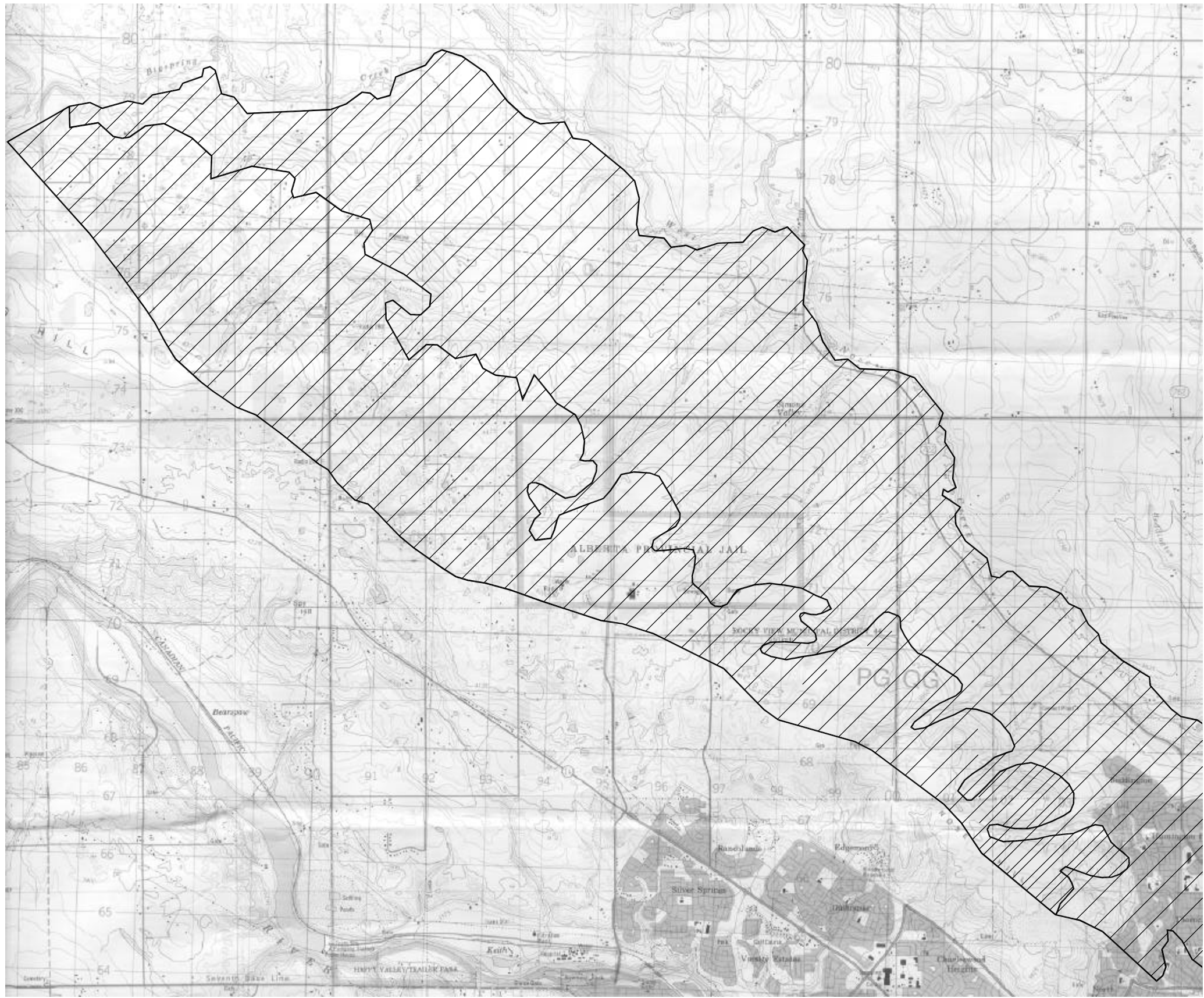



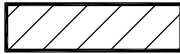

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TITLE/EBA DRAWING NO.
GRAVEL PIT TEST HOLE LOCATIONS
FIGURE 3



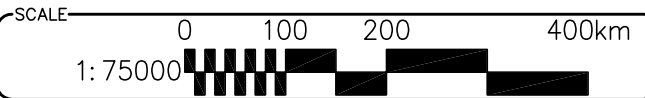
- LEGEND:**
-  RECHARGE ZONE
 -  DISCHARGE ZONE
 -  WATERSHED BOUNDARY

SHEET TITLE
BROWN & ASSOCIATES PLANNING GROUP
 SPY HILL LANDS DEVELOPMENT PROJECT

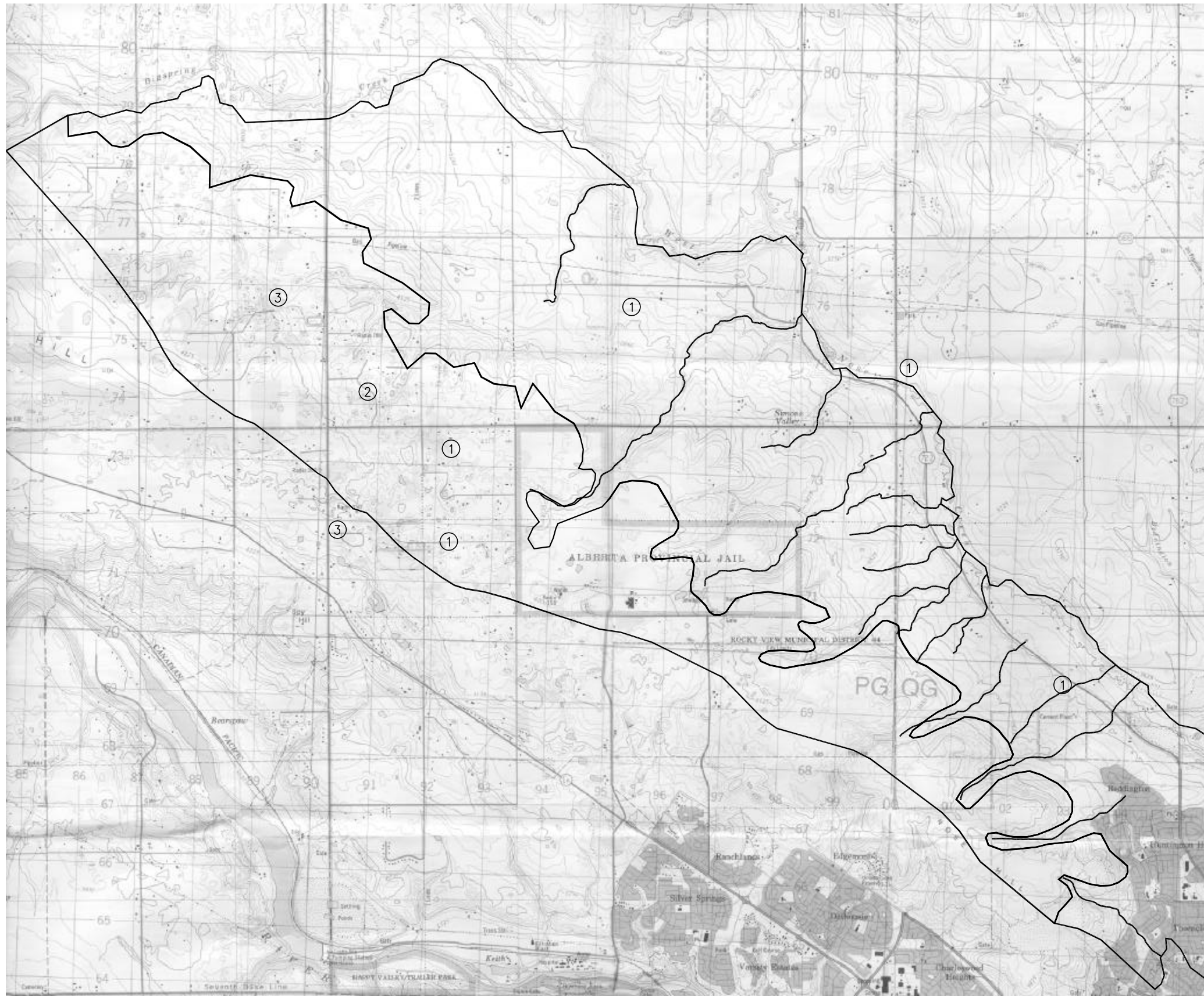
NOTES:
 THIS IS A FIELD SKETCH. PROPORTIONS SHOULD BE CORRECT BUT ACTUAL DIMENSIONS MAY BE INACCURATE. ACTUAL LOCATIONS SHOULD BE VERIFIED INDEPENDENTLY BY THE CONTRACTOR IN THE FIELD PRIOR TO CONDUCTING ADDITIONAL WORK.

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WATERSHED BOUNDARY & RECHARGE/DISCHARGE ZONES
 FIGURE 4



LEGEND:
 (#) NUMBER OF WELL USERS IN THAT AREA

SHEET TITLE
BROWN & ASSOCIATES PLANNING GROUP
 SPY HILL LANDS DEVELOPMENT PROJECT

NOTES:
 THIS IS A FIELD SKETCH. PROPORTIONS SHOULD BE CORRECT BUT ACTUAL DIMENSIONS MAY BE INACCURATE. ACTUAL LOCATIONS SHOULD BE VERIFIED INDEPENDENTLY BY THE CONTRACTOR IN THE FIELD PRIOR TO CONDUCTING ADDITIONAL WORK.

