GM 62230

REPORT OF THE SPECTRUM SURVEY, LAC BELLEAU PROJECT AREA

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SPECTREM AIR LIMITED

ANGLO OPERATIONS LIMITED

REPORT of the SPECTREM SURVEY

LAC BELLEAU PROJECT AREA

for

Ressources naturelles et Faune, Quebec

2 0 JUIN 2006

Service de la Géoinformation

ANGLO AMERICAN EXPLORATION (CANADA) LTD

NOVEMBER 2005

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KEYWORDS

Lac Belleau, Canada, Anglo American Exploration (Canada) Ltd, SPECTREM, Airborne, Electromagnetic, Magnetic

Anglo Operations Limited Spectrem Air Limited 621144

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15-53-039



SUMMARY

The Spectrem Airborne Electromagnetic Survey over the Lac Belleau Area mapped number of conductors within the surveyed area. These are mainly situated within a belt of basalt which extends in a north westerly direction through the area

Eight anomalous zones have been identified. The zones have been graded as low priority but would require some form of ground investigation.



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CIRCULATION LIST		

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- Mr. E Yarrow Director Anglo American Exploration (Canada) Ltd
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- Mr. C Pretorius Vice President GSD
- SPECTREM's Archive



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1 SPECTREM SURVEY OF THE LAC BELLEAU AREA

1.1 INTRODUCTION

From 15 September to 17 September 2005, SPECTREM Air Limited conducted airborne electromagnetic, magnetic and radiometric surveys over the Lac Belleau Area in Canada. A total of 325 line kilometres were surveyed. The general location of the survey is shown in Figure 1.

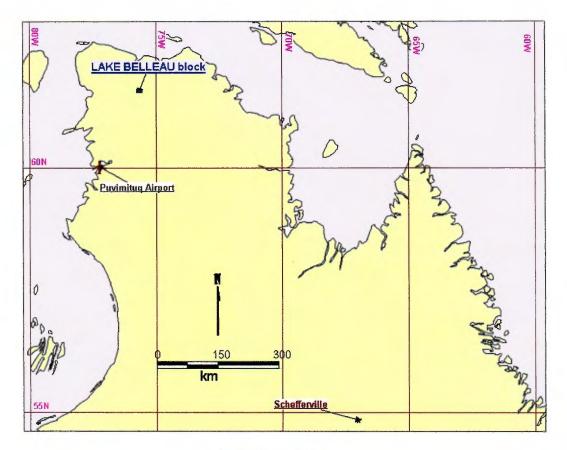


Figure 1: Survey location

Details of the survey can be found in Appendix 1. The system specifications are presented in Appendix 2 and the standard Spectrem Air data processing stream is described in Appendix 3. A list of the products delivered to the geophysicist in charge of the project is given in Appendix 4. The criteria and procedures used in anomaly selection are discussed in Appendix 5 and a listing of anomalies is given in Appendix 6. All the above data is also presented to the client in digital format.



2 AEM INTERPRETATION OF LAC BELLEAU AREA

2.1 GEOLOGY OF THE SURVEY AREA

A detailed geological interpretation of the magnetic and electromagnetic data is currently being undertaken by Spectrem Air and will form part of a separate report.

