

GM 65031

ECONOMIC ASSESSMENT IN SAGUENAY-LAC-ST-JEAN, THE LAC-A-PAUL APATITE-ILMENITE PROJECT

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Economic assessment in Saguenay-Lac-St-Jean
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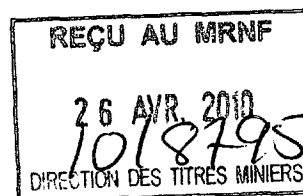
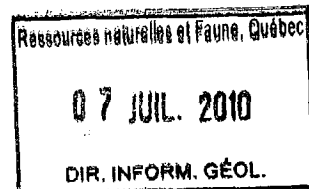
A NI-43-101 Compliant Technical Report

THE LAC-À-PAUL APATITE-
ILMENITE PROJECT

Presented to
Les Ressources d'Arianne inc.
30 rue Racine est, bur. 160
Chicoutimi, Qc,
G7H 1P5

By
Réjean Girard, P. Geo.

GM 65031



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Section L0+50S

Section L2+00S

Section L3+50S

Section L4+00S

Section L5+50S

Section L7+50S

Section L8+50S

Section L11+50S

Zone Manouane:

Section L5+00E

Section L4+00E

Section L3+00E

Section L2+00E

Section L0+00

Section L1+00W

Section L2+00W

Zone Lac-à-Paul:

Section L4+00E

Section L3+00E

Section L2+00E

Section L1+00E

Section L0+00

Section L1+00W

Section L2+00W

Section L3+00W

Section L4+00W

Section L5+00W

Section L7+00W

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Appendix 1: List of claims

ITEM 3: EXECUTIVE SUMMARY

The present report intends to provide guides in the decision regarding the investment required to bring the project into prefeasibility as well as outlining the general work-program toward which the project shall be developed in order to make it economically viable.

The current report presents a preliminary economic assessment report ("Scoping study") of the Lac-à-Paul apatite-ilmenite project. The present report intends to provide guides in the decision regarding the investment required to bring the project into prefeasibility as well as outlining the general work-program toward which the project shall be developed in order to make it economically viable. The project still being in early development stage, this report does not intend to provide neither accurate economical assessment nor detailed engineering. Conclusions and recommendations call upon diverse assumptions, numerous discussions, the author's experience and common sense.

D'Arianne acquired the initial property (42 titles) from the Fonds minier du Saguenay-Lac-St-Jean (*FMSLS*), a non-profit organization providing support to local prospectors, four of which titles have a residual 1% NSR attached. From then, compilation and field work outlined other occurrences, which lead d'Arianne to recently required land tenure up to the actual 345 maps designed cells covering approximately 19,172 hectares. The property is located in the Grenville Geological Province, north of the Lac St-Jean, approximately 200 kilometres from Ville de Saguenay. The mineralization is associated to the margin of the Lac St-Jean anorthosite Complex, an extensive intrusive system covering about 20,000 square kilometres. Ilmenite, apatite and titanomagnetite mineralization forms numerous scattered occurrences within this Middle Proterozoic intrusive, which were sporadically explored in the last 60 years.

In 1995, following a regional reconnaissance, the *FMSLSJ* initiated various prospecting project in the Chutes-des-Passes area, already known for its copper and nickel occurrences. Initial properties were staked (ground posts) for this commodity, and exploration projects were concomitantly initiated by Virginia Gold Mines and Soquem. Ilmenite and apatite bearing nelsonites, segregated from the anorthositic magma, were discovered in 1998 by the *FMSLSJ* prospector and geologist from Québec's Department of Energy, Mines and Resources.

Mineralurgical testing indicated the ore as being amenable to produce a commercially acceptable 41.39% P₂O₅ apatite and a 46.6% TiO₂ ilmenite concentrate.

D'Arianne, then interested in developing titanium projects, carried a limited amount of exploration work on the property from 1999 to 2001, which included mapping and prospecting, limited drilling and limited metallurgical work. A NI-43-101 non-compliant inferred resource was calculated. Mineralurgical testing indicated the ore as being amenable to produce a commercially acceptable 41.39% P₂O₅ apatite and a 46.6% TiO₂ ilmenite concentrate. In the same period, a drilling campaign on an adjacent property by Virginia Gold Mines, aiming nickel-copper sulphide mineralization, intersected 7.56% P₂O₅ and 9.65% TiO₂ over 117.9 metres.

However, considered the then prevailing ilmenite and phosphate prices (US \$90/ton each), the project was considered not sufficiently profitable and set aside.

The recently soaring phosphate prices, which reached \$450/ton in July 2008, encouraged d'Arianne to re-evaluate the Lac-à-Paul project in 2008. D'Arianne carried a two phases drilling program for 4731 metres on Paul, Manouane and "2" zones, which enable SGS-Geostats to calculate the following NI-43-101 compliant inferred resources:

Occurrence	Category	Tonnage	%P ₂ O ₅	%TiO ₂
Lac-à-Paul	Inferred	99,315,000 t.	7.84%	8.24%
Manouane	Inferred	140,632,000 t.	5.77%	9.01%
Zone 2	Inferred	64,099,000 t.	4.52%	4.51%
Total	Inferred	304,046,000 t.	6.18%	7.81%

An apatite concentrate has been produced with a grade between 38.6 to 40.1% P₂O₅ (88% BPL), with a recovery between 85.0% and 91.5%.

Metallurgical testwork, completed at SGS-Lakefield, included an apatite flotation test on a sample from each the Lac-à-Paul, Manouane and zone 2 occurrences. An apatite concentrate has been produced with a grade between 38.6 to 40.1% P₂O₅ (88% BPL), with a recovery between 85.0% and 91.5%. These numbers are comparable to what has been obtained in 1999 by IOS.

No serious attempts have been made by SGS to recover ilmenite, and only the preliminary results by IOS obtained in 1999 are available.

A third drilling campaign has been conducted in fall 2009 in order to test various exploration targets, selected from diverse regional aeromagnetic surveys. Finally, a fourth drilling campaign is currently on its way, aiming to improve the drilling pattern on Lac-à-Paul deposit and calculate indicated resources by winter 2010. Only preliminary drill holes description is currently available to the author.

The question addressed by the current scoping study is regarding the Lac-à-Paul: Does the Lac-à-Paul deposit has realistic chances to lead to an economically viable operation, and is it worth to do the investment required to bring the project into prefeasibility? The next investment to be made by d'Arianne or an eventual partner will likely exceed 10 M\$:

1. Definition drilling to improve the resource to measured and indicated categories.
2. Extensive market study.
3. Metallurgical bench-testing and pilot plan.
4. Pre-feasibility studies and engineering.

As for many "industrial minerals", phosphate is a commodity characterized by a controlled market, and a transportation cost which may surpass the value of the commodity itself.

As for many "industrial minerals", phosphate is a commodity characterized by a controlled market, and a transportation cost which may surpass the value of the commodity itself. However, phosphate is the fourth largest mineral commodity in value traded, is produced by numerous players and various countries, with a wide-spread and fragmented end-market. In such a context, d'Arianne apatite's cost of production shall be considered in the global transportation framework, and compared to market prices including their transportation cost to the targeted consumers.

World phosphate production in 2008 was established at 173.2 millions tons, the bulk of which being either direct shipping ore or with little beneficiation from sedimentary phosphorite deposits. Main producing countries are China (61,8 Mt), Morocco and other North African countries (44.0 Mt) and North America (30,9 Mt), while consumption of phosphatic rock mimics the production. Less than 10% of the phosphates are traded internationally. Base reserves of phosphatic rock, available for mining at less than US \$40 per ton, is currently established at 32 billion tons, 48% of which is located in Morocco, therefore, the market is not dependant on commodity restriction. Phosphate production is constrained by either mining capacity or market. Future price for 72% BPL phosphate rocks were forecasted as hovering at US \$90-100 per ton, FOB Morocco. A structural change in the industry has been invoked to explain the base price jump from US \$50 /t prevailing until 2006.

North America produced about 31.3 Mt of phosphatic rock in 2008 out of 14 mines, with a slight imbalance with its domestic consumption. The 2.8 Mt deficit of production is currently compensated through import from North-Africa. Bulk of the production and consumption is concentrated in Florida, with lesser amount in Idaho and even lesser in Ontario. Mine closures are expected in Florida due to exhaustion of the best deposits

and environmental limitations, so production is forecast to drop by further 6 Mt/year by 2017, increasing the import deficit. Phosphoric acid plants, the main phosphate rock consumers, are located in Florida and Idaho, near to miner, with two exceptions in South Carolina and Red River, Canada.

Less than 12% of the world phosphates production is in the form of apatite concentrates from igneous origin, such as d'Arianne project.

Less than 12% of the world phosphates production is in the form of apatite concentrates from igneous origin, such as d'Arianne project. Apatite concentrate are more costly to produce than quasi-DSO phosphorite, requiring comminution and beneficiation. Inversely, apatite concentrates are richer (80-87% BPL), thus reducing proportionally transportation costs. Higher purity also implies lower processing cost for phosphoric acid production and lower level of deleterious contaminants

such as uranium and cadmium. Apatite concentrates are dominantly produced in Russia (13.9 Mt/Y) and Brazil (6.46 Mt/y), dedicated to domestic or European markets. Russian concentrates are typically sold for 20% higher price than Moroccan phosphate rock on the European market.

D'Arianne project targets an apatite concentrate production of 2 millions tons per year. Cost of production is estimated at about \$70 per ton (US \$65 / ton).

D'Arianne project targets an apatite concentrate production of 2 millions tons per year. Cost of production is estimated at about \$70 per ton (US \$65 / ton) which is in the upper quartile of world phosphate rock producers, but comparable to other apatite producers. Capital expenditures are estimated to 281 m\$, or \$17.02 per ton-annum.

D'Arianne shall foresee a selling price of CND \$120 per ton. Realistically, d'Arianne can remain competitive on two different markets. First, the conterminous North American market where edges can be made on transportation cost. Moroccan, or other seaborne, phosphates are imported at the estimated cost of CND \$140, once FOB in a North American railcar. Superior quality, such as higher PBL and lesser contaminant, at similar price shall make d'Arianne concentrate attractive to any North American phosphoric acid plant requiring rail transportation.