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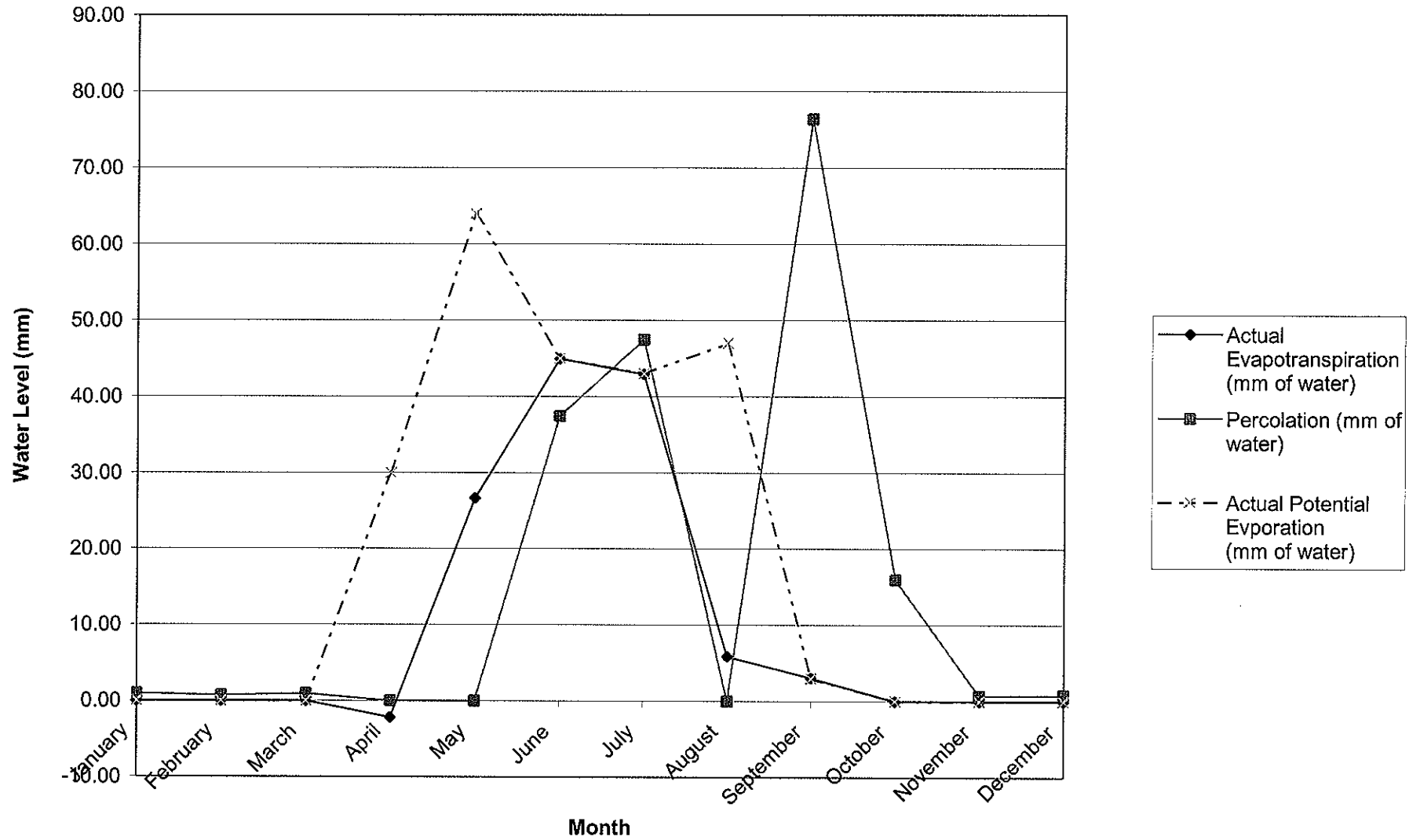
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DATE/EBA PROJECT NO.
 03/07/30
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EBA Engineering Consultants Ltd.

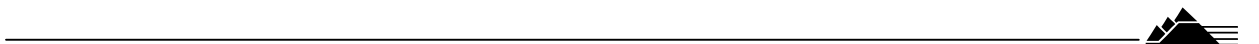
TITLE/EBA DRAWING NO.
 GROUNDWATERS USERS WITH WELLS COMPLETED IN THE AQUIFER
 FIGURE 5

Figure 6
Water Balance





APPENDIX A
ENVIRONMENTAL REPORT - GENERAL CONDITIONS



EBA Engineering Consultants Ltd. (EBA)
ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA’s investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 Information Provided to EBA by Others

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA’s liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

- (1) With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
- (2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

EBA Engineering Consultants Ltd. (EBA)
ENVIRONMENTAL REPORT – GENERAL CONDITIONS

4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

10.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.