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REPORT

Geology and Hydrostratigraphy of the Rosetown Area (72O), Saskatchewan

by

M.A. Simpson

Environment Branch

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November 1998

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Saskatchewan Research Council
15 Innovation Blvd.
Saskatoon, SK S7N 2X8
Phone: (306) 933-5400
Fax: (306) 933-7446

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INTRODUCTION

Geologic mapping, test drilling and groundwater level measurements have been conducted for the settled area of Saskatchewan during the past 30 years. These data provide a basis for mapping the location of hydrostratigraphic units, containing palatable water, present in Saskatchewan. The objective is to continuously improve the understanding of provincial groundwater resources, in terms of occurrence, quality, and behaviour, in order to support the development, management, and protection of these water supplies.

With this need in mind, the Saskatchewan Research Council (SRC) has worked co-operatively with SaskWater to complete a new Geology and Hydrostratigraphic/Groundwater Resource map series corresponding to the 1:250,000 scale, National Topographic Series (NTS) areas of Saskatchewan. This work is an update and refinement of maps published by SRC during the late 1960's and 1970's.

The present report accompanies the preliminary maps and cross sections depicting the geology and hydrostratigraphy in the Rosetown Area (72O). The updated maps include empirical aquifer information including: depth and thickness to specific aquifers as well as depth to water for wells completed at individual locations throughout the area. It also demonstrates the close relationship of soil salinity to geology and groundwater conditions and assists in evaluating irrigation potential and contamination hazards.

Stratigraphic cross sections were prepared along 13 profiles which display the stratigraphic continuity from adjacent testholes and wells in the Rosetown area. These cross sections were constructed utilizing testhole logs obtained from records stored at SRC. This entailed the preparation of a preliminary database of a hydrostratigraphic/ stratigraphic picks for each of the 919 wells/testholes used in the study. These picks consisted of readily recognized units and stratigraphic picks from previous studies (eg. sand units, bedrock formation, group breaks, surficial sand etc.). In addition, map coordinates (UTM- NAD83) were generated for each well/testhole by calculating the centroid of the most accurate, dominion land location description reported (i.e. well locations reported to a legal sub-division (lsd) location, were assigned the UTM point coordinate located at the center of that lsd etc.). Cross section were created by selecting wells/testholes from a map display of well locations, using an AutoCAD autolisp routine called "AutoWell". This program positioned hydrostratigraphic/stratigraphic

strip logs at each well along the cross section. Stratigraphic correlations and picks were then refined and edited by interpreting and extrapolating stratigraphic data from one well to the next with AutoCAD (ver. 14). These roughly parallel cross sections were spaced approximately 14 to 19 km apart: 7 in a north-south orientation, and 6 traversing the study area in an east-west direction. These include testholes with electrical logs only; (oil and potash exploration testholes) and testholes and observation wells drilled by SRC (comprised of electrical logs, driller's logs, and geologist's descriptions), and farm or municipal water-well testholes (comprised of electrical logs and driller's logs) which were drilled with the assistance of Sask Water, or formerly, the Family Farm Improvement Branch of the Saskatchewan Department of Agriculture. In all 919 individual testhole/waterwell records were utilized in the compilation of the is report. Map 1 shows the location of the 13 cross sections and testhole/waterwell locations in the Rosetown area.

A map showing the bedrock surface geology and topography was prepared (Map 2). Separate map sheets were completed for each stratigraphic level at which aquifers or potential aquifers (i.e. sands and gravels) occur (Maps 3-8). In some cases, where there are few, or only minor occurrences of the deposits at different levels, aquifers from different levels may be shown on one sheet. Information on aquifer maps includes the depth to, thickness of the deposit, and the static water level when reported. Initial preparation of these maps was completed with the use of the Geographic Information System (GIS) software ArcView (ver 3.0). The GIS enabled the spatial display and query of the database of stratigraphic and aquifer information, which had been prepared from the water well and testhole information.

Upon completion of the aquifer map compilations, the line work was digitized and saved as *.dwg, AutoCad 14 drawing files. These layers were then combined with a digital base map of the Rosetown area (1:250,000 scale) licenced by SaskWater from SaskGeomatics, for this report. Hard copy aquifer maps were plotted at a scale of 1:200,000. The accompanying cross sections are plotted at the same horizontal scale of 1:200,000 with a vertical exaggeration of 50x.

GEOLOGY

General

All sediments between the bedrock surface and the present surface are considered to be "drift". Topographic surface elevations in the Rosetown area range from 500 metres above sea level (masl) near the South Saskatchewan River valley, to elevations in excess of 750 masl in the south central portion of the area. Recorded bedrock surface elevation ranges from 675 masl in the Missouri Coteau Upland located in the southwestern portion of the study area, to elevations of 365 m in an area referred to as the "Saskatoon Low". Bedrock surface topography was formed by several processes: preglacial, fluvio-glacial and glacial erosion and collapse. In preglacial time rivers flowed from the Rocky Mountains region eastward across Saskatchewan. The Tyner Valley (Map 4) was formed by such a preglacial river. Erosion by glacial meltwater modified both surface and bedrock topography as glaciofluvial predecessors of the South Saskatchewan River and Coteau Creek eroded through drift into bedrock. The bedrock surface was further modified by collapse which was a result of the removal of salt from the stratigraphically lower, Prairie Evaporite Formation, by groundwater. Evidence of salt collapse is evident along many of the cross sections in the Rosetown map are, particularly sections C-C' and D-D', where it is obvious that the Judith River and Bearpaw Formations have been involved in the subsidence that would have accompanied the removal of the salt.

The drift in the Rosetown area ranges in thickness from a maximum of 200 metres in the south western portion of the Rosetown area to a minimum of 0 masl where bedrock is exposed at the ground surface (as is the case at some locations along the South Saskatchewan River valley).