Second is the European market, where the Belgium based phosphoric acid plants are provided mainly with Russian apatite concentrate. Russian apatite, produced mainly in the Kola Peninsula, is currently delivered at CND \$182 per ton, FOB in northern Europe. D'Arianne apatite can be expected at CND \$160 per ton, delivered.

Clean apatite concentrates have numerous advantages in regard to transformation into phosphoric acid. One of them is the lesser abundance of deleterious elements, such as cadmium and uranium. Most developed countries have stringent regulation in regard to deleterious contaminants in fertilizer. However, applications of these regulations are, in most cases, pending, considering the lack of clean fertilizer sources. The empowerment of such regulation will act strongly in favour of phosphate derived from apatite concentrate, thus favouring d'Arianne project.

Using a selling price of \$118 per ton, and 2 millions tons per year, the project is profitable:

- IRR = 19.84%
- DNPV: 305 m\$

The financial model indicate the project as sensitive to tonnage, to grade or recovery, but to show some robustness to selling price, operation cost and capital investment. The project is insensitive to inflation rates and currency fluctuation.

Phosphoric acid production by d'Arianne has not yet been evaluated, but shall be considered as a realistic future scenario.

Along with apatite production, d'Arianne will be in a position to produce about 1 million ton per year of ilmenite concentrate. This ilmenite can be produced at very low cost as co-product, and may represent a 20-40% increase in revenues. These revenues were not included in the economic model. However, this ilmenite is not suitable for intensive fusion such as RTIT (Sorel, Québec) process, requiring then pelletization. Although titanium grade reaches 45% TiO₂, the concentrate is not suitable for direct feed to chlorine route for titanium dioxide production. Therefore, ilmenite production as a co-product has not been considered in the current scenario, but can be re-evaluated in future.

Other by-product, such as magnetite, vanadium, copper, cobalt and nickel as well as gypsum was not considered.

According to the previous observations, the author is confident that the Lac-à-Paul project has realistic chance of being economically viable. Therefore, it is considered sound by d'Arianne to continue their effort by upgrading their mineral resources to indicated category, commissioning a detail market study, and pursuing a potential well-established partner or take-off agreement.

While d'Arianne project represents about 1% of the world phosphate rock production, it is 6.5% of North American production, or 10% of the world apatite production. With such scale, d'Arianne shall not be considered as threat to existing producers, but still attractive enough to drag their interest.

ITEM 4: INTRODUCTION AND TERMS OF REFERENCE

4.1 INTRODUCTION

The role of such study is to provide d'Arianne with decisional insights in regard to the general guidance in the development of the project.

This study intent to provide a preliminary economic assessment of the Lac-à-Paul apatite-ilmenite project commonly referred to as a "Scoping study". The role of such study is to provide d'Arianne with decisional insights in regard to the general guidance in the development of the project as well as providing justification for the multimillion dollars needed to complete a pre-feasibility on the project.

Interest in the project has been speared by the 2007-2008 surge in phosphate price on the international market, which soared from US \$50 to US \$450 per ton. However, the remote location and low grade of the project was perceived as a hindrance, and a careful examination of the pros and cons must be carried prior to justify the important investment needed to fund the subsequent studies.

4.2 MANDATE

The author was retained by Les Ressources d'Arianne inc. (DAN) to evaluate the viability likelihood of the Lac-à-Paul project in the form of a preliminary scoping study as part of an independent Technical Report compliant to National Instrument 43-101-F1. The purpose of that report was to make a first disclosure of the economical assessment, setting the project into the market context for this specific commodity, as a requirement for *L'Autorité des marchés financiers du Québec* (AMF), and to make an independent review of all geological and technical data available.

The present assessment report is largely inspired from various internal d'Arianne reports, including a predecessor NI-43-101 report disclosing the mineral resources prepared by C. Duplessis from SGS-Geostats. The author also taps on published assessment reports available from the Quebec Ministry of Energy and Natural

Resources (MNR) database, a general phosphate rock market study prepared by British Sulphur Consultant, as well as various sources available on internet. The author did not rely significantly upon other experts, else that the aforementioned reports provided by d'Ariane and discussion with d'Ariane representatives.

4.3 EXTENT OF FIELD INVOLVEMENT

The author visited the property for a day on September 14th 2009, while d'Ariane was carrying exploration drilling. The author bears witness to drilling and sampling procedure, and visited drill sites on Paul, Manouane and Zone-2 occurrences. The author is also familiar with the project from works he and his group carried from 1998 to 2001 either for d'Ariane or the *Fonds minier du Saguenay-Lac-St-Jean*.

4.4 UNITS OF MEASUREMENTS

A listing of the used abbreviation measure:

Cm: Centimetre
Km: Kilometre
M: Metre
M², M³: Square and cubic metres
Msl: Mean sea level
Ppm: Part per million
PBL: Bone phosphate of lime or $2.18 \times \%P_2O_5$
\$ or CND \$: Canadian Dollar
US \$: American dollar
Tpd: Tons per day
Tpy: Tons per year
Tons: Short tons, 2000 lbs
Tonnes: Metric tons, 2200 lbs or 1000 kg.
Lbs: Pounds, 0,454 kg.
Ft or ': Feet
In or ": Inches
Ha: Hectares

ITEM 5: DISCLAIMER

5.1 AUTHORSHIP

This document represents an opinion based on professional judgement and reasonable care.

This document represents an opinion based on professional judgement and reasonable care. The conclusions are consistent with the level of details included in this study and based on the information available at the time of writing.

This document includes economical statements and some element of mine design. These elements must be taken with circumspection, the author not being an economist neither a mining engineer. These statements must be taken as merely indicative and shall be considered as affected by large margin of errors, although considered sufficiently reliable for a scoping study. The author endorses the professional liabilities of his assertions only within these aforementioned limits. These assertions were provided with the only intent to preliminary test the economic likelihood of the project, to provide d'Arianne with a general strategy in developing the project and as a prerequisite to justify the funding needed to complete a prefeasibility study.

5.2 INDEPENDENCE

The author and its firm shall be considered as independent from *Les Ressources d'Arianne* according to all criterions cited in NI-43-101. The author nor the firm he represents does not hold any participation in the property or neighbouring properties, nor they hold any securities or other incentives in *Les Ressources d'Arianne*. Mandates from d'Arianne represent less than 20% of the author's and the firm he represents incomes.

The *Fonds minier du Saguenay-Lac-St-Jean* was initially encouraged by the author to promote the *Chutes-des-Passes* area to local prospector from 1992 to 1994. From then, and based upon their own finding, the *Fonds minier du Saguenay-Lac-St-Jean* acquired the first claims without any involvement of the author. *Les Ressources d'Arianne* subsequently acquired both properties and a participation in the *FMSLSJ* properties without involvement of the author.

5.3 RELIANCE UPON OTHER PROFESSIONAL

The author relied upon the following professional for specific items:

- Exploration work: D. Boulianne from d'Arianne Resources.
- Resources calculation: C. Duplessis from SGS-Geostats.
- Phosphate market: British sulphur consultants.
- Various consultants and individuals in regards to various points used in the preliminary economic assessment.

ITEM 6: PROPERTY DESCRIPTION AND LOCATION

6.1 PROPERTY DESCRIPTION

The target is composed of 345 maps designed mineral titles, covering 19,172.38 hectares (191 km²) of land.

The *Lac-à-Paul* project is composed of a single large property, irregular in shape, for a total of 345 maps designed mineral titles, covering 19,172.38 hectares (191 km²) of land. A small property of 3 titles, adjacent to the east, is also own by d'Arianne. A set of 26 cells, in three groups, worked recently by d'Arianne near Paul, Manouane and n° 2 occurrences, under recommendation of the author, in order to secure the adequacy of size for mining infrastructures. One cell, embedded within d'Arianne property, which was left unstaked, was also acquired. Ownership is still pending on the MRNF registry.

The property enclosed an unstaked area of approximately 14.3 km². No attempt was made by d'Arianne to acquire this claim, not considered as strategically located. A table on claims data is presented in **appendix 1**. *Les Ressources d'Arianne* is registered as 100% owner of these mineral claims.

6.2 MINERAL RIGHTS

Map designated cell, which defines the mineral titles according to the Québec mining law, are pre-established parcels of land, half a minute of arc by half a minute of arc on the NAD-83 projection, the limits of which are predefined by their longitude and latitude. These titles are near to irrevocable by the government, and unchallengeable by a third party. Their limits being defined by laws, they do not need to be land surveyed prior to implementing infrastructures.

Map designated mineral titles confer the exclusive rights to the owner to carry mineral exploration, and to acquire the mining lease in the eventuality of exploitation.

Map designated mineral titles confer the exclusive rights to the owner to carry mineral exploration, and to acquire the mining lease in the eventuality of exploitation. However, the mineral right does not include the surface rights, neither it includes rights over resources else than minerals, such as forestry, cynergetic, halieutic or hydroelectric. Such surface rights are although included within the mining lease if the project is located on crown's land.

6.3 EXPIRATIONS, RIGHTS AND CREDITS

Claims have to be renewed every two years, renewal date being dictated by anniversary dates of individual claims. The next renewal on this property is indicated as July the 10th 2010. A renewal fee of \$52 per claim is requested, for a total cost of \$17,940 per two years. Assessment work to the amount of \$1200 per claims per renewal, or \$1800 for claims passed their third renewal, are needed to be credited to the claim at the time of their individual renewal. A total of \$921,492.31 is currently available in credit, for a need of \$423,000 for the next renewal period. These credits do not include the 2009 exploration drilling expenditures, neither the current definition drilling on Paul occurrence. Claims are considered secure in regard to available credit for at least next two renewals.

6.4 LOCATION

The property is located about 190 kilometres north of Lac St-Jean; Québec, and the nearest cities being Dolbeau-Mistassini, Alma or Ville de Saguenay. The nearest landmark is *Chutes-des-Passes*, a hydroelectric infrastructure belonging to Rio Tinto-Alcan. The property is bounded between 70° 35' 0" and 70° 52' 0" of western longitude and 49° 43' 0" and 49° 55' 00" of northern latitude (utm coordinates: 5260000N to 5280000N; 377000E to 390000E, NAD 83 Zone 19 datum), within NTS map-sheets 22E/10 and 22E/15.