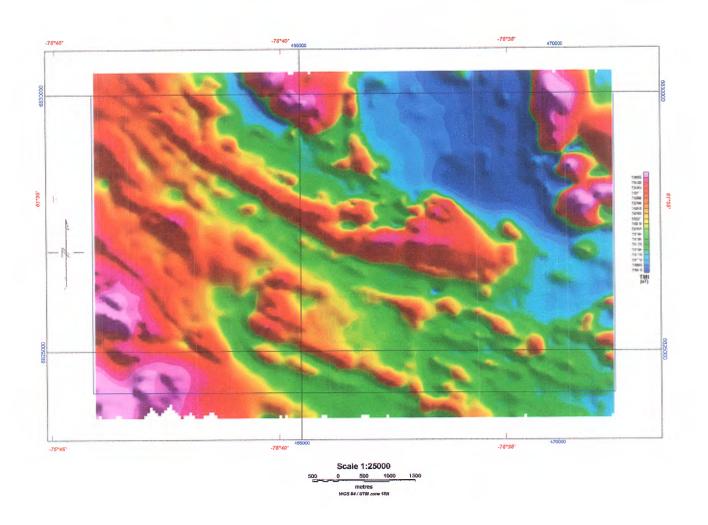


Figure 2 - An image of the magnetic data



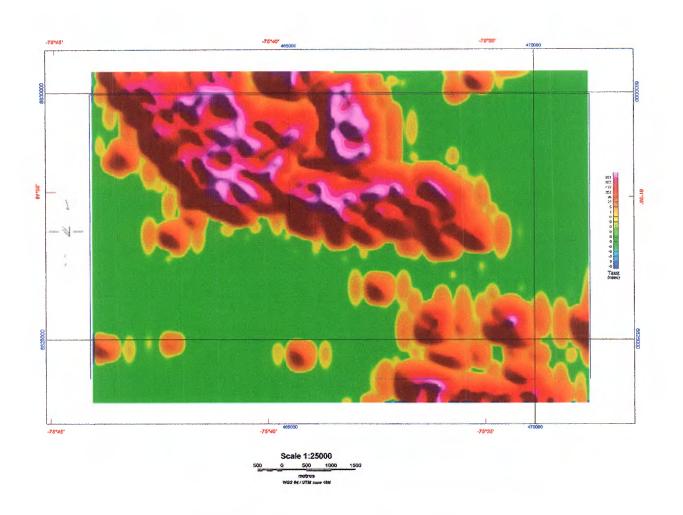


Figure 3 - An Image of conductor time constant (Tau Z)



3 INTERPRETATION OF AEM ANOMALIES

A number of conductive zones are present in the area surveyed. These are mainly situated within a belt of basalt which extends in a north westerly direction through the area. The basalt is variably magnetic which indicates that other rock types are probably present within it. For example some of the more magnetic anomalies in the basalt could be due to ultramafic bodies or sills and these would be of definite interest as ground follow up targets if they had good conductors associated with them. The data was therefore carefully examined for anomalies of this type.

The conductor dips were generally northwards which probably reflects the regional structure in the area.

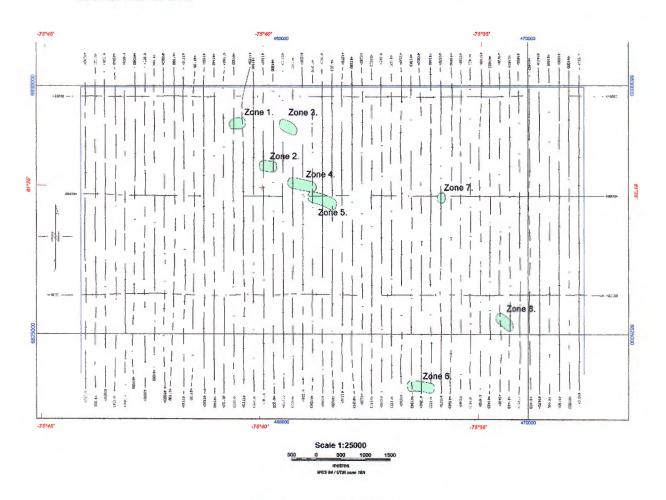


Figure 4 - AEM Zone Map

The individual zones selected for ground follow up work will now be discussed in line order.

3.1 ZONE 1 😣

This is a low priority zone situated in wacke near a contact with basalt. The anomaly on Line 41160 has a high conductance value of 90 Siemens and fairly narrow peak shape which could indicate a localized conductor. If any ground follow up work is carried out on this zone, the most favourable locality would be on Line 41160, Fiducial 3883, X = 464034, Y = 6829238.

3.2 ZONE 2

A low priority zone situated in basalt. Both anomalies in the zone have high conductances of 90 Siemens and small associated magnetic anomalies. The anomaly on Line 41190, Fiducial 5414, X = 464634, Y = 6828405 is the most suitable one for following up on the ground.

3.3 ZONE 3 😣

Low priority has been assigned to this zone which appears to be situated on a contact between basalt and wacke. The conductor has a high 90 Siemens conductance and its dip is probably fairly flat. A depth estimate indicates that it could be deep. The most favourable anomaly in the zone is located on Line 41210, fiducial 6540, X = 465026, Y = 6829209.