The glacial ice eroded but also deposited material, mainly glacial till, which is an unsorted mixture of sand, silt, clay, pebbles, and boulders accumulated by the glacier. As the ice retreated from the area much meltwater was released, which eroded existing materials and deposited stratified gravels, sands, silts, and clays. This process of erosion and deposition of till and stratified deposits occurred several times as the ice repeatedly advanced and retreated over the area. This sequence of events resulted in the drift stratigraphy that presently exists.

Where information makes it possible, the drift has been divided into three groups; Empress Group, Sutherland Group, and Saskatoon Group. The Empress Group consists of stratified gravels, sands, silts, and clays that occur between the bedrock surface and the till. The

Period	Composite Stratigraphy*			Lithology	Hydrostratigraphic Units Rosetown Area	
				sand and silt / silt and sand	aquifer / aquitard	Surficial Sand Aquifers
Quaternary	Surficial Stratified Deposits					
	Saskatoon Group	Battleford Formation		till	aquitard	Saskatoon Group Aquifers
		Floral Formation	Upper Floral Till	till	aquitard	
			Riddell Member	sand and gravel	aquifer	
			Lower Floral Till	till	aquitard	
				sand and gravel	aquifer	
	Sutherland Group	Warman Formation		till	aquitard	Sutherland Group Aquifers
				sand and gravel	aquifer	
		Dundurn Formation		till	aquitard	
				sand and gravel	aquifer	
		Mennon Formation		till	aquitard	
Tertiary	Empress Group			sand and gravel	aquifer	Empress Group Aquifers
	(unnamed)			sand and gravel	aquifer	Tertiary Aquifer
Cretaceous	Bearpaw Formation			clay	aquitard with minor aquifers	Bearpaw Sand Aquifers
		Ardkenneth Mb.		silt and sand		
				clay		
		Demaine Mb.		silt and sand		
				clay		
		Matador Mb.		silt and sand		
				clay		
		Outlook Mb.		silt and sand		
	Judith River Formation			sand and silt	aquifer	Judith River Aquifer
	Lea Park Formation & Upper Colorado Gp.			clay	aquitard	
	Lower Colorado Group			clay	aquitard	

* Modified after Christiansen, 1992 and Caldwell, 1968

Table 1. Schematic hydrostratigraphic setting of the study area.

Sutherland Group, as well as the Saskatoon Group, consists of several till units and stratified units that are not formally separated and identified here (see Table 1). The definition of these groups and the description of the typical drift units forming the stratigraphy are provided by Christiansen (1968, 1992) and Whitaker and Christiansen (1972). The subdivision of the drift into various units is presently not possible throughout all of the Rosetown area due to the lack of accurate and complete descriptions available from drillers logs.

Bedrock

Lea Park Formation and Upper Colorado Group

The Lea Park Formation cannot be differentiated from Upper Colorado Group on the basis of electric logs which is the dominant type of information available from the testhole which penetrate to this depth (Christiansen, 1979). In this study these two units will be referred to as one. The unit is composed of noncalcareous, gray, marine silt and clay, and is found throughout the entire Rosetown map area.

Judith River Formation

The Judith River Formation is comprised of nonmarine, interbedded, very fine- to medium-grained sand, silt, and clay with carbonaceous and concretionary zones. This formation (McLean, 1971) forms the bedrock surface in the northwestern position of the study area and also subcrops along the length of the preglacial Tyner Valley, a preglacial channel which had eroded down through the entire Judith River Formation to the Lea Park Formation. Generally, within the study area, the Judith River Formation thins towards the north and east. This unit is absent along the deepest portions of the Tyner Valley.

Bearpaw Formation

The bedrock unit that underlies the drift throughout most of the Rosetown area is the Bearpaw Formation. This unit, which ranges in recorded thickness from 0 m to 230 metres, is composed of soft, gray, noncalcareous, marine silt and clay. There are several sandy members which are located within the Bearpaw Formation. The Bearpaw sand members reported to occur in the Rosetown area, in ascending order are the Outlook, Matador, Demaine, and Ardkenneth members (Caldwell, 1968). An attempt was made to correlate Bearpaw sand members on the cross sections based largely on stratigraphic position and inferred structural control as indicated by tops of deeper formations. The extent of these sand members is effected by a combination of: pinch out, truncation by glacial erosion, and salt collapse.

Descriptions of the formation were made by Caldwell (1968) at several exposures located along the banks of the South Saskatchewan River. Many exposures used to establish the

stratigraphy are now inaccessible due to the construction of the Gardner Dam and subsequent flooding of the South Saskatchewan River valley.

Tertiary Undifferentiated Formation

The youngest bedrock deposits in the Rosetown area are composed of 0-140 m of brown silt, sand, chert and quartzite gravel. These deposits are referred to as Tertiary-Quaternary sediments. These sediments were deposited in freshwater lakes and rivers between the deposition of the Bearpaw Formation and the erosion of the preglacial Tyner Valley. These sediments, which occupy an upland stratigraphic position, form the bedrock surface in the west central portion of the Rosetown Area. The preservation of these sediments may in part be related to the process of salt collapse and subsidence, allowing the Tertiary sediments to escaped removal by glacial erosion.

Drift

Empress Group

The Empress Group is composed of those sediments lying between the bedrock surface and the oldest till. The Empress Group is comprised of stratified gravel, sand, silt, and clay sediments. The basal sand of this group is composed predominantly of quartz and dark minerals; and the basal gravel is composed predominately of well rounded chert and quartzite pebbles. These units are commonly noncalcareous. Upper sand and gravel units of the Empress Group indicate a glacial derivation, as indicated by greater proportions of igneous, metamorphic and carbonate rocks. The upper units are usually calcareous. The Empress Group, therefore, includes both preglacial (Tertiary) and glacial (Quaternary) deposits (Whitaker and Christiansen, 1972; Christiansen, 1992).