Property location is shown on **figure 1** (item 26), while a map showing the claims is presented in **figure 2** (item 26).

6.5 OWNERSHIP

All mining titles, except four blocks, were acquired through map designation by d'Arianne and under the name of d'Arianne, and are recorded accordingly in the Ministère registry. No contract, mortgage, guaranties, options to acquired a participation nor other ties are attached to these titles. No royalty is attached to these titles.

Three blocks of claims were originally acquired from the Fonds minier du Saguenay-Lac-St-Jean.

Three blocks of claims were originally acquired from the *Fonds minier du Saguenay-Lac-St-Jean* through an option to acquire a participation by d'Arianne in 1999¹. Most of the terms of this contract are currently obsolete, the *FMSLSJ* being diluted, and entitled to a 1.5% NSR, which can be bought for 1.5 millions dollars. The first block encompasses 10 cells over "Zone 1" occurrence, while the second block encompasses 2 cells over "zone 2" occurrence. The third block, over "Zone 3", is currently obsolete. An area of influence² two kilometres wide surrounds these claim blocks, to which is attached a 0.5% NSR, which can be bought for \$500,000. The *FMSLSJ* itself is bounded to an agreement with the four prospectors who made the discovery of the initial occurrences. Although the *FMSLSJ* obligations are included within the d'Arianne obligations, such obligation will survive to an eventual dissolution of the *FMSLSJ*, d'Arianne obligations being then transferable to the initial prospectors.

The initial claims acquired by *FMSLSJ* were under the previous Québec's mining regime, and then were physically pegged in the field. These claims were converted into map designated cells in 2001, and are now conferred with the same irrevocability in regards to eventual staking flaws.

1 Mr. Bernard Lapointe, actual CEO of Ressources d'Arianne was the former manager of the Fonds minier du Saguenay-Lac-St-Jean, until April 1998. To the author knowledge, the present apatite occurrences were discovered after resignation of Mr. Lapointe from the *FMSLSJ* and no conflict of interest is interpreted.

2 An ambiguity remain in regard to area of influence, if its perimeter is defined according to the original claim outline, or if it is defined according to the actual claims outline.

Two other claim blocks were acquired 100% from Mr. James L. Dierzen and Mr. Pierre Morissette encompassing 2 cells over Paul occurrence and 2 cells over Manouane occurrence.

Two other claim blocks were acquired 100% from Mr. James L. Dierzen and Mr. Pierre Morissette respectively on August 28th 2008, encompassing 2 cells (CDC 2129818 and CDC 2129819) over Paul occurrence and 2 cells (CDC 2121340 and CDC 2121341) over Manouane occurrence. A 1.5% NSR was payable collectively to the vendors, or could be bought back for \$1,000,000. Part (0.5%) of Mr. Morissette NSR was bought back by d'Arianne on October 15th 2009, which leaves a total of 1% NSR on these claims³. No area of influence or grubstake was indicated. There is no interference or cumulative effect between the FMSLSJ and Morissette/Dierzen deals.

6.6 ADMINISTRATIVE DIVISIONS

The property is located on Crown's land ("*Territoires non organisés*"), within the *Fjord du Saguenay* regional municipality, Saguenay-Lac-St-Jean administrative division ("02").

6.7 NEIGHBOURING PROPERTIES

A group of claim (physically pegged in the field, but with its location officialised in government registry, restriction n° 17760) is near to adjacent of d'Arianne to the east. These claims, owned by "*Les Mines d'or Virginia inc.*" cover a nickel-copper sulphides occurrence and are not considered as a competitor to the d'Arianne project.

Two groups of two cells, registered by Wayne Holmstead, are adjacent to the south-west of d'Arianne. Three groups of claims were designated recently to the south of d'Arianne, the owner of which is not disclosed yet.

6.8 RESTRICTIONS TO MINERAL EXPLORATION

Restriction 6577: A small exclusion to mineral exploration is present just north of *Lac-à-Paul* occurrence along the Manouane River, subtracted for the Betsiamites hydro-

³ There is no indication on the contact if the buy-back payment has been reduced proportionally after the sell of part of the NSR.

electric project. This infrastructure will need to be taken into consideration by d'Arianne in the planning of the project.

Furthermore, the Manouane River delivering a hydroelectric potential in the excess of 225 Kw, limitations to mineral exploration and exploitation are present although not indicated on the MRNF claim map.

Restriction 6573, 6574, 6575 and 6576: A set of exclusion to mineral exploration are present 5 kilometres to the north-east, related to the construction of the Betsiamites hydro-electric complex. These restrictions are not considered as a hindrance to d'Arianne project.

Restriction 6572: This restriction to mineral exploration relates to the reservoir Betsiamites, which is expected to be inundated. Mineral exploration is allowed within this restriction, under certain conditions and permission from Hydro-Québec is needed. This restriction is not considered a hindrance to d'Arianne.

Restriction 20551: A small restriction to mineral exploration is related to this site along the Manouane River, west of d'Arianne. This site is designated as *Experimental forest*, and exploration is allowed under certain conditions.

Restriction 6578: A small exclusion to mineral exploration is present 12 kilometres to the west of Lac-à-Paul occurrence, related to the construction of the Betsiamites hydro-electric complex. These restrictions are not considered as a hindrance to d'Arianne project.

Restriction 21925: Mineral exploration is temporarily excluded within this restriction, relating to the current evaluation to be designated as protected land. As the proposed route to haul the apatite concentrate traverses this area, its designation as protected land may imply construction of a deviation route⁴.

6.9 SURFACE RIGHTS

A few parcels of lands were loaned by the ministère des Ressources naturelles et de la Faune to individual in order to built hunting/fishing cabins. Inventory of these cabins was not made by d'Arianne. The "*Pourvoirie du Lac-à-Paul*", an outfitting camp, owns the

⁴ Included in capital expenditure estimates in Item 20.

exclusive fishing and hunting rights over an area which encompass the northern part of d'Arianne property, including the Paul occurrence. Infrastructures belonging to this outfitter are not located within the property. It is considered that the presence of this outfitter is not a hindrance to d'Arianne exploration work, assuming that d'Arianne does not conduct any work during moose hunting period. However, in the event of a mining development on Paul occurrence, interference with the outfitter activities are expected.

6.10 NATIVE RIGHTS

The Lac-à-Paul property is located within the ancestral territories (Nistassinan) belonging to the Montagnais community of Mashteuiatsh (Pointe Bleue, Lac St-Jean).

The Lac-à-Paul property is located within the ancestral territories (Nistassinan) belonging to the Montagnais community of Mashteuiatsh (Pointe Bleue, Lac St-Jean). The area is overlapped by the ancestral territories of Betsiamites⁵ Montagnais community. Land claims from the Montagnais nation were partly resolved by the "Entente commune" signed with the Québec government. D'Arianne must

request authorization from community council prior to proceed with exploration work or logging, authorization which is embedded within governmental permit.

6.11 TRAP LINES

Traps lines are likely attributed to native within the project area, although d'Arianne has not been able to obtain tallyman's name. Tallymans shall to be consulted prior to exploration or logging activities.

6.12 ENVIRONMENTAL LIABILITIES

No environmental liabilities are known within or attached to the property.

No environmental liabilities are known within or attached to the property. Drilling sites were visited by the author and apparently comply with all environmental good

⁵ A very different attitude in regard to economic development is noted between these two communities. While the Mashteuiatsh is rather well integrated and collaborative in regard of economical development, the Betsiamites community is much more reluctant and vindictive. The author has not been capable to solve who between both communities has precedence.

practices. Environmental damages left by previous property owner are limited. The area underwent intensive logging in the last decades. No abandoned camp sites, waste dump, fuel spill, wetland disruption or other environmental inconvenience were noted. Remabec logging camp, which was previously located within the property, has been rehabilitated according to regulations. Virginia and Soquem core racks are currently abandoned on this site.

ITEM 7: ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

7.1 TOPOGRAPHY

Topography around *Lac-à-Paul* is typical of the Laurentian Plateau, with rolling hills and narrow valleys. The only significant water body is Lac-à-Paul, standing at an altitude of about 400 metres above sea level while the highest ridge stands at 550 metres. The area is drained by small streams into *Manouane* or *Castor-qui-calle* rivers, themselves tributaries of the Peribonka River which flows toward *lac St-Jean*. The Manouane River, adjacent to the north and flowing westward into the Peribonka, is currently being diverted by Hydro-Québec in order to flow eastward into the Pipmuacan reservoir. Despite the proximity of some infrastructure, these installations shall not be hindrance to d'Arianne's project.

7.2 FLORA AND FAUNA

The property is covered by commercial taiga forest dominated by black spruce, although a major part has been harvested in the last two decades. The vegetation is now typically a second growth and regenerating taiga forest. It includes large areas with mixed birch, poplar, fir, black spruce and pines. Wildlife consists of occasional black bears, moose, beavers, etc. Part of the property is currently covered by an outfitter with exclusive fishing and game hunting rights.

7.3. ACCESS AND POPULATION

No community is present in the vicinity of the project. A small settlement is present at *Chutes-des-Passes*, about 30 kilometres from the property, where a logging camp, some convenience and a few cabins are present. Some services are also available at Alcan's

Chutes-des-Passes and Hydro-Québec's *Péribonka* hydro-electric complexes, at various logging camps as well as outfitters and seaplane bases.

The area can easily be accessible by the Chutes-des-Passes road, a gravel public road.

The area can easily be accessed by the *Chutes-des-Passes* road, a gravel public road leading from the village of *St-Ludger de Milot*, north of *Lac St-Jean*, to Alcan's hydroelectric complex, and from there, by the *Manouane* gravel road. This road is maintained year round, the cost being shared by Alcan, Hydro-Québec and various logging companies. A dense network of maintained and unmaintained logging roads also lead from the project to *Dolbeau-Mistassini*, *Notre-Dame-du-Rosaire* (*Peribonka* road) or *Falardeau* (*Onatcheway* road). A new network is currently being developed to the north to access the *Manouane* and *Bersismis* rivers hydroelectric developments, connecting with logging roads to *Labrieville* and *Forestville* on the north shore of *St-Lawrence* River. From the *Manouane* road, a dense network of unmaintained logging roads provides access to most of the properties.