3.4 ZONE 4 😣

This is a low priority zone situated in basalt. The anomaly conductances vary between 42 and 90 Siemens and they all have very small magnetic associations. Ground follow up work is recommended on Line 41240, Fiducial 8538, X = 465629, Y = 6827966.

3.5 ZONE 5 🙁

Although a low priority has been assigned to this zone, it does have some good characteristics which could upgrade it to a higher priority rating. The zone is situated in basalt immediately south east of Zone 4. All three anomalies in the zone have conductances of 61 Siemens and fairly narrow anomaly peak shapes. The magnetic associations vary between 42 and 104 nanoTeslas. For follow up purposes the best anomaly is located on Line 41260, Fiducial 9728, X = 466032, Y = 6827633.



3.6 ZONE 6

A low priority zone situated in tuff close to a contact with basalt. All three anomalies in the zone have 61 Siemens conductance values and their magnetic associations vary between 44 and 99 nanoTeslas. The anomaly located on Line 41360, Fiducial 15523, X = 468021, Y = 6823920 is the most suitable one for following up on the ground.

3.7 ZONE 7 😣

A low priority has been given to this anomaly which is situated in basalt. Immediately south of the anomaly a magnetic body occurs so it is possible that a conductor may be present here on the contact or at the base of this magnetic body. The anomaly is located on Line 41370, Fiducial 16331, X = 468234, Y = 6827759. The conductor may extend at depth on to the adjacent flightlines trending in a south easterly and north westerly direction.

3.8 ZONE 8 😣

A low priority zone situated in tuff and basalt. Although the conductor appears to be at a deeper depth on Line 41430, it is definitely the more favourable line for initiating ground follow up work. The conductor here is located on Line 41430, Fiducial 20236, X = 469432, Y = 6825336.

STATEMENT OF QUALIFICATIONS, PASCAL PARÉ

I, Pascal Paré, Hereby certify that:

- 1) I am geophysicist residing at 1440 Boul. Auclair, Ste-Foy, Québec, Canada G2G 2M6
- 2) I am geophysicist for Anglo American Exploration (Canada) Ltd. performing geophysical services.
- I am a graduate of ECOLE POLYTECHNIQUE DE MONTREAL in Applied Science, Geological Engineering (B. Sc. 1994).
- 4) I am a member of the Ordre des Ingénieurs du Québec (OIQ)
- 5) I have practiced by profession for over 10 years



Signed:

Pascal Paré, Eng. Trois-Rivières, Québec May 2006



4 APPENDIX 1: SURVEY DETAILS

4.1.1 Logistics

The specific details of the survey were as follows:

Base of operations	Puvirnituq - Canada
Flying Dates	Between 15 to 17 September 2005
Survey type	Electromagnetic, magnetic, radiometric, terrain
Aircraft type	DC3 - TP67
EM Base Frequency	45 Hz
Nominal aircraft altitude	90 m
Nominal aircraft speed	60 m/s
Acceptable Kilometres flown:	325 Line kilometres
Nominal flight-line spacing	200 m
Nominal flight-line direction:	0 degrees
Nominal tie-line spacing	2000 m
Nominal tie-line direction:	90degrees

4.1.2 Datum

All coordinates provided in this report, in maps and in processed digital data-sets have the following datum parameters.

Datum	NAD 83
Projection	UTM Spheroid: CL66 Zone: 18
Туре	Transverse Mercator
Dx / Dy / Dx	4 / 159 / 188

4.1.3 Survey Area Coordinates

The corner coordinates of the survey areas were:

Area coordinates	Easting (m)	Northing (m)
LAC BELLEAU	460933.00	6824196.00
	460933.00	6829966.00
	471133.00	6829966.00
	471133.00	6824196.00
	460933.00	6824196.00



APPENDIX 2: SYSTEM SPECIFICATIONS

SPECTREM simultaneously takes electromagnetic, total field magnetic and radiometric measurements. Both the electromagnetic and magnetic sensors are towed behind the aircraft in "birds" while the radiometric crystals are installed inside the cabin. The geometry of the system is shown below in Figure 2. Other system specifications are listed below.