The Empress Group deposits in the Rosetown area are confined mainly to bedrock valleys and glacially eroded depressions in the bedrock surface.

Sutherland Group

Where it is differentiated, the Sutherland Group (Christiansen, 1968, 1992) lies above bedrock or the Empress Group and beneath the Saskatoon Group. In the Rosetown area, this unit ranges from 0 to about 95 metres in recorded thickness (Allan Hills and Bear Hills areas, Section C-C') and comprises tills and stratified drift. The tills of the Sutherland Group are commonly clayier and harder, less resistive electrically, and are more difficult to penetrate by drilling than tills of the Saskatoon Group. These two groups are also differentiated on the basis of carbonate content, the presence of shale fragments in the till, and a weathering zone separating the two groups.

Saskatoon Group

The Saskatoon Group (Christiansen, 1968, 1992) comprises all sediments lying between the Sutherland Group and the present surface. Where it is differentiated in the Rosetown area this unit attains a maximum recorded thickness of about 100 metres (Allan Hills area, Section C-C').

The Saskatoon Group is composed of tills and stratified drift. The tills of the Saskatoon Group are commonly more sandy, more resistive electrically, and have a higher carbonate content

that the tills of the Sutherland Group. The Saskatoon Group comprises the Floral Formation, which itself consists of multiple tills and stratified units, the Battleford Formation and Surficial Stratified Deposits (Christiansen, 1968, 1992).

Surficial Stratified Deposits occurs as eolian, glaciolacustrine and glaciofluvial sediments and as alluvial sediments that were deposited by modern, or at least postglacial, streams and rivers. These sediments cover significant area of the Rosetown study areas.

The surficial sand and silt is composed of 0 to 80 metres of deltaic sand and silt which was deposited where the north and South Saskatchewan Rivers and Tramping and Whitebear Spillways emptied into Lake Saskatchewan. As lake levels dropped, the shoreline retreated to the northeast and, as a consequence, the deltaic sand and silt progressed lakeward covering large areas of the Lake Saskatchewan basin (Christensen, 1979).

Significant deposits of alluvial silt, sand and gravel are found along the South Saskatchewan River valley. A flood plain in excess of 8 km width developed in the easily erodible deltaic sand and silt in and around Pile Lake Provincial Park, in the north central part of the Rosetown area (Christiansen, 1979).

HYDROSTRATIGRAPHY

General

A hydrostratigraphic unit is defined as a lithological body having considerable lateral extent and comprises a geological framework for reasonably distinct hydrologic system. This report outlines the stratigraphic relationship of these various units in order to refine the search for groundwater in the Rosetown area (see Table 1).

Groundwater originates from precipitation that infiltrates to the water table, moves downward and laterally under the influence of gravity, and eventually discharges back to the ground surface at some point of lower elevation (Meneley, 1977). An aquifer is a layer in which a well can be constructed yielding sufficient water for production. Aquifers are separated by aquitards, which are layers sufficiently permeable to transmit water but not sufficiently permeable to allow completion of a production well. The inter-relationships between aquitards, aquifers, and aquifer systems are discussed by Meneley (1983).

Groundwater moves through the intergranular openings and fractures in the sediments. The water moves under influence of gravity from regions of higher hydraulic head to regions of lower hydraulic head. The hydraulic head generally is expressed as the elevation above sea level of the water level in a well. If the layers are horizontal and of large areal extent, as in this area, the water tends to move vertically in aquitards while in aquifers it moves horizontally. The distribution of the hydraulic head determines the direction of flow. The hydraulic head distribution in turn is controlled by factors such as topography, stratigraphic setting, and the type of material forming the aquitards and aquifers (Meneley 1977).

In the Rosetown area, the Judith River Formation forms the most extensive aquifer unit. Less extensive, but significant, aquifers include: the Empress Group sediments, Saskatoon Group intertill/interglacial sands and gravels, and surficial sands. Aquifers in the Sutherland Group and Bearpaw Formation sand members constitute minor aquifers in this area. Till units and bedrock clays form the aquitards in the area.

Bedrock Aquifers

General

Bedrock aquifers are those water yielding units which occur stratigraphically below the Empress Group. Bedrock deposits form very important sources of palatable water in the Rosetown area. They can be grouped into three categories: shallow, intermediate and deep. Shallow bedrock aquifers are composed of those sediments belonging to the upland Tertiary deposits. Intermediate bedrock aquifers comprise the Bearpaw sand members. The deep bedrock aquifer in the Rosetown area is the Judith River Formation. It should be emphasized that these terms: shallow, intermediate and, deep do not imply actual depth below ground surface, but are used to describe the stratigraphic position of the bedrock aquifers.

Judith River Aquifer

The Judith River Formation, which occurs throughout most of the Rosetown area (Map 3) forms the largest bedrock aquifer in the area. The recorded depth to the top of this aquifer is extremely variable, ranging from 0 m along the South Saskatchewan River valley to 406 m on Throughout much of the Prelate area, however, the top of the Judith River Aquifer lies between about 100 and 200 m below the surface.

The Judith River Aquifer is hydraulically connected to both the Empress Group sediments of the Tyner Valley Aquifer and to the Surficial Sand aquifer of the South Saskatchewan River alluvium.

A total of 130 wells were reported as completed in the Judith River Formation in the Rosetown area. Depth to water varies greatly from flowing conditions reported at several locations (see Table 1) to 87 metres below surface.

Bearpaw Sands

Within the Bearpaw Formation are several sandy members in which wells have been developed. Christensen (1972) indicates the presence of only the Ardkeneth Member in the Rosetown map area. Millard (1998) indicates the presence of at least 4 sand members within the Bearpaw Formation present at the northern boundary of the Swift Current map area (72J) which forms the southern edge of the Rosetown area. Resolution of these relatively thin silty sand units

in the Rosetown area is difficult due shallow holes which do not intersect reliable marker horizons and incomplete geological descriptions (if at all). Extrapolation from the mapping done by Millard (1998) in the Swift Current area, coupled with the testhole information available in the Rosetown area resulted in the identification of several sand members based largely on stratigraphic position (see cross section F-F').