7.4 INFRASTRUCTURES

No infrastructure else than logging roads is present within the property. Power lines can be tapped at *Chutes-des-Passes* (161 kv), 30 kilometres from the project. Required transportation infrastructures will be reviewed in detail at Item 20.

ITEM 8: HISTORY

8.1 THE PRE-1994 PERIOD

Mineral exploration interest in the Chutes-des-Passes area has been initiated by Mr. Lionel Lefebvre, a local prospector, in the 1970's.

Mineral exploration interest in the *Chutes-des-Passes* area has been initiated by Mr. Lionel Lefebvre, a local prospector, in the 1970's. Some exploration activity for copper and nickel mineralization has been recorded by Imperial Oil (GM-27460 and 27031) and N.Q.N. Mines (GM-27033, 27034, 28000, 26105, 26106). Little activity was recorded in the 1980's, after the discovery of the *Lac du Poisson Blanc* deposit.

Mineral exploration in the *Lac-à-Paul* area has been initiated by the *Fonds minier du Saguenay-Lac-St-Jean*, in 1994 (Barrette 1994, GM-57004, GM-57006). In the following

years, prospector's training camp were set-up in the area (GM 57007, 58152), which lead to the discovery of copper and nickel occurrences (GM-57007), of high purity quartz vein (GM 53478, 52422), and subsequently to apatite and ilmenite.

8.2 VIRGINIA AND SOQUEM COPPER-NICKEL EXPLORATION

Virginia Gold Mines initiated a reconnaissance program for nickel-copper in the area.

Starting in 1995, Virginia Gold Mines initiated a reconnaissance program for nickel-copper in the area, and subsequently acquired an option upon the *Fonds Minier* claims. Within the same period, SOQUEM initiated a similar program in the same area, which they promptly merged with Virginia into a single joint-venture. Large properties from this project are still active in the area, notably adjacent to the east of d'Arianne. Abundant literature has been filed as assessment:

- GM-56023: 1998; 18 drill holes, FMSLSJ option.
- GM-56024: 1997; Mag and HLEM surveys, FMSLSJ option.
- GM-56149: 1997; Airborne Mag and EM surveys, FMSLSJ option.
- GM-56382: 1998; Mag and HLEM surveys, FMSLSJ option.
- GM-56422: 1998; Mag and HLEM surveys.
- GM-56578: 1998; Mapping and prospecting.
- GM-57008: 1998; Mapping and prospecting.
- GM-57184: 1997; Airborne mag and EM surveys.
- GM-58190: 2000; 7 Drill holes, including three with apatite-ilmenite intersections
- GM-58232: 2000; 3 Drill holes, Apatite-ilmenite.
- GM-58806: 2000; HLEM Survey.
- GM-58807: 2001; 11 Drill holes
- GM-58815: 2001; 12 Drill holes, MHY occurrence
- GM-59143: 2001; 11 Drill holes
- GM-60717: 2002; Soquem, SIROTEM, time domain EM survey.
- GM-60730: 2003; 8 Drill holes, MHY occurrence

- GM-60731: 2003; Gravimeter survey, MHY occurrence
- GM-61185: 2004; 6 Drill holes, MHY occurrence.

Virginia discovery of ilmenite and apatite in the Manouane and Paul zones was accidental.

Part of Virginia-Soquem's exploration effort encompasses the actual d'Arianne properties. Their discovery of ilmenite and apatite in the Manouane and Paul zones was accidental, these being magnetic and electromagnetic anomalies evaluated for their copper-nickel potential. Ground and heliborne geophysics as well as two drill holes on both occurrences are now available to d'Arianne.

8.3 THE FMSLS-D'ARIANNE PERIOD

The first discovery of apatite was made in the area by the QDER.

In 1998, the Québec Department of Energy and Resources (QDER, actually MRNF), carried geological mapping of the 22E map-sheet (Hébert 1998, Hébert et al. 2009, Hébert et Beaumier 2000). In the course of this mapping, in collaboration with a prospector training camp organized by the FMSLSJ (Tremblay, 1998), the first discovery of apatite was made in the area in 1998 by the QDER. Interest for this commodity was triggered by the discovery, two year before, of the Sept-Îles deposits by the QDER (Cimon, 1994) and the fast development of the project by SOQUEM. The FMSLSJ and its prospectors staked their discoveries (zones n° 1 to n° 3), which claims were granted for option to Ressources d'Arianne. Some of these initial claims are still active. D'Arianne, in collaboration with the FMSLSJ, carried a limited amount of work until 2002.

- GM-57004; 1995; Prospecting.
- GM-57006; 1995; Compilation work.
- GM-57007; 1997; Prospecting.
- GM-58151; 1999; Prospecting.
- GM-58152; 1998; Prospecting.
- GM-58767; 2001; 10 Drill holes.
- GM-58768; 2000; 2 Drill holes.
- GM-58769; 2000; Metallurgical testing.
- GM-58774; 2000; Metallurgical testing.
- GM-59784; 2002; 12 Drill holes.

Due to a lack of interest in the capital market, d'Arianne abandoned the exploration for apatite and ilmenite in 2002, and allowed most claims to lapse.

8.4 RECENT D'ARIANNE INVOLVEMENT

D'Arianne re-staked the Virginia's Manouane and Lac-à-Paul occurrences.

D'Arianne interest in the project resumed in 2008, stimulated by a surge in phosphate price. D'Arianne re-staked the Virginia's Manouane and Lac-à-Paul occurrences and initiated prospecting and drilling work. D'Arianne work consisted of:

- Summer 2008: Prospecting and surface sampling.
- Fall 2008: Ground magnetometer survey over Zone n° 2.
- Fall 2008: 22 drill holes on Paul and Zone n° 2 occurrences.
- Winter 2009: 13 drill holes on Manouane occurrence.
- Spring 2009: Resource estimates by SGS-Geostats.
- Spring 2009: Apatite beneficiation test, SGS-Lakefield.
- Summer 2009: Prospecting and surface sampling.
- Fall 2009: 11 Drill holes for exploration purposes, completed September 13th.
- Late fall 2009: 18 drills holes on Paul zone, results pending.

None of these campaigns is currently filed as assessment at MRNF.

ITEM 9: GEOLOGICAL SETTING

9.1 REGIONAL GEOLOGY

The Grenville Province, largely Proterozoic, occupies a vast territory in the northeastern North America. It is the result of a collisional orogen with associated plutonism in crustal rocks. The rocks have been polydeformed with high grade amphibolite to granulite metamorphism. The property is located in the central part of the Grenville Geological Province (*figure 1*, item 26).

The huge 1160-1140 My multi-phase labradorite-type lac Saint-Jean anorthosite suite (about 20 000 km²), which host the current project.

Many magmatic events took place within the central Grenville Province in Québec from 1510 to 985 My before today (Hébert et al., 2003), of which four generated anorthositic suites. The about 1330 My labradorite-type De La Blache plutonic suite is the oldest one intruding the

basement assemblages in the central Grenville. It was followed by the huge 1160-1140 My multi-phase labradorite-type Lac Saint-Jean anorthosite suite (about 20 000 km²), which host the current project. Later, the andesine-type 1080-1060 My Saint-Urbain

anorthosite suite was emplaced. The fourth anorthosite event is represented by the 1010-1008 My andesine-type Labrieville anorthosite suite (Piché, 1981).

Apatite is reported associated with most magnetite-ilmenite occurrences, although it may have remained unnoticed in old reports.

Oxide mineralization occurs within all Grenville anorthosite suites. Magnetite and ilmenite are found in the labradorite-type, while hemo-ilmenite and magnetite are associated with the andesine-type. Apatite is reported associated with most magnetite-ilmenite occurrences, although it may have remained unnoticed in old reports. For example, the St-Urbain deposits although well documented, do not have any mention of

apatite even if present⁶. No systematic overview of Grenvillian apatite occurrences is available in literature.

9.2 LOCAL GEOLOGY

Grenvillian geology of the Lac St-Jean area was first described in Laurin and Sharma (1968), at the scale of 1:250 000, and compiled in Avramtchem et Piché, 1981). Informations on this map are limited and indicate the *Lac-à-Paul* area as included in an anorthosite lobe, flanked by some gabbros, and hosted in quartzofeldspatic grey gneiss and granites.

The area has been mapped in greater details by Hébert (Hébert and Baumier 2000, RG-99-05), at the scale of 1:50 000.

9.3 PROPERTY GEOLOGY

The vast majority of the property is underlain by norite and leuconorite.

Property geology map is taken from Hébert and Beaumier (2000), which is still the most accurate available (**figure 3, item 26**). According to this map, the vast majority of the property is underlain by norite and leuconorite, with some pyroxenite and gabbronorite. Three north-north-east trending faults are reported. No geological mapping has been undertaken by d'Arianne. In details lithofacies are variegated on the small scale, and more diverse that what is indicated on Hébert and Beaumier map.

⁶ Author's observation.

ITEM 10: DEPOSIT TYPES

10.1 GENERAL MODELS

Two types of apatite-ilmenite occurrences are present within the Lac-à-Paul project. Both are magmatic in origin and form specific facies of the Lac-St-Jean Anorthositic complex. Although these kinds of deposits are known as associated with various anorthosite complexes in the world, none is currently mined for its phosphate content. However, similar deposits with dominant ilmenite are currently mined in lac Tio (Rio Tinto Iron Titanium, Havre-St-Pierre, Québec) and Tellnes (Norsk Hydro, Norway). Numerous occurrences are currently under evaluation in Québec for their iron and titanium content.

10.2 NELSONITE TYPE

Manouane and Paul zones are made of layered medium-grain nelsonite. These are layered sequences made of various proportions of ilmenite, magnetite, apatite and olivine rocks.