4.1.4 EM system

Transmitter height above ground 91 m

Tx - Rx vertical separation 36.6 m

Tx - Rx horizontal separation 122.9 m

Transmitter coil axis Vertical

Receiver coil axes X: horizontal, parallel to flight direction

Current waveform Square wave
Base frequencies 45 Hz
Transmitter loop area 420 m²
RMS current 960 amperes
RMS dipole moment 400 000 A.m²

Digitising rate @ 45Hz 46 080 Hz / component

Recording Rate 5 Hz

Number of windows 8 per component Window distribution Pseudo-binary

Window Times 45Hz

Window Number	Window Center (us)	Window Width (us)
1	21.7	21.7
2	54.3	43.4
3	119.4	86.8
4	249.6	173.6
5	501.0	347.2
6	1030.8	694.4
7	2072.5	1388.9
8	4155.8	2777.8

4.1.5 Magnetic system

Bird height above ground 72 m

Bird location 19 m below and 41 m behind center of aircraft

Sensor Scintrex CS-2 Sensor with SPECTREM

Recording Rate 5 Hz
Sensitivity 0.01 nT
Resolution 0.1 nT



4.1.6 Positioning system

Sensor Novatel RT-20 GPS receiver with Fugro

Recording Rate 5 Hz

4.1.7 Other sensors

Radar Altitude Collins with 5 Hz sampling with 0.3 m

Laser Altitude Riegl with 5 Hz sampling with 0.03 m resolution

Barometric Pressure Rose Mount with 1 Hz sampling
Temperature (OAT) PT-100 RTD with 1 Hz sampling

Analogue Chart Recorder RMS GR-33



5 APPENDIX 3: DATA PROCESSING

The EM data was processed in Johannesburg using Geosoft packages.

5.1 ELECTROMAGNETIC PROCESSING

5.1.1 Aircraft Processing

Some of the most important EM data processing was carried out on the aircraft as it acquired the data. The first processing stage was stacking the data to 1024 samples. The data was then deconvolved to remove system response and transformed to a square wave. A square transmitter waveform was chosen as a periodic approximation of the step response.

In the next stage of processing the data was binned into 9 channels or windows. As the SPECTREM system makes its measurement while the transmitter is switched on, it is necessary to separate the primary (transmitted) field from the (induced) secondary field. The assumption is made that the induced field will have decayed to a minimal amount at the time the last channel is sampled. As the last channel only measured the primary field, it can be subtracted from the other channels to separate the secondary field. Hence there are actually 8 channels with geological information in the final data.

5.1.2 Profile data

The spikes in the line data have been removed using a 3 point Naudy filter. The line data have also been drift corrected and micro-leveled. The drift is particularly noticeable on the later time channels and has been applied to channels 4 to 8. This is an iterative process, with the assumption that there is a constant drift on a single line. This is reasonable if the lines are short. The processing steps are:

- The channel data are clipped retaining the data in the resistive areas where the response should be close to zero.
- The average of the clipped data is then calculated and subtracted from the channel data.

The steps are then repeated, refining the correction.

Decorrugation and micro-leveling has been applied to all the channels to reduce small residual errors that have not been corrected through the drift correction method.

5.1.3 Apparent Conductivity

The apparent conductivity was calculated from its channel amplitude and the aircraft height. An apparent conductivity is the conductivity of a half space that would produce an amplitude equivalent to the measured response. It is useful in providing a physically



sensible unit and partially compensates for aircraft ground clearance variations. The unit for apparent conductivity is milliSiemens/meter.

5.1.4 Grids

The data were gridded using an Akima spline. System lag was corrected before gridding.

A decorrugation filter was applied to reduce the herringbone effects created by geometrical asymmetry inherent in AEM systems

5.2 MAGNETIC PROCESSING

The leveling processing included:

- Tie-line leveling
- Decorrugation
- Micro-leveling

5.2.1 Tie-line leveling

Tie line leveling is used to remove the diurnal variation and errors due to instrument drift, both are assumed to vary slowly over time.

Tie-line leveling is an iterative process:

- Calculate the mis-closures at the crossover points of the tie and traverse lines. The
 mis-closure is the difference between the magnetic value on the tie line and the
 traverse line. The mis-closures are weighted by the gradient of the total field at the
 crossover point.
- The error is approximated by a piecewise polynomial as a function of time along a flight and then along a tie line.

These steps are repeated until a good fit has been obtained.