Map 4 indicates where one or more of the sandy members of the Bearpaw Formation can be expected to occur. Most of the wells reported in the Bearpaw Formation, are completed into one of the aforementioned sandy members. Occasionally the driller has indicated that the completion zone is fractured shale. Lack of detailed geological descriptions and complete stratigraphic sequences makes the identification of the precise sand member in which wells have been completed, infeasible.

Waterwell records indicate that 19 wells were completed into sand members of the Bearpaw Formation in the Rosetown area. Flowing conditions were reported at four of these wells.

Tertiary Sands and Gravels

Significant sand and gravel deposits of Tertiary age were mapped in the west central portion of the Rosetown area. A number of wells (16) are reported to be completed in these sediments. Thickness of the unit varies from 0 to approximately 75 metres. Most testholes indicate the formation is deposited over Bearpaw Shale, but at some locations the Bearpaw Formation has been removed by erosion and the Tertiary deposit directly overlays the Judith River Formation (see cross section C-C'), thus establishing a hydraulic connection between the two aquifers.

Drift Aquifers

Empress Group

Silts, sands, and gravels that occupy the stratigraphic position of the Empress Group (Map 5) occur primarily along the Tyner Valley which cuts diagonally through the western half of the Rosetown area along a northeast to southwest trend. A significant tributary of the Tyner Valley fluvial system extends southeast from the main valley in the central part of the Rosetown sheet.

Two narrow channel type Empress Group aquifers, one near Dundurn and the other in the extreme northeast portion study area were also identified. A poorly defined broad Empress Group aquifer was also indicated along the southeast margin of the Rosetown area. Several single point locations of Empress Group sediments are also indicated on the map.

Waterwell records indicate thirty-eight wells completed into Empress Group sediments in the Rosetown area. Depth to and thickness of these aquifers are highly variable. Depth to the top of Empress Group sediments ranged from 33 to 143 metres below ground surface while thickness as great as 36 metres were intersected. Static water level varies from reported flowing conditions at one location, to 76 m below ground surface. In spite of the relatively few number of wells completed in this aquifer it is reported to be one of the most productive aquifer systems in the area.

Sutherland Group

Sutherland Group aquifers are stratigraphically located within tills of the Sutherland Group and above Empress Group sediments (Map 6). These aquifers are fewer in number and areal extent than are Saskatoon Group aquifers. This is somewhat due to a lack of information, as wells completed into shallow aquifers often did not have testholes drilled to investigate deeper formations. Of the 410 well records used in this investigation only 20 were completed into Sutherland Group aquifers. Most of these aquifers are located in the northeast portion of the Rosetown area. Significant flowing conditions are known to exist in an area south of the community of Dundurn in the Brightwater Marsh area (Meneley 1968). Data from a number of isolated wells completed in the Sutherland Group are also indicated on the map. The continuity and interconnection of these aquifers is limited by incomplete stratigraphic information.

Saskatoon Group

Saskatoon Group aquifers in this report include the stratified deposits that form the 'interglacial' aquifers, which occur between the lowest till of the Saskatoon Group and the uppermost till of the Sutherland Group as well as aquifers positioned between tills of the Saskatoon Group itself (i.e. Battleford till and Floral till). These aquifers are commonly at depths less than 50 m below ground surface. Saskatoon Group aquifers are quite extensive in the

Rosetown area (Map 7). The majority of wells, 283 of the 410 well completion records, in the Rosetown area are completed in Saskatoon Group aquifers. These include portions of the previously named: Forestry Farm and Tessier aquifers as mapped by Christensen (1979). These aquifers are located in the northern portion of the Rosetown map area.

Surficial Stratified Deposits

Many shallow seepage wells, generally less 15 m deep, have been constructed throughout the area primarily in Surficial Stratified Deposits, but also in shallow stratified deposits of the Battleford Formation or the Floral Formation. In addition, alluvial deposits along the South Saskatchewan River valley provide domestic water. Many large diameter, bored wells (not included in this compilation) have been completed in surficial stratified deposits. The extent, as indicated from the 916 testhole and water well records used in this report, of the Surficial Sand aquifer is indicated on Map 8. Water in surficial aquifers originates as precipitation which has infiltrated down from the ground surface to the watertable. Recharge occurs seasonally mainly during the spring snow melt period and during intensive or long duration rainstorms.

Flowing Wells

Flowing wells (i.e. where the static water level is above the ground surface) generally indicate an upward groundwater flow. In the Rosetown area, flowing wells have been completed into Sutherland Group, Empress Group, and bedrock aquifers. Flowing wells in the Rosetown area, as reported from completion records in the SRC testhole files, are listed in Table 1. Also included is the completion depth of the well and the classification and the stratigraphic position of the aquifer (if known).

Table 2. Flowing Wells in the Rosetown Map Area 72O

Location	Aquifer	Screen Depth
SW 4-30-26-2-W3	Bearpaw sand	61 m
NW 12-17-32-12-W3	Judith River Formation	95 m
SE 8-28-34-4-W3	Sutherland Group Aquifer	87 m
NW 20-32-4-W3	Bearpaw sand	77 m
SE 5-32-4-W3	Judith River Formation	109 m
NW 12-32-5-W3	Judith River Formation	85 m
SE 3-32-5-W3	Judith River Formation	77 m
NE 4-18-32-4-W3	Bearpaw sand	80 m
SW 3-30-31-4-W3	Judith River Formation	63 m
C 4-32-26-2-W3	Judith River Formation	126 m
NW 2-34-33-12-W3	Judith River Formation	100 m
SE 8-16-32-4-W3	Sutherland Group Aquifer	108 m
NW 36-32-4-W3	Bearpaw sand	75 m
NW 6-30-3-W3	Judith River Formation	99 m
NW 13-30-4-W3	Bearpaw sand	94 m
SE 3-7-28-12-W3	Empress Group Aquifer	106 m
NW 15-18-32-4-W3	Sutherland Group Aquifer	Testhole only
SW 12-17-32-12-W3	Judith River Formation	98 m

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APPENDIX I

Index of Cross Section Logs

The following types of logs and records have been used for the compilation of this work.