Manouane and Paul zones are made of layered medium-grain nelsonite. These are layered sequences made of various proportions of ilmenite, magnetite, apatite and olivine rocks. Nelsonites, first described from Nelson County in Virginia, are usually defined as ilmenite-apatite±rutile, although biotite, magnetite, olivine and pyroxene may be present. Most known occurrences are described from gabbroic and anorthositic intrusions, although some are reported from granites and carbonatites. Genesis of anorthosite-related nelsonite is

still debated, but usually accepted as a liquid segregation from a titanium-iron-phosphorus saturated mafic-anorthositic silicate magma. Segregation is considered to be triggered by silica polymerization induced by a wall-rock contamination. This explains why such deposits are typically found in proximity of anorthosite-gneiss contact. A simple differentiation-accumulation process can not be invoked to generate these unusual rocks.

Most nelsonite occurrences described in literature are ilmenite dominated, and occurs either as pods or layered sequences. Examples are known in Sept-Îles complex, Lac-à-La-Blache anorthosite, St-Urbain anorthosite, and in various locations within the Lac-St-Jean Anorthosite, as well as in the Archean lac Doré and Bell River complexes.

10.3 GABBROIC TYPE

The Zone 1 to Zone 3 occurrences, which initially attracted D'Arianne attention, are apatite-ilmenite bearing coarse-grain gabbros.

The zone 1 to zone 3 occurrences, which initially attracted d'Arianne attention, are apatite-ilmenite bearing coarse-grain gabbros. Apatite and ilmenite are disseminated in the gabbroic rock, coarse grain and granular idiomorphic, millimetre in size. Their abundance is lower than Nelsonite, and suggests that titanium and phosphorus did not reach saturation in the magma. They form large volumes, extending for kilometres. Outcrops in the Lac-à-Paul area are heavily weathered, with the rock crumbling into gravel due to the frost dislocation along neat grain boundaries.

10.4 CARBONATITE TYPE

Most apatite currently mined in the world is from carbonatite complex.

Most apatite currently mined in the world (Ontario, Kola peninsula, Brazil) is from carbonatite complex. It shall be clearly stated that Lac-à-Paul deposits is not carbonatite hosted. Carbonatite hosted deposits are higher apatite grades, typically in the 30-70% apatite. However, these deposits suffer from other hindrances, such as lower apatite recovery, carbonate contamination of the concentrate, higher deleterious contaminants such as uranium and fluorine, etc.

ITEM 11: MINERALIZATION

11.1 GENERAL CONSIDERATIONS

Six mineralized zones are reported within d'Arianne's project. Zones n° 1, n° 2, n° 3 and n° 4 are low-grade apatite-ilmenite bearing gabbros discovered by the FMSLSJ, and will be discussed only briefly. On these, only zone n° 2 has been explored significantly. The two other zones, Manouane and Paul, are nelsonites and the most promising.

11.2 PAUL ZONE

Paul zone is the prime target of d'Arianne project.

Paul zone is the prime target of d'Arianne project (**figure 4**, item 26). It is located in the northern part of the property, on claim n° 2129818, n° 2129818 and n° 2167470. The zone occupies a small hillcrest, adjacent to the north of Lac-à-Paul (UTMX: 374000; UTMY: 5529000). It is easily accessible through various loggingtrails connecting to the main logging road. Thin overburden is reported, less than 10 metres.

The rocks consist of an olivine nelsonite, made of similar proportion of apatite, ilmenite, magnetite and olivine, plus accessory pyroxene, feldspar and biotite. Depending on mineral proportion, this layered rock can vary from a genuine nelsonite, to a troctolitic nelsonite, troctolite (olivine-plagioclase rock) pyroxenite, gabbroic anorthosite, etc., which facies are intricate in disorder. This zone is embedded in apatite-free gabbroic to anorthositic host rock. The difference between the various facies is subtle, and correlation between drill holes remains tricky.

The Paul zone is known over 1000 metres, aligned east-south-east. Ovoid in shape, its width is not well constrained, between 150 and 300 metres. The zone is open at depth and true thickness is not established.

The Paul zone is known over 1000 metres, aligned east-south-east. Ovoid in shape, its width is not well constrained, between 150 and 300 metres. The zone is open at depth and true thickness is not established. The zone is open to the east and to the west, although the magnetic survey indicates its pinch. The magnetic survey also indicates a complex internal structure, with likely folding and stacking. Bedding attitude is not well constrained due to the diffuse lithological contacts and no effort were made in this regard. The structure has been interpreted as twisted by SGS-Geostats (Duplessis, 2009): Dipping north at the east end, sub-vertical on its center and dipping south on the west end. The understanding of the geometry of the zone has to be properly addressed in future work. However, this lack of comprehension is not considered as a severe hindrance considering the bulk open-pit mining approach.

11.3 MANOUANE ZONE

The Manouane zone is located in a flat terrain, 5.5 kilometres east of Lac-à-Paul, 2 kilometres to the south of the bight on Manouane River (UTMX: 381300, UTMN: 5527000). Its access has required logging of a 3 kilometres trail by Soquem in 1998. The

zone is under a poorly drained muskeg, therefore not outcropping and hampering summer access to drill rigs. Thick overburden is reported, between 10 to 28 metres.

The Manouane zone is currently known to extend 800 metres, northeast-southwest trending, open at both ends. It has an apparent width of about 200 metres.

Manouane zone (**figure 5**, item 26) is dominated by a magnetite-bearing nelsonite, similar to Paul zone. This nelsonite is interbedded with gabbros, anorthosite and tonalite layers. Again, correlation between holes was not attempted, and attitude of layering is not certain. The zone is currently known to extend 800 metres, northeast-southwest trending, open at both ends. It has an apparent width of about 200 metres, although this width is not well constrained. This current outline

approximately mimics the aeromagnetic anomaly. The zone has been tested at a depth of almost 200 metres, and is still open at depth, at the least on its west end. Depth is constrained down to 125 metres on east end.

11.4 NICOLE ZONE

Nicole zone corresponds to a magnetic anomaly located between Paul and Manouane zone. Only limited surface sampling is available, no drilling being done yet.

11.5 ZONE N° 1

Little exploration has been dedicated to zone n° 1, which was one of the areas initially discovered by FMSLSJ (**figure 6**, item 26). It is located 6 kilometres south-east of Lac-à-Paul, by UTMX 380600 and UTM Y 5521700. It consists of an apatite-bearing gabbro which makes friable outcrops along road cuts. Else than prospecting, two (2) short surface holes were drilled in 2000, plus seven (7) in 2001 at a depth of 30 metres. The zone is open in all directions and at depth. A preliminary resource estimate was calculated, 43-101 non-compliant.

11.6 ZONE N° 2

Zone n° 2 is the only zone acquired from the FMSLSJ upon which significant exploration effort was dedicated (**figure 7**, item 26). It is located about 10 kilometres to the south-south-west of Lac-à-Paul, in an area with rugged topography, near *Castor-qui-Cale* River (UTMX: 366500, UTM Y: 5516500). Anorthosite outcrops are scattered in the area, with the usual crumbling weathering. The zone n° 2 occurrence is made of apatite-ilmenite

bearing homogeneous anorthositic gabbro, with minor variegated gabbro and anorthosite. Nelsonite and troctolites are reported as small pods. Attitude of these rocks is not well understood and correlation between holes is difficult due to subtle lithological variation.

The zone is known to extend about 1200 metres, northeast trending, with a known width up to 500 metres. It has been tested by drilling at a depth of about 200 metres. The rock being rather massive and differences between facies being subtle, correlation between drill holes is difficult. Attitude of the layer is suspected sub-horizontal. The zone can be considered as open in every direction. Magnetic pattern over the zone is irregular and of little help in delineating mineralization.

11.7 ZONE N° 3

Little exploration has been dedicated to zone n° 3, which was one of the areas initially discovered by FMSLSJ. It is located on the south of the project, NTS 22E10, by UTMX377500 and UTM Y 5509600. It consists of an apatite-bearing gabbro which makes friable outcrops along roadcuts. Only surface prospecting has been carried.

11.8 ZONE N° 4

Little exploration has been dedicated to zone n° 4, which was acquired in 2001 but it is not covered by FMSLSJ agreement. It is located within an isolated small group of claims to the East, UTMX 389000, UTM Y 5524950. It consists of an ilmenite-rich gabbro which makes friable outcrops along road cuts. Four short holes were drilled in 2001, which are the only exploration work recorded. Mainly titanium rich, one of the hole intersected 14.36% TiO₂ over 24.47 metres.

ITEM 12: EXPLORATION

12.1 PREVIOUS WORKS

Most of Virginia's efforts were dedicated to various airborne electromagnetic anomalies, in the search of copper-nickel magmatic sulphides mineralization.

Virginia gold mines and its partner Soquem carried intensive exploration effort in the Lac-à-Paul area between 1996 and 2004. Most of their efforts were dedicated to various airborne electromagnetic anomalies, in the search of copper-nickel magmatic sulphides mineralization. These efforts included conventional mapping and surface sampling, line cutting, ground geophysics including magnetometer and max.-min. HLEM surveys, and a total of 76 drill holes (**figure 8**, item 26). Thorough compilation

of this work is outside the scope of the current mandate, and only the relevant data located within d'Arianne's property is here considered. These are restricted to:

- Airborne geophysics
- Ground magnetometer and HLEM surveys.
- A few drill holes on Manouane and Paul zone, which will be reviewed in next section.

12.2 GEOPHYSICS

A series of airborne magnetic and frequency domain electromagnetic surveys (GM-56149, 57184) were flown in 1997 in behalf of Virginia Gold Mines, with different orientations and spacing. These surveys were merged and reprocessed by Mr. Boivin (2009) on behalf of d'Arianne. They encompass a large area which does not coincide with actual d'Arianne property. The total magnetic field picture generated by Boivin is presented on **figure 9** (item 26), with localization of Paul, Nicole and Manouane zones. As indicated in these report (St-Hilaire, 2007), a narrow positive in-phase response coincident with positive off-phase response is suggestive of a bedrock conductive zone. Such zones are prime exploration target in regard of copper-nickel mineralization, and were the focus of Virginia and Soquem subsequent work. Inversely, a positive in-phase response devoid of negative off-phase response is suggestive of bedrock with high magnetic susceptibility, such as nelsonite. Drilling of such anomaly leads to Paul and Manouane zones discovery.