5.2.2 Decorrugation

This is a grid based operation designed to reduce the residual errors that the tie-line leveling does not remove. These are due to inaccuracies in the crossovers, localized diurnal activity, and local altitude variations.

Elongated anomalies with the following characteristics are removed:

- 2 times the line spacing perpendicular to the line direction
- 2 times the tie line spacing parallel to the line direction
- small dynamic range



5.2.3 Micro-leveling

Applies the corrections made to the grid to the profile data and thereby enhances the line data by removing the final residual errors. The micro-leveled data are then gridded. The lag correction is 40m.

5.3 DEM PROCESSING

Initially, the GPS height and the radar altimeter channels are visually inspected and any spikes or discontinuities are removed. A Low Pass or Naudy Filter is then applied to both channels. The GPS height channel is then gridded and the resultant grid is checked. Due to the nature of the GPS data, it is normally necessary at this stage to perform some degree of decorrugation on the grid with the corrections then written back to the database.

The radar altimeter channel is then subtracted from the corrected GPS height channel in the database and the resultant channel is gridded and verified.



6 APPENDIX 4: DELIVERABLES

6.1 DIGITAL PRODUCTS

6.1.1 Grids / Profile Data

(Grids supplied in Geosoft format)

	GRIDS (digital)	LINE DATA	MAPS (paper)	PROFILES
EM Data	1	2	3	4
EMX1 to EMX8	Y	Y	-	-
EMZ1 to EMZ8.	Y	Y	-	•
EMX Apparent Conductivity	_	-		-
EMZ Apparent Conductivity	-	-	_	-
Tau X	Y	-		-
Tau Z	Y	-		-
Anomaly Map	Y	Y		_
Bedrock Elevation X		_		
Bedrock Elevation Z	-	-	_	_
Overburden Thickness X	-	_	_	
Overburden Thickness Z	-	-	-	
		-	-	-
TF Magnetic Data				
TFMI	Y	Y		
TFMI with IGRF/ DGRF Removed.		-	-	
Vertical Derivative.	Y	Y	-	_
	-	-	-	_
<u>Terrain</u>				
DEM	Y	Y		



6.1.2 Report

This anomaly selection and logistics report.

6.1.3 Autopick Databases

• Autopick databases in MS Excel format (copy attached to this report)

6.2 MAPS

• AEM Anomalies Interpretation



7 APPENDIX 5: ANOMALY SELECTION

Interpretation of AEM data should follow two approaches, one using profile data for EM anomaly selection and the other using gridded data to produce images for secondary interpretation.

7.1 ELECTROMAGNETIC ANOMALY SELECTION

The EM profiles were interpreted using the Autopick software developed by SPECTREM. Anomaly selections were made on the basis of anomaly shape, decay characteristics and magnetic correlation. Interpreting profile data is important as it contains detail that is lost in the later, grid based, secondary interpretation.

7.1.1 Conductor Parameterisation and Classification

The EM anomaly interpreter picks and parameterises all EM anomalies of interest in a survey area using a SPECTREM proprietary software suite called Autopick. Using Autopick, the physical location of the electromagnetic conductor can be recorded, and various parameters associated with the conductor can be assigned. These parameters include an anomaly grade, the conductivity-thickness product of the conductor, its midtime (window 4) residual X channel amplitude, its estimated depth below ground surface, its dip with respect to the nominal survey direction, and the magnitude of its associated magnetic anomaly.

The many anomaly shapes recorded by the SPECTREM electromagnetic system can be classified into three types - cultural, surficial and bedrock.

Cultural conductors are man-made conductors such as fences, power-lines, buried pipes and other metal structures. These give rise to anomalies if they form closed conducting loops, either by being well grounded in a conducting environment, or due to their physical geometry. Cultural conductors can be flagged as such in Autopick in order to reduce the possibility of following these up in the field.

Surficial conductors are flat-lying conductors which occur on or just beneath the ground surface. They generate anomalies which are characteristically broad, of poor conductivity, and large in amplitude. Examples are Quaternary cover and conductive regolith.

Bedrock conductors are typically steeply-dipping narrow zones of high conductivity situated in a relatively resistive host environment. Strike length may be considerable. These conductors present an interpretative problem in selecting from a large number of bedrock anomalies those which are more likely to be due to economic base metal mineralisation. Anomalies which are seen as more favorable are given a higher grade.