1. The SRC file contains logs that include E-logs, driller's logs, geologist's descriptions of the cutting samples, and often analytical results. These logs are listed as SRC, GSC, SDA, CDL, Beckie, U of S, DNR, SIP, RD, and JWD.

2. The Oil - Potash logs consist of geophysical logs only. These logs are listed as OIL.

3. The SWC file contains logs consisting of E-logs, driller's logs, and information pertaining to well completion. Collection of this type of data was initiated under the Family Farm Improvement Branch (FFIB) Testhole Assistance Program, which was the forerunner of a similar program now administered by the SWC. These logs are list as SWC.

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
1	16143	BENS BOB	SWC	NW	16		12	34	15	3
2	6561	BREITKEITZ BYRON	SWC			NW	7	34	14	3
3	76134	TW BIGGAR CROWN 2	OIL		9		20	34	14	3
4	1159	SRC FEUDAL	SRC	NW	4		10	34	13	3
5	9640	TRASK DWEIN	SWC	NW	2		34	33	12	3
6	1154	SRC TESSIER	SRC	NW	13		33	33	11	3
7	76075	TW BA LAURA CROWN	OIL		16		29	33	10	3
8	1144	SRC LAURA PLOTS 1	SRC	NW	13		25	33	10	3
9	1147	SRC LAURA PLOTS 007	SRC	NE	14		25	33	10	3
10	1111	COMINCO LAURA	SRC	NW	10		19	33	9	3
11	16152	FRASER TOM	SWC	NW	14		22	33	9	3
12	1113	COMINCO CHAMBERS	SRC	SE	1		25	33	9	3
13	1085	COMINCO CHAMBERS	SRC	SE	16		19	33	8	3
14	9892	BENTLEY TERRY	SWC	SW	12		22	33	8	3
15	76047	JAMES CHAMBERS	OIL		16		22	33	8	3
16	16157	RIDGEWELL RANDY	SWC			NE	31	33	7	3
17	76035	HB PIKE LAKE	OIL		2		2	34	7	3
18	1070	SRC PIKE LAKE	SRC	SE	3		18	34	6	3
19	1069	SRC PIKE LAKE	SRC	SW	1		17	34	6	3
20	1068	SRC PIKE LAKE	SRC	SW	4		15	34	6	3
21	1066	SRC VALLEY PARK	SRC	SE	1		24	33	6	3
22	1058	NRC-SRC WHITECAP	SRC	SE	14		15	33	5	3
23	1059	SRC CAMP DUNDURN	SRC	SE	11		24	33	5	3
24	1047	SRC-NRC DUNDURN	SRC	NE	15		21	33	4	3
25	1048	HAYTER DUNDURN	SRC			SW	25	33	4	3
26	1036	SRC-NRC STREHLOW	SRC	SW	4		5	34	3	3
27	75963	US BORAX BRADWELL	OIL		9		29	33	2	3
28	1023	SRC ALLAN	SRC	SE	9		29	33	2	3
29	17428	KARY WILFRED	SWC		15		5	34	1	3
30	75914	US BORAX ALLAN TW 1	OIL	NW	13		1	34	1	3
31	16138	WALKER WILLIAM	SWC			NE	30	32	14	3
32	11406	BLAZEK JAMES	SWC	NE	9		32	32	14	3
33	11407	NASH MERLE	SWC	SE	9		36	32	14	3
34	16141	CAIRNSIDE FARM	SWC			SE	27	32	13	3
35	9890	CAIRNS W J	SWC	SW	4		26	32	13	3
36	1158	SRC VALLEY CENTRE	SRC	NE	9		23	32	13	3
37	16140	JONSIN COLLIN	SWC	SE	9		28	32	12	3
38	10916		SWC	SW	2		26	32	12	3
39	7385	GENEST LEO	SWC			SE	25	32	12	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
40	10309	HUSBAND DAVID	SWC	NE	1		32	32	11	3
41	7482	WALKER BOB	SWC	NW	5		4	33	10	3
42	1136	COMINCO LAURA	SRC	SW	12		36	32	10	3
43	1135	COMINCO LAURA	SRC	NE	16		24	32	10	3
44	1110	COMINCO DONAVON	SRC	SW	1		27	32	9	3
45	1109	COMINCO DONAVON	SRC	NW	4		24	32	9	3
46	10770	REGEHR ABE	SWC	SE	15		13	32	9	3
47	76043	TW SWANSON CROWN	OIL		16		9	32	8	3
48	2924	U OF S EAGLE NO.166 PROCTOR LK	SRC	SE	1		4	32	6	3
49	76026	TW DUNDURN 4	OIL		5		1	32	6	3
50	16122	HILLCREST COLONY	SWC			NW	12	32	5	3
51	1041	SRC BRIGHTWATER MARSH	SRC	NW	15		18	32	4	3
52	1042	HAYTER RON EVANS	SRC		8		21	32	4	3
53	1044	NRC MOUNT BLACKSTRAP	SRC	SW	14		25	32	4	3
54	1030	HAYTER NICK SCHROEDER	SRC	NW	14		29	32	3	3
55	11607	JOHNSON IVER	SWC	NE	9		25	32	3	3
56	1022	SRC SOUTH ALLAN	SRC	NE	16		29	32	2	3