Ground magnetometer and max.-min. surveys were carried on behalf of Virginia/Soquem over 12 grids in the area. Of these, only Paul and Manouane grid is located within d'Arianne property (Poirier et Granger, 1997, Manouane only). D'Arianne,

in summer 2009, contracted a ground magnetometer survey on the Paul and Nicole grid to Geosig Inc. (Simoneau 2009). The Nicole grid encompass partly Virginia's grid on Manouane. These surveys were levelled and merged by Boivin (2009) (**figure 9**, item 26). These were also integrated into the airborne survey, with the use of downward continuation and a pass-high filter on the latter.

A ground magnetometer survey also been carried on zone n° 2 grid by Services Exploration inc., in fall 2008, interpreted by G.Lambert (Lambert 2008, in Tollari and Boulianne 2009). This survey is noisy and of limited use (**figure 10**, item 26).

12.3 PROSPECTING, MAPPING AND SURFACE SAMPLING

Numerous prospecting campaigns were carried in the area from 1994 to 2002, either by the FMSLSJ, Virginia, Soquem, and d'Arianne, the results of which were never integrated into a comprehensive database by d'Arianne. Such compilation being outside the range of the current mandate, no discussion will be offered concerning these campaigns.

The main campaign carried in this period was in fall 2001 (Boulianne 2002, GM-58767). This campaign focuses on zones n° 1, n° 2 and n° 4, where 174 surface samples were collected. No geological map was produced. Results were as follow:

- Zone n° 1: 37 samples, 4.74% P₂O₅ in average.
- Zone n° 2: 45 samples, 4.12% P₂O₅ in average.
- Zone n° 4: 92 samples, 0.91% P₂O₅ in average.

D'Arianne conducted a brief prospecting and surface sampling program in summer 2008 (Tollari and Boulianne, 2009). According to the database provided by d'Arianne, the average grade of the 95 samples submitted for assaying returned above 2.98% P₂O₅ and 4.90% TiO₂, with 25 of these above 4% P₂O₅. The work being carried by a prospector, no sample description is available. A second campaign was carried in 2009 (report pending), under the supervision of C. Tremblay, P. Geo. These 365 samples returned an average of 2.99% P₂O₅ and 5.18% TiO₂, with 104 samples above 4% P₂O₅.

The France zone (UTMX 371900 and UTM Y 5519600) has been discovered in the course of this prospecting.

These campaigns were carried by d'Arianne prospectors, and only limited rock and outcrop description is available. No geological map has been attempted. Results are indicated on **figure 11**, item 26). No analytical quality control was implemented.

12.4 VALIDITY OF WORK

The validity of works carried out by FMSLSJ, Virginia and Soquem in the area can not be reliably addressed, and seems to be of very unequal quality and relevance. A thorough compilation of all prospecting results is recommended. The author has no reason to question the quality of the geophysics, which is apparently within industry standards.

The work carried out on behalf of d'Arianne is of uneven quality. Magnetic surveys are of sufficient quality considering the large contrasts induced by Nelsonite. Levelling of data by Boivin is adequate. The prospecting work carried by d'Arianne would grain to be reviewed in detail. All apatite occurrences will deserve to be properly evaluated.

12.5 INDEPENDENCE OF CONTRACTORS

All fieldwork carried on behalf of d'Arianne was conducted under the supervision of Daniel Boulianne, P. Geo, by d'Arianne technical staff. These individuals can not be considered as independent from d'Arianne, although the author has no reason to doubt of their integrity.

ITEM 13: DRILLING

13.1 GENERALITIES

Currently, there are a total of 143 holes which have been drilled on the property or its vicinities, since 1996.

Currently, there are a total of 143 holes which have been drilled on the property or its vicinities, since 1996. Of these, 76 holes were drilled on the behalf of Virginia Gold Mines or Soquem in the search of nickel-copper mineralization, the remaining on behalf of d'Arianne in the search of apatite-ilmenite mineralization.

Rock is typically competent and recovery is excellent (>98%). Structural measurements, such as RQD and fracture description, were obtained only on the last campaign of late fall 2009. All d'Arianne core is currently stored, cross-piled on pallets, in d'Arianne facilities located on St-Martin road, La Baie. Samples rejects and pulps were discarded, except for the last campaign, which are to be store in d'Arianne facility. SOQUEM-Virginia core is abandoned in former Remabec camp site. Holes PAU-97-02 and MAN-91-07 were recovered by d'Arianne.

13.2 VIRGINIA-SOQUEM DRILLING

Of the 76 holes drilled by Virginia and Soquem within their *Chutes-des-Passes* project, 13 are located within d'Arianne project, and 6 were analyzed for their apatite and ilmenite content. Limited information is available in regard to drilling contractor, target selections, logging procedures, quality control, etc. These holes, extracted from MRNF's Sigeom information system, are located on **figure 3** (item 26), and with a short description for the ones located within d'Arianne property in **table 1**. Holes were located with the use of grid location and hand-held GPS.

Table 1: Holes drilled on behalf of Virginia-Soquem

Hole:	UTMX	UTMY	Intersection
PAU-97-01	374906 ⁷	5529604	1.28% Ni/ 0.33 m.
PAU-97-02	374924	5529364	8.99% P ₂ O ₅ + 9.42% TiO ₂ / 41.09 m.
MAN-97-01	381199	5527369	7.56% P ₂ O ₅ + 9.65% TiO ₂ / 117.86 m.
MAN-97-02	381200	5527260	6.60% P ₂ O ₅ + 9.88% TiO ₂ / 24.0 m.
MAN-97-03	381203	6627783	Not mineralized
MAN-97-04	381414	5528056	1.18% Ni + 0.1% Co / 1.66 m.
MAN-97-05	380411	5528469	0.7% Ni, 0.1% Co, 0.1% Cu / 0.76 m.
MAN-97-06	381191	5527724	Not mineralized
1279-00-07 ⁸	384140	5515151	0.67% Ni, 0.36% Cu / 1.5 m.
			0.59% Ni, 0.46% Cu / 5.2 m.
1279-00-11	382350	5516400	6.36% P ₂ O ₅ + 6.27% TiO ₂ / 7.50 m.
1279-00-12	375797	5520560	3.25% P ₂ O ₅ + 5.50% TiO ₂ / 24.0 m.
1279-00-13	375940	5520350	5.10% P ₂ O ₅ + 8.41% TiO ₂ / 1.5 m.
			5.79% P ₂ O ₅ + 8.71% TiO ₂ / 3.0 m.
1279-00-14	381572	5528250	1.24% Ni, 0.63% Cu + 0.16 Co/ 0.4 m.

13.3 D'ARIANNE AND FMSLS

- The first two holes drilled on behalf of d'Arianne in 2000 (Boudreault, 2000; GM-58768), BQ in size, are located on zone n° 1, for a total of 51.56 metres. These short holes aimed at measuring the thickness of the apatite-bearing gabbroic layer. Drilling was contacted to Laboratoire S.L., while assaying was done at Chimitec-Intertek testing from Val-d'Or, using ICP-OES after metaborate fusion.

⁷ Projection unspecified, NAD-27 or NAD-83

⁸ NAD-83

N° QCQA was implemented. Core description was under author's supervision. Results are summarized in **table 2**.

- A second drilling campaign, BQ in size, was performed in winter 2001 (Boulianne 2001, GM-58767). The first 7 holes are located on zone n° 1, for a total of 187.1 metres. Another 3 holes are located on zone n° 2, for a total of 80.19 metres. Drilling was contracted to Laboratoire S.L., under supervision of Alexandre Boudreault from IOS. Analyses were contracted to Chimitec-Bondar Clegg from Val-d'Or, using ICP-OES after metaborate fusion. N° QCQA protocol was implemented. Core description was under author's supervision. Results are summarized in **table 2**.
- A third larger drilling campaign, BQ in size, was performed in fall 2001 (Boulianne, 2001, GM-58784). The first 4 holes are located on zone n° 4, for a total of 175.26 metres. Another 8 holes are located on zone n° 2, for a total of 258.15 metres. These holes were drilled by Major-Kennebec Drilling, under D. Boulianne supervision. Assays were done at Chimitec-Bondar-Clegg from Val D'Or, using ICP-OES after metaborate fusion. No QCQA protocol was implemented. Core description was under author's supervision. Results are summarized in **table 2**. Holes were located with the use of hand-held GPS, and no deviation measurement was made. Casings were not left on sites, so a *postiori* DGPS measurement can not be achieved on every site.