7.1.2 EM Anomaly Grading

An anomaly grading scheme has been devised to assist in prioritising which anomalies should first be considered for ground follow-up. This grading scheme is essentially geophysical, being a cumulative assessment by the interpreter of the likelihood of a particular anomaly being a prospective mineral target. Anomaly grade takes cognisance of such features of the anomaly as its peak shape (width and amplitude), its conductivity-thickness product (CTP) and its magnetic association.

Massive sulphide bodies are usually fairly narrow and of short strike length, and they are often highly conductive. If sufficient pyrrhotite or magnetite is present, a magnetic anomaly may be associated with the EM anomaly. Stratiform deposits, however, commonly contain disseminated sulphide mineralisation, and electromagnetic responses over such bodies may be diffuse to almost non-existent. Strike length can be considerable in the case of stratiform deposits, and magnetic signatures, if any, tend to parallel the trend of the regional geology.

SPECTREM EM anomalies are graded A, B, C or D, with grade A anomalies being the most favorable.

7.1.3 Complications of Anomaly Interpretation

In the grading process, small, discrete conductors were given a better grade than larger bodies, which were assumed to be lithological. Lithological conductors are generally formational (i.e. composed of a particular stratigraphic unit), with extended strike lengths, broader anomalies, and moderate to large electromagnetic responses. Often their conductivity is due to graphitic content rather than economic mineralisation. However the conclusion should not be drawn that larger conductors are definitely not mineralised. If mineralisation is disseminated it may have produced a broader, low amplitude EM response. An ore body's response may also be masked by nearby lithological or surficial conductors.

The anomaly picking process is used to directly detect an ore body. This is not the only method through which SPECTREM should be applied. It is important to remember the geological mapping capabilities of the system, which are covered in the Data Imaging section.

7.1.4 Estimated Conductor Depth

Caution needs to be taken when using the depth estimates provided in the EM anomaly listings. Autopick uses as its reference model a 300m by 300m wire loop conductor, which approximates a typical volcanogenic massive sulphide target, but bears very little resemblance to a body of appreciably different dimensions, such as a typical stratiform deposit. For this reason, depth estimates reported by Autopick are unreliable for bodies of dimensions very much greater than 300m by 300m (reported depths are too shallow) and very much less (reported depths are too deep).



8 APPENDIX 6: ANOMALY LISTING

These are the EM anomalies interpreted through Autopick. They are stored digitally in a Microsoft Excel Worksheet stored in the report directory on the CD. The columns for the anomaly listing are:

Line#	line number
Fiducial	fiducial number
Lag	lag in fiducials applied to anomaly peak position before plotting
Head	heading of line
NomH	nominal survey heading
UTM X	X coordinate
UTM Y	Y coordinate
Туре	model type, C=culture, ?=possible culture, P=probable culture, N=no culture,
CTP	Conductivity thickness product in Siemens
X4	EM window X4 residual amplitude (pp2t, parts per two thousand of the primary field at the receiver)
Depth	depth calculated for a 300m X 300m plate with the same response
Dip	dip of conductor (degrees)
Dip dir	dip direction of conductor
Strike	strike of conductor
Grade	EM anomaly grade, assigned by interpreter
Mag	Residual magnetic anomaly in nT



8.1 LAC BELLEAU AREA – ANOMALY LIST

Lake Belleau Anomalies.xls

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Lac Belleau Claims

(1) 2346-LAC BELLEAU PROJECT (QC)

Project Property List

Quebec

Project Geologist: R.Dufresne/P.Smerchanski

Disposition No.	Disposition Name	WORK REQUIREMENT	EXCESS CREDITS	PAYMENT DUE	На	NOTE	ANNIVERSARY DATE
Chain:				QC 2-YR Filing	Fee		
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56679		120.00	0.00	88.00	41.08		Dec 16, 2006
56680		120.00	0.00	00.88	41.08		Dec 16, 2006

29-Nov-05

2346-LAC BELLEAU PROJECT (QC)