57	75912	TW ALLAN CROWN	OIL		4		10	33	1	3
58	10319	O'GRADY GRATTON	SWC	SW	1		2	33	1	3
59	1165	SRC ROSETOWN	SRC	NW	13		24	30	15	3
60	76131	IMPERIAL FORTUNE	OIL		13		20	30	14	3
61	1164	SRC PYM	SRC	SW	5		23	30	14	3
62	10306	LEFEURE MIKE	SWC	NE	16		5	30	13	3
63	18821		SWC	SE	15		11	30	13	3
64	9020	JENSEN GRANT	SWC		13		25	30	12	3
65	1151	SRC BRISBIN	SRC	SW	5		32	30	11	3
66	7291	MCPHADDEN IAN	SWC			SW	27	30	11	3
67	1132	SSRIP CONQUEST 50	SRC	SE	1		30	30	10	3
68	41911	SSRIP ARDath No. 2	SRC	SW	16		21	30	10	3
69	41919	SSRIP CONQUEST No.37	SRC	SW	14		23	30	10	3
70	41920	SSRIP CONQUEST No.5	SRC	NE	7		24	30	10	3
71	41873	SSRIP CONQUEST No.41	SRC	NW	6		19	30	9	3
72	1105	SSRIP CONQUEST 10	SRC	NE	8		19	30	9	3
73	1107	SSRIP CONQUEST 9	SRC	SE	2		27	30	9	3
74	1106	SSRIP CONQUEST 24	SRC	SE	3		26	30	9	3
75	41878	SSRIP CONQUEST No.23	SRC	NW	14		24	30	9	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
76	2406	SSRIP CONQUEST NO.27	SRC	SE	1		20	30	8	3
77	76033	TW OUTLOOK CROWN 1	OIL		7		20	30	7	3
78	10295	HEMINGWAY PAT	SWC	NW	4		30	30	6	3
79	7477	ABRAHAMSON EDDIE L	SWC			NW	34	30	6	3
80	1065	RANKIN HANLEY	SRC	NE	16		25	30	6	3
81	7515	PETERS HENRY N	SWC			NE	15	31	5	3
82	13674	KEMMER CHARLIE	SWC	SW	3		30	31	4	3
83	6986	KYLE KEITH	SWC	SE	12		18	31	3	3
84	1027	HAYTER HANLEY 1	SRC			NE	16	31	3	3
85	1021	SRC ALLAN HILLS	SRC	SE	1		27	31	2	3
86	7119	ELLIS GERALD W	SWC	SE	8		34	31	1	3
87	7520	DENGLER FRED	SWC		11		25	31	1	3
88	11394	LEBREQUE ERNEST	SWC	SE	16		23	28	15	3
89	9630	SANDERSON ROSS	SWC	NE	14		22	28	14	3
90	10279	SPARKS CHARLES	SWC	NE	16		29	28	13	3
91	16071	BAILEY FRANK	SWC	SE	9		3	29	13	3
92	7740	MOURRE EDWARD	SWC		13		4	29	12	3
93	16069	MILDEN GOLF CLUB	SWC			SW	13	29	12	3
94	76078	CAN GULF TW CRUSE 13	OIL		13		18	29	11	3
95	11393	TOWN OF MILDEN	SWC			NW	17	29	11	3
96	11397	RANKIN HOWARD	SWC	SW	4		15	29	11	3
97	1123	SSRIP BOUNTY	SRC	NE	13		10	29	10	3
98	1081	SRC OUTLOOK	SRC	NE	5		18	29	8	3
99	1080	SDH OUTLOOK	SRC	SW	3		16	29	8	3
100	1074	RANKIN BRODERICK	SRC	SW			19	29	7	3
101	2952	SIP OUTLOOK 87-104	SRC	SW	7		15	29	7	3
102	1064	RANKIN GLENSIDE	SRC	NW	10		17	29	6	3
103	76010	PLACID TW HAWARDEN CROWN 1	OIL		12		10	29	5	3
104	9631	PEDERSON NORMAN	SWC	SE	8		24	29	5	3
105	1037	SRC BEAVER CREEK	SRC	NE	13		35	29	4	3
106	16112	OULLETTE DEB	SWC	NE	16		15	29	3	3
107	1026	SRC KENASTON	SRC	SW	11		24	29	3	3
108	17761	ZDUNICH REG	SWC		12		20	29	2	3
109	8620	PAVELICH VINCENT	SWC	NW	4		33	29	1	3
110	16118	BRUYNOOGE KELLY	SWC	SW	4		26	29	1	3
111	1163	EPD HOUGHTON	SRC			SE	17	27	14	3
112	76127	INC HUSKY GLAMIS	OIL		10		12	27	14	3
113	76101	FINA FORGAN	OIL		7		13	27	13	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
114	1155	MRH WISETON	SRC			NE	17	27	12	3
115	16081	TOWN OF DINSMORE GOLDER ASSOC.	SWC	NW	5		7	27	11	3
116	2444	SIP DINSMORE 84-101	SRC	SW	1		18	27	11	3
117	16085	TOWN OF DINSMORE GOLDER ASSOC.	SWC	NE	14		9	27	11	3
118	16084	TOWN OF DINSMORE GOLDER ASSOC.	SWC	NW	5		14	27	11	3
119	16094	CAMERON ASHLEY	SWC	NW	13		13	27	11	3
120	1121	SRC DINSMORE	SRC	NW	13		21	27	10	3
121	16095	HEDGER DENNIS	SWC	NW	13		23	27	10	3
122	1101	EPD SURBITON	SRC		1		30	27	9	3
123	13990	HILL MAURICE	SWC	SE	8		20	27	8	3
124	10283	LEE ROY	SWC	SE	4		7	27	7	3
125	11610	FORSBERG A A	SWC	NE	4		10	27	7	3