Table 2: Holes drilled on behalf of d'Arianne-FMSLS

Hole:	UTMX ⁹	UTMY	Zone	Intersection
97-01	380543	5521483	n° 1	4.54% P ₂ O ₅ + 5.17% T _i O ₂ / 12.96 m.
"				1.43% P ₂ O ₅ + 2.01% T _i O ₂ / 3.0 m.
"				3.87% P ₂ O ₅ + 4.10% T _i O ₂ / 3.68 m.
97-02	380925	5521818	n° 1	2.82% P ₂ O ₅ + 3.27% T _i O ₂ / 14.82 m.
"				3.08% P ₂ O ₅ + 4.44% T _i O ₂ / 8.0 m.
"				3.28% P ₂ O ₅ + 4.95% T _i O ₂ / 2.8 m.
LP-101	380514	5521086	n° 1	4.84% P ₂ O ₅ + 5.44% T _i O ₂ / 19.97 m.
LP-102	380550	5521284	n° 1	3.97% P ₂ O ₅ + 4.87% T _i O ₂ / 16.71 m.
LP-103	380757	5521766	n° 1	3.38% P ₂ O ₅ + 4.41% T _i O ₂ / 20.22 m.
LP-104	380930	5521775	n° 1	3.74% P ₂ O ₅ + 4.67% T _i O ₂ / 28.78 m.
LP-105	381405	5521674	n° 1	4.55% P ₂ O ₅ + 4.50% T _i O ₂ / 21.9 m.
LP-106	381415	5521896	n° 1	3.93% P ₂ O ₅ + 4.75% T _i O ₂ / 6.34 m.
LP-107	381116	5521984	n° 1	1.19% P ₂ O ₅ + 1.78% T _i O ₂ / 24.66 m.
LP-201	367265	5516223	n° 2	1.19% P ₂ O ₅ + 3.21% T _i O ₂ / 23.70 m.
LP-202	366901	5516223	n° 2	4.89% P ₂ O ₅ + 4.47% T _i O ₂ / 32.18 m.
Lp-203	367080	5516505	n° 2	4.95% P ₂ O ₅ + 4.41% T _i O ₂ / 21.73 m.
LP-204	367038	5516577	n° 2	No significant intersection
LP-205	367177	5516335	n° 2	3.78% P ₂ O ₅ + 5.12% T _i O ₂ / 23.27 m.
LP-206	366862	5516290	n° 2	4.70% P ₂ O ₅ + 4.36% T _i O ₂ / 23.13 m.
LP-207	367020	5516217	n° 2	5.26% P ₂ O ₅ + 4.47% T _i O ₂ / 28.5 m.
LP-208	366770	5515900	n° 2	4.81% P ₂ O ₅ + 4.34% T _i O ₂ / 28.95 m.
LP-209	366878	5515720	n° 2	3.94% P ₂ O ₅ + 4.44% T _i O ₂ / 16.06 m.
LP-210	366752	5515460	n° 2	3.55% P ₂ O ₅ + 3.88% T _i O ₂ / 28.72 m.
LP-211	366605	5515498	n° 2	2.79% P ₂ O ₅ + 3.42% T _i O ₂ / 11.25 m.
LP-401	389764	5524918	n° 4	1.41% P ₂ O ₅ + 7.75% T _i O ₂ / 37.19 m.
LP-402	389750	5524970	n° 4	1.56% P ₂ O ₅ + 6.77% T _i O ₂ / 41.76 m.
LP-403	389360	5524899	n° 4	0.65% P ₂ O ₅ + 6.26% T _i O ₂ / 40.97 m.
LP-404	389409	5524806	n° 4	0.48% P ₂ O ₅ + 14.36% T _i O ₂ / 24.47 m.

⁹ NAD-27

13.4 D'ARIANNE, RECENT DRILLING

Since d'Arianne resumed its activity in the project, it carried out four significant drilling campaigns.

Since d'Arianne resumed its activity in the project, it carried out four significant drilling campaigns, spanning from fall 2008 to fall 2009. All collars were located with the use of non-referenced DGPS by d'Arianne, and grids and definition drill collars surveyed by a land surveyor with the use of a referenced DGPS. Hole deviations were measured with the use of a Flex-It instrument. Shall be noticed that this instrument is sensitive to the surrounding magnetic field, and may record erroneous values with the presence of magnetite. Geologist wisdom is needed to discard such values. Casings were usually not left on the hole.

- First drilling campaign, NQ in size, spanning from late October to late November 2008 aimed to allow calculation of inferred resources on Paul zone and zone n° 2 (Tollari 2009). It included 13 holes for 1860 metres on Paul zone, organized in 5 sections 200-300 metres apart. Drilling on zone n° 2 included 9 holes for 924 metres, organized in 4 sections 200 metres apart. Plan view is provided in **figure 4** and **6** (item 26) and **sections** (item 26). Logging protocols and core management have been witnessed by C. Duplessis from SGS-Geostats and is apparently according to industry's best practices. Results from this campaign are listed on **table 3**.
- Second drilling campaign, NQ in size, carried in January and February 2009, aimed to delineate Manouane zone and to allow calculation of inferred resources. Drilling on this zone is restricted to winter due to marshy terrain. A total of 13 holes, for 1947 metres, were drilled along 4 sections 200 metres apart. Plan view is provided in **figure 5** (item 26) and **sections** (item 26). The campaign, as well as the first one, was planned and supervised by D. Boulianne, P. Geo, and executed by Christian Tremblay, P. Geo. Drilling was contracted to Forage Dami-Or and assaying to ALS-Chemex, both from Val-d'Or. Assays were made by XRF on metaborate beads. Logging protocols and core management have been witnessed by C. Duplessis from SGS-Geostats and is apparently according to industry's best practices. Results from this campaign are listed on **table 3**.
- The third drilling campaign, NQ in size, has been carried in summer 2009 and was dedicated to exploring for new zones. Target selections were based upon interpretation of the airborne magnetometer survey, if possible coincident with muskegs. Program was planned by D. Boulianne, but execution and core description was left to R. Ouellet, P. Geo. Drilling was contracted to Forage Dami-Or and assaying to ALS-Chemex, both from Val-d'Or. Assays were made

by XRF on metaborate beads. Results from this campaign are listed on **table 4**, while drill holes location is on **figure 3** (item 26). Logging protocols and core management have been witnessed by the author and is apparently according to industry's recommended practices.

A fourth drilling campaign has just been completed, dedicated to improve drilling density on Paul zone in order to allow calculation of indicated mineral resources.

A fourth drilling campaign, NQ in size, has just been completed (December 2009), dedicated to improve drilling density on Paul zone in order to allow calculation of indicated mineral resources. A total of 18 holes, for 3593 metres have been drilled. Planning of the program was made by D. Boulianne and the author, and execution and core description was left to Pascal Simard, geologist in training. Drilling was contracted to Forage Dami-Or and assaying to ALS Chemex, both from Val-d'Or. Assays were by XRF on metaborate beads but are currently pending. Drill holes location is provided on **figure 4** (item 26) while profiles are included in sections (item 26).

Table 3: Resource definition drilling, 2008-2009

Hole:	UTMX ¹⁰	UTMY	Zone	Intersection
Pau-08-01	374744	5529547	Paul	7.50% P ₂ O ₅ + 8.11% TiO ₂ / 160 m.
Pau-08-02	374737	5529449	Paul	7.52% P ₂ O ₅ + 8.75% TiO ₂ / 104.5 m.
Pau-08-03	374927	5529450	Paul	7.44% P ₂ O ₅ + 7.33% TiO ₂ / 156 m.
Pau-08-04	374934	5529345	Paul	2.18% P ₂ O ₅ + 2.52% TiO ₂ / 153 m.
Pau-08-05	375139	5529546	Paul	7.80% P ₂ O ₅ + 11.01% TiO ₂ / 151.3 m.
Pau-08-06	375137	5529350	Paul	7.40% P ₂ O ₅ + 6.19% TiO ₂ / 106.5 m.
Pau-08-07	375141	5529452	Paul	10.32% P ₂ O ₅ + 7.80% TiO ₂ / 141 m.
Pau-08-08	375437	5529450	Paul	8.15% P ₂ O ₅ + 11.55% TiO ₂ / 14 m.
Pau-08-09	375639	5529251	Paul	No significant intersection
Pau-08-10	375646	5529348	Paul	No significant intersection
Pau-08-11	375438	5529253	Paul	7.98% P ₂ O ₅ + 8.71% TiO ₂ / 153 m.
Pau-08-12	375430	5529352	Paul	8.35% P ₂ O ₅ + 11.29% TiO ₂ / 66.6 m.
Pau-08-13	375437	5529450	Paul	No significant intersection
Z2-08-01	366935	5516058	Z n° 2	4.62% P ₂ O ₅ + 4.73% TiO ₂ / 99 m.
Z2-08-02	366858	5516104	Z n° 2	4.54% P ₂ O ₅ + 4.73% TiO ₂ / 98 m.
Z2-08-03	366761	5516138	Z n° 2	4.29% P ₂ O ₅ + 4.70% TiO ₂ / 117 m.
Z2-08-04	367052	5516227	Z n° 2	5.23% P ₂ O ₅ + 4.76% TiO ₂ / 97 m.
Z2-08-05	366947	5516271	Z n° 2	4.78% P ₂ O ₅ + 4.48% TiO ₂ / 99 m.
Z2-08-06	366847	5516312	Z n° 2	4.93% P ₂ O ₅ + 4.69% TiO ₂ / 99 m.
Z2-08-07	367131	5516403	Z n° 2	4.75% P ₂ O ₅ + 4.50% TiO ₂ / 66 m.
Z2-08-08	367040	5516451	Z n° 2	4.23% P ₂ O ₅ + 4.52% TiO ₂ / 43.8 m.
"				3.38% P ₂ O ₅ + 3.88% TiO ₂ / 12.1 m.
Z2-08-09	366955	5516500	Z n° 2	3.35% P ₂ O ₅ + 4.23% TiO ₂ / 36.7 m.
"				3.73% P ₂ O ₅ + 4.78% TiO ₂ / 33 m.
Man-09-01	381102	5527321	Manouane	5.35% P ₂ O ₅ + 9.29% TiO ₂ / 132 m.
Man-09-02	381139	5527232	Manouane	5.73% P ₂ O ₅ + 9.31% TiO ₂ / 183 m.
Man-09-03	381213	5527137	Manouane	5.29% P ₂ O ₅ + 6.74% TiO ₂ / 76.7 m.
Man-09-04	381430	5527138	Manouane	6.38% P ₂ O ₅ + 8.70% TiO ₂ / 22.6 m.
Man-09-05	381327	5527408	Manouane	6.10% P ₂ O ₅ + 9.38% TiO ₂ / 159 m.
Man-09-06	381367	5527320	Manouane	5.47% P ₂ O ₅ + 8.70% TiO ₂ / 150 m.
Man-09-07	381339	5527226	Manouane	4.93% P ₂ O ₅ + 9.67% TiO ₂ / 50.6 m.
Man-09-08	381504	5527483	Manouane	6.31% P ₂ O ₅ + 10.16% TiO ₂ / 105.4 m.
Man-09-09	381604	5527407	Manouane	6.57% P ₂ O ₅ + 9.12% TiO ₂ / 119.5 m.
Man-09-10	381635	5527312	Manouane	6.03% P ₂ O ₅ + 8.94% TiO ₂ / 98 m.
Man-09-11	381730	5527539	Manouane	7.40% P ₂ O ₅ + 11.51% TiO ₂ / 46.5 m.
"				5.83% P ₂ O ₅ + 8.43% TiO ₂ / 89.6 m.
Man-09-12	381826	5527493	Manouane	6.02% P ₂ O ₅ + 8.78% TiO ₂ / 75.7 m.
Man-09-13	381466	5527577	Manouane	6.04% P ₂ O ₅ + 9.29% TiO ₂ / 78.5 m.