35G-12

OPERATOR: AAEC

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Disposition No.	Disposition Name	WORK REQUIREMENT	EXCESS CREDITS	PAYMENT DUE	Ha	NOTE	ANNIVERSAR DATE
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56683		120.00	0.00	88.00	41.08		Dec 16, 2006
56684		120.00	0.00	88.00	41.08		Dec 16, 2006
66685		120.00	0.00	88.00	41.08		Dec 16, 2006
56686		120.00	0.00	88.00	41.08		Dec 16, 2000
56687		120.00	0.00	88.00	41.08		Dec 16, 2006
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6689		120.00	0.00	88.00	41.09		Dec 16, 200
56690		120.00	0.00	88.00	41.09		Dec 16, 200
6691		120.00	0.00	88.00	41.09		Dec 16, 200
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6693		120.00	0.00	88.00	41.09		Dec 16, 200
56694		120.00	0.00	88.00	41.09		Dec 16, 200
56695		120.00	0.00	88.00	41.09		Dec 16, 200
6696		120.00	0.00	88.00	41.09		Dec 16, 200
56697		120.00	0.00	88.00	41.09		Dec 16, 200
56698		120.00	0.00	88.00	41.09		Dec 16, 200
6699		120.00	0.00	88.00	41.09		Dec 16, 200
6700		120.00	0.00	88.00	41.09		Dec 16, 200
6701		120.00	0.00	88.00	41.09		Dec 16, 200
6702		120.00	0.00	88.00	41.09		Dec 16, 200
6703		120.00	0.00	88.00	41.09		Dec 16, 200
6704		120.00	0.00	88.00	41.09		Dec 16, 200
56705		120.00	0.00	88.00	41.09		Dec 16, 200
56706		120.00	0.00	88.00	41.09		Dec 16, 200
6707		120.00	0.00	88.00	41.10		Dec 16, 200
6708		120.00	0.00	88.00	41.10		Dec 16, 200
6709		120.00	0.00	88.00	41.10		Dec 16, 200
56710		120.00	0.00	88.00	41.10		Dec 16, 200
56711		120.00	0.00	88.00	41.10		Dec 16, 200
56712		120.00	0.00	88.00	41.10		Dec 16, 200
56713		120.00	0.00	88.00	41.10		Dec 16, 200
6714		120.00	0.00	88.00	41.10		Dec 16, 200
6715		120.00	0.00	88.00	41.10		Dec 16, 200
6716		120.00	0.00	88.00	41.10		Dec 16, 200
6717		120.00	0.00	88.00	41.10		
6718		120.00	0.00	88.00	41.10		Dec 16, 200
6719		120.00	0.00	88.00	41.10		Dec 16, 200
6720		120.00	0.00	88.00			Dec 16, 200
6721		120.00	0.00		41.10		Dec 16, 200
6722		120.00		88.00	41.10		Dec 16, 200
			0.00	00.88	41.10		Dec 16, 200
56723		120.00	0.00	88.00	41.11		Dec 16, 20

29-Nov-05 2346-LAC BELLEAU PROJECT (QC) 35G-12 OPERATOR: AAEC

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Disposition No.	Disposition Name	WORK REQUIREMENT	EXCESS CREDITS	PAYMENT DUE	На	NOTE	ANNIVERSARY DATE
56724		120.00	0.00	88.00	41.11		Dec 16, 2006
56725		120.00	0.00	88.00	41.11		Dec 16, 2006
56726		120.00	0.00	88.00	41.11		Dec 16, 2006
56727		120.00	0.00	88.00	41.11		Dec 16, 2006
56728		120.00	0.00	88.00	41.11		Dec 16, 2006
56729		120.00	0.00	88.00	41.11		Dec 16, 2006
56730		120.00	0.00	88.00	41.11		Dec 16, 2006
56731		120.00	0.00	88.00	41.11		Dec 16, 2006
56732		120.00	0.00	88.00	41.11		Dec 16, 2006
56733		120.00	0.00	00.88	41.11		Dec 16, 2006
56734		120.00	0.00	88.00	41.11		Dec 16, 2006
56735		120.00	0.00	88.00	41.11		Dec 16, 2006
56736		120.00	0.00	00.88	41.11		Dec 16, 2006
Claim	94	11,280.00	0.00	8,272.00	3,861.99		
Project Total: 94		11 280 00	0.00	8 272 00	3 861 00	***************************************	

 Project Total:
 94
 11,280.00
 0.00
 8,272.00
 3,861.99

 Hectares:
 3,861.99

Lac Belleau

INVOICES