126	2770	OUTLOOK 87-115	SRC	NE	8		7	27	6	3
127	1062	P-W STRONGFIELD TH & WELL	SRC	SW			25	27	6	3
128	1056	SRC STRONGFIELD	SRC	SW	4		29	27	5	3
129	10288	TASTAD R G	SWC	SW	2		29	27	5	3
130	9633	BIRCH JIM	SWC	NE	16		21	27	5	3
131	13675	BRISTOW ROBERT	SWC	NW	13		13	27	5	3
132	9635	LANGAGER LES	SWC	NW	15		8	27	4	3
133	6301	FIRBY RONALD G	SWC			SE	15	27	3	3
134	75962	IMPERIAL DAVIDSON 2	OIL		13	0	10	27	2	3
135	13001	AMES JACK	SWC			NE	11	27	2	3
136	1020	SRC DAVIDSON	SRC	NE	16		8	27	1	3
137	7207	HILL GERALD	SWC	SE	8		9	27	1	3
138	8106	LEIS LORRAL	SWC	SW	12		14	25	15	3
139	76118	TW KYLE STH 20	OIL		13		7	25	14	3
140	76119	HUSKY ELROSE STH 1	OIL		5		11	25	14	3
141	76120	TW ELROSE STH 297	OIL		12		12	25	14	3
142	76099	TW ELROSE STH 298	OIL		12		9	25	13	3
143	7724	ELLIOT JACK	SWC	SE	7		15	25	13	3
144	9262	WENDT CRAIG	SWC	NE	13		21	25	12	3
145	11615	KALLIO JOHN DENNIS	SWC	SW	2		3	25	11	3
146	1148	SRC LUCK LAKE	SRC	SW	4		1	25	11	3
147	10654	HENDERSON C TREVOR	SWC	NE	13		36	24	10	3
148	1077	RANKIN BIRSAY	SRC	SE			34	24	8	3
149	8997	BAGSHAW LAVERNE	SWC	NE	9		25	24	8	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
150	8850	SINCLAIR ROSS	SWC	SW	2		4	25	7	3
151	76020	BEARD MVC TH 20	OIL		4		14	25	6	3
152	2837	SWC ELBOW NO.88-03	SRC	NW	11		18	25	5	3
153	76005	BEARD MVC TH 11	OIL		12		16	25	5	3
154	6108	MARTENS JAKE	SWC			SE	18	25	4	3
155	13673	KRETSCH JOE	SWC	SW	4		21	25	4	3
156	6845	DRIEDIGER HENRY JACOB	SWC			SW	25	25	4	3
157	10273	KRETSCH MERVIN	SWC	NW	12		20	25	3	3
158	11389	SPRATT ED S J	SWC	NW	3		6	25	1	3
159	8434	SOUTHAM DON	SWC	SW	4		3	25	1	3
160	10655	RUDD PHILIP	SWC	SW	16		32	23	14	3
161	1160	EPD ELROSE TH & WELL	SRC	SW	4		10	24	14	3
162	1161	PFRA ELROSE	SRC		2		22	24	14	3
163	16061	RIGLIN KIRK	SWC	NE	13		11	25	14	3
164	1162	HOUGHTON	SRC	NE	8		17	26	14	3
165	76126	SOCONY SOHIO HUGHTON	OIL		7		29	26	14	3
166	16106	JACKSON DARYL	SWC	NE	13		19	27	14	3
167	8164	QUINNY HENRY	SWC			NW	13	28	15	3
168	6854	DUBOIS ALBERT	SWC			SW	30	29	14	3
169	6883	HUTCHEON WALLY	SWC			NE	8	31	14	3
170	11731	MCMILLAN DUNCAN	SWC	SW	4		9	32	14	3
171	76133	TW VALLEY CENTRE CROWN 1	OIL		16		10	33	14	3
172	1643	BIGGAR	SRC	SW	4		18	35	14	3
173	13683	WALSH ELMER V.	SWC			SE	36	23	12	3
174	76084	NORVANIAN KAM DINSMORE	OIL		5		24	24	12	3
175	16064	MCPHAIL JOHN	SWC	NE	9		28	25	12	3
176	16057	OMIECINSKI JOE	SWC	SW	4		9	26	12	3
177	16080	TOWN OF DINSMORE GOLDER ASSOC.	SWC	NW	13		7	27	11	3
178	13988	MANSON JOYCE	SWC	NW	13		36	27	12	3
179	7479	SOMERVILLE ARNOLD	SWC		16		29	29	11	3
180	10301	LUNNEY MILTON	SWC	NW	12		4	30	11	3
181	76081	CAN GULF TW WATT	OIL		1		20	30	11	3
182	13314	HEYWOOD WILLIAM	SWC		4		28	30	11	3
183	13994	CROSSMAN BILL	SWC			SE	22	31	12	3
184	1157	SRC HARRIS	SRC	NE	2		3	32	12	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
185	12999	VILLAGE OF HARRIS	SWC			NW	12	32	12	3
186	10307	MCDONALD VIOLET	SWC	NW	15		31	32	11	3
187	6770	CLAYTON THOMAS R	SWC			SE	13	33	12	3
188	13316	HOWARD GLENN	SWC			SE	30	33	11	3
189	11617	BOUCHER RALPH	SWC	NE	8		20	34	11	3
190	9427	WEIR TOM	SWC	NW	15		36	34	12	3
191	7743	SCOTT KEITH	SWC			NW	10	24	10	3
192	76069	PEYTO GERC LUCKY	OIL		12		23	24	10	3
193	16053	BOON MURRAY	SWC	NE	1		26	24	10	3
194	12730	KOSKI TED	SWC	NW	8		6	26	10	3
195	18210	DAWE R H	SWC	SW	3		16	26	10	3
196	16100	THORPE BOB	SWC	NE	9		28	26	10	3
197	76070	IMPERIAL TW ANERLEY	OIL		13		21	27	10	3
198	16096	DINSMORE COLONY	SWC			SW	16	28	10	3
199	41888	SSRIP Conquest No.8	SRC	NE	1		4	30	10	3
200	41895	SSRIP Conquest No.33	SRC	NE	12		11	30	10	3
201	41899	SSRIP Conquest No.11	SRC	NW	13		13	30	10	3
202	1131	SSRIP CONQUEST 51	SRC	NE	16		25	30	10	3
203	16130	HARRINGTON ROBERT W.	SWC	SW	3		25	31	10	3
204	76063	TW SWANSON CROWN 1	OIL		4		8	32	9	3
205	1137	SRC LAURA PLOTS 008	SRC	NE	6		25	33	10	3
206	1116	COMINCO LAURA	SRC	SW	5		18	34	9	3
207	1118	COMINCO DELISLE	SRC	SW	4		30	34	9	3
208	1119	COMINCO DELISLE	SRC	SE	1		6	35	9	3
209	1120	COMINCO DELISLE	SRC	NE	16		7	35	9	3
210	9797	BOON EDWARD	SWC	NW	5		11	24	8	3
211	1076	SRC LUCK LAKE	SRC	SW	3		27	24	8	3
212	76040	TW BIRSAY CROWN 2	OIL		4		15	25	8	3
213	13311	SIMONSON LLOYD	SWC	NE	15		12	26	8	3
214	10280	WILSON JOHN	SWC	SW	4		6	27	8	3
215	11719	YAHN SADIE	SWC	SW	4		28	27	8	3
216	10950	BOREHOLE 1	SWC		14		28	29	8	3
217	16125	HAUG MILO	SWC	NE	15		34	30	8	3
218	1082	SSRIP SWANSON	SRC	SW	4		15	31	8	3
219	1083	COMINCO DONAVON	SRC	NW	13		36	32	8	3
220	1088	COMINCO DELISLE	SRC	NW	13		12	34	8	3
221	16150	EXNER EDWIN	SWC	NW	13		13	34	8	3
222	1090	COMINCO DELISLE	SRC	SW	1		26	34	8	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
223	18612		SWC	NE	5		2	35	8	3
224	76059	CMS VANSCOY	OIL		13		11	35	8	3
225	2842	SWC ELBOW NO.88-07	SRC	SE	7		27	25	6	3
226	1061	SRC CUTBANK	SRC	SE	1		6	27	6	3
227	12268	NIXON COLIN	SWC	SW	4		27	28	6	3
228	11398	TOMECEK BILL	SWC	SE	11		5	29	6	3
229	10539	MCPHERSON RUSSELL	SWC	NW	13		21	29	6	3
230	6248	LEE KEN	SWC			NW	10	30	6	3
231	76027	TW DUNDURN CROWN 3	OIL		2		25	32	6	3
232	1067	SRC WHITECAP	SRC	SW	15		13	34	6	3
233	1060	NRC-SRC GRASSWOOD	SRC	SE	1		6	35	5	3
234	1072	U OF S MOON LAKE	SRC	NW	16		1	35	6	3
235	6077	TAYLOR DAVE	SWC			SW	36	24	4	3
236	6557	ESTATE JOHANNA NELSON	SWC	NE	16		28	25	4	3
237	75999	IMPERIAL TW STRONGFIELD	OIL		12		16	26	4	3
238	16050	BROWN KEN	SWC	NE	13		21	26	4	3
239	10284	LUCKI DENNIS	SWC	NW	13		8	28	4	3
240	8070	HANSON FREEMAN	SWC			NE	13	30	4	3
241	8999	SUDERMAN NORMAN	SWC	NW	5		31	30	3	3
242	1038	SRC HANLEY	SRC	SE	1		26	31	4	3
243	6386	LIBKE ROLAND M	SWC			NE	26	31	4	3
244	6271	KING GORDON	SWC			SE	13	32	4	3
245	1029	HAYTER BLACKSTRAP	SRC	NE	16		19	32	3	3
246	1033	SRC BLACKSTRAP LAKE	SRC	SE	1		6	33	3	3
247	13309	NEUFELD PETER	SWC		6		13	34	4	3
248	1052	SRC CLAVET	SRC	NW	4		11	35	4	3
249	1054	SRC CLAVET	SRC	NW	13		11	35	4	3
250	16049	SANDEN VERNAL	SWC	SW	12		33	23	2	3
251	12262	COUTTS BOB	SWC	SW	13		3	24	2	3
252	12263	FARRELL RICHARD	SWC	NW	15		10	24	2	3
253	8849	RETTGER CARL	SWC	NE	16		23	25	2	3
254	10247	SHAW CLIFF R	SWC	NE	6		28	26	2	3
255	10290	BARLOW DALE H	SWC	NE	16		21	27	2	3
256	18601		SWC	NE	16		8	28	2	3
257	7508	MILLER GARRY	SWC		5		21	30	2	3
258	6296	HAIGHT ALLEN	SWC	NW	15		35	30	2	3
259	18603		SWC			NW	11	31	2	3

XSEC	SRC NO.	NAME	TYPE	QLSD	LSD	QSEC	SEC	TWNN	RNGN	MER
260	7480	BATES CLIFFORD	SWC		1		33	31	2	3
261	75966	US BORAX ALLAN TW 40	OIL		13		21	34	2	3
262	75974	US BORAX ALLAN TW 41	OIL		13		28	34	2	3
263	75983	US BORAX ALLAN TW 42	OIL		4		4	35	2	3
264	75987	US BORAX ALLAN TW 43	OIL		4		9	35	2	3
265	75988	US BORAX ALLAN TW 58	OIL		13		9	35	2	3