¹⁰ NAD-83

Table 4: Exploration drill holes, summer 2009

Hole:	UTMX	UTMY	Zone	Intersection
LPA-09-01	382026	5523446	n° 1	1.37% P ₂ O ₅ + 4.75% T _i O ₂ / 3.0 m.
LPA-09-02	381673	5523945	n° 1	5.21% P ₂ O ₅ + 5.52% T _i O ₂ / 12.0 m.
LPA-09-03	381426	5524350	n° 1	7.23% P ₂ O ₅ + 9.94% T _i O ₂ / 6.0 m.
LPA-09-04	381196	5524350	n° 1	3.56% P ₂ O ₅ + 4.94% T _i O ₂ / 6.0 m.
LPA-09-05	382062	5520149	n° 1	4.81% P ₂ O ₅ + 5.48% T _i O ₂ / 33.0 m.
LPA-09-06	381697	5520675	n° 1	8.88% P ₂ O ₅ + 5.66% T _i O ₂ / 7.8 m.
LPA-09-07	381940	5527611	n° 1	2.91% P ₂ O ₅ + 3.57% T _i O ₂ / 3.0 m.
LPA-09-08	381581	5527134	n° 1	4.39% P ₂ O ₅ + 4.57% T _i O ₂ / 3.0 m.
LPA-09-09	380881	5528196	n° 1	2.70% P ₂ O ₅ + 3.17% T _i O ₂ / 3.0 m.
LPA-09-10	382007	5529544	n° 1	5.82% P ₂ O ₅ + 7.28% T _i O ₂ / 33.0 m.
				7.09% P ₂ O ₅ + 8.14% T _i O ₂ / 36.0 m.
LPA-09-11	386047	5527134	--	0.53% P ₂ O ₅ + 1.22% T _i O ₂ / 6.0 m.

ITEM 14: SAMPLING METHOD AND APPROACH

Only limited information is available concerning sampling methods historically used by Virginia and Soquem, which are assumed as compliant to contemporary industry's practice.

Sampling for the 1999-2001 drill cores by d'Arianne was done under the author supervision in IOS facilities. Core was hand split in IOS facility, bagged and shipped for assaying by road carrier. A total of 636 samples have been submitted for assay. Surface sampling during this period was not compiled by the author.

Surface samples collected during 2008-2009 prospecting campaign were collected with sledge and hammer directly from outcrop. Most of these are selected grab samples, a few being composites of a few chunks. A bias toward high grade sample is suspected. No channel or chips samples were reported. Typical sample weight is about 2 kilograms, which is a minimum, considering the coarseness of these rocks.

Samples from the 2008-2009 drill campaign were taken at more or less regular intervals, typically 3 metres, regardless of the lithofacies.

Samples from the 2008-2009 drill campaigns were taken at more or less regular intervals, typically 3 metres, regardless of the lithofacies. The first few holes were sampled at 1.5 metres interval, protocol which has been changed to 3 metres under SGS-Geostats recommendations.

The core was split with the use of a hydraulic splitter at d'Arianne logging facility set-up at Chutes-des-Passes. A total of 1819

samples were submitted on Paul, Manouane and zone n° 2 occurrences. Exploration drilling carried in summer 2009 included 92 samples, collected with same protocol. Fall 2009 definition drilling on Paul zone added 1175 samples, for an overall total of 3086 samples

ITEM 15: SAMPLE PREPARATION, ANALYSIS AND SECURITY

15.1 ANALYTICAL PROTOCOL

Apatite is not refractory to most digestion methods.

Titanium oxides are notorious for being refractory both in digestion and borate glass melting.

Phosphorous and titanium rich material such as Nelsonite are not material routinely analyzed by commercial laboratories, and matrix effects may differ significantly from silicate rocks. Care and concerns shall be applied in analytical protocols. Apatite is not refractory to most digestion methods, but high phosphorous may cause difficulties in melting of borate glass or precipitation in acid digestion. Titanium oxides are notorious for being refractory both in digestion and borate glass melting. Tight quality control is of concern.

- Soquem made their core samples analyzed by X-Ray fluorescence on fused borate beads for major oxydes plus elemental barium and strontium, and upon press pellets for elemental zirconium and yttrium (Roy, 2000, GM-58232).
- Information concerning surface samples analysis for d'Arianne and FMSLSJ has not been compiled by the author.
- Drill core samples from 1999-2001 d'Arianne programs were assayed using induced coupled plasma atomic emission spectrometry (ICP-AES) after digestion of a borate fused bead (Boulianne 2001, 2001b; Boudreault, 2000). This method is considered as adequate, but may present titanium saturation problems with high grade samples. Phosphorous detection limit (2σ) is a little elevated at 0.03%. The method provided analysis of major oxides, plus elemental barium, chromium and strontium. Lost on ignition (LOI) was also measured. Samples from 1999 drill campaign were also assayed using induced coupled plasma atomic emission spectrometry (ICP-AES) after Aqua Regia digestion, providing a whole range of elements. Samples were milled and pulverized with the use of standard CW rigmills.

- Surface samples from 2008-2009 campaign were assayed using induced coupled plasma atomic emission spectrometry (ICP-AES) after a four acids digestion for major elements, plus induced coupled plasma mass spectrometry after four acids digestion for trace elements. Using a multi-acid digestion instead of borate bead fusion may cause incomplete dissolution and underestimation of titanium.
- Drill core from 2008-2009 campaigns were assayed using X-ray fluorescence (XRF) upon fused borate beads (Tollari and Boulianne, 2009). The method provided analysis of major oxides, including barium, strontium and chromium oxides. Lost on ignition (LOI) was also measured. This method, compared to ICP-AES after borate fusion, enable better precision and detection limits for phosphorus, is less prone to nugget effect, and less sensitive to incomplete digestion. Samples were milled and pulverized with the use of standard CW rigmills.
- Drill core from last 2009 campaign on Paul zone is still being processed. Samples were brought to IOS facilities in Chicoutimi for being crushed (3 mm) and riffle split. A 300-500 grams aliquot was submitted for assaying at ALS-Chemex in Val D'Or with the use of X-ray fluorescence on fused borate bead. Rejects were kept and stored temporarily at IOS, pending for some metallurgical testing.

15.2 ANALYTICAL QUALITY CONTROL

Analytical quality control of the present project is of concern with the following issues:

Routine assaying of titanium and phosphorous is not common in commercial not-specialized assaying laboratory, and miscalibrations and methods inadequacy are potential treats.

The utmost important issue in analytical quality is precision. Routine assaying of titanium and phosphorous is not common in commercial not-specialized assaying laboratory, and miscalibrations and methods inadequacy are potential treats. Rigorous control of the assays with the use of certified reference material is a must. Any discrepancy in analytical precision will

reflect proportionally on resources calculation and overall grade, and therefore on the economical analysis.

- Tampering of the samples for phosphorus and titanium is not an issue. Apatite and ilmenite are readily visible on core, and the high grades hamper the

practicality of tampering. The author examined the core on many occasions and testifies the presence of these minerals.

- Considering the large width and grade consistency of the mineralized intersection, sample inversion, mixing and robustness are not a serious issue. Intercalation of abundant (>15%) reference material in order to control these issues is not considered as necessary.
- Use of samples aliquots, hole twins, quarter-splits, and other duplication methods will provide accuracy of the assays, but will by no means provides any indication on precision.

No rigorous quality control protocol was applied for the Soquem-Virginia analysis, d'Arianne-FMSLSJ analysis, d'Arianne 2008-2009 surface sampling program as well as d'Arianne exploration drilling program. Analysis of quality control material provided by the laboratory were not compiled nor disclosed. No reference material was added by the clients.

D'Arianne implemented a succinct QCQA program in the course of their 2008-2009 definition drilling programs, which consisted of:

- Introduction among the sample sequence of a certified reference material. This material KPT-1 is a quartz diorite prepared by Université du Québec à Chicoutimi geochemistry laboratory, and has submitted for a proficiency test in various commercial and/or academic laboratories in order to obtain certification (Webb et al., 2006). The silicate matrix of this material can be compared to the anorthositic gabbro, but not to the nelsonite which is the main ore carrier. Recommended phosphate grade is 0.17% P_2O_5 , which is a fortieth of the current ore and too low to certify. Recommended titanium grade is 0.90% TiO_2 , likely silicate hosted, which is a tenth of the current ore grade and unsuitable to certify. This CRM has been assayed 35 times for d'Arianne, every 50 samples or 2% of the sample population. Statistics are presented on **table 5** and indicate an excellent accuracy and precision of the method, although it can not be extrapolated to ore grades.
- No blank material or placebos were inserted by d'Arianne.
- Abundance of control material inserted by the client, limited to 2% of the population, is not sufficient to detect samples inversion or other robustness issues.
- Quality control protocols implemented by ALS-Chemex include analytical replication, certified reference material analysis, internal reference analysis and

blank analysis. Results of these tests have not been compiled by d'Arianne neither by the author.

- SGS-Geostats representatives (Duplessis, 2009) made a detailed evaluation of the analytical quality in the course of their mineral resource calculation. They personally collected a quarter-split of 83 samples from holes Pau-08-02, Pau-08-12, Man-09-10 and Man-09-11. These samples were shipped to SGS-Lakefield for assaying by X-ray fluorescence on borate fused bead¹¹. They concluded for a minor discrepancy between both laboratories, P₂O₅ grades at SGS being about 2% higher that ALS Chemex, and 3% lower for TiO₂. Only rudimentary statistical analysis was offered to substantiate this conclusion. Various statistical tools are available to test paired samples population but were not applied: correlation diagram, Student-t tests, regression analysis, etc. Irregularities in the database provided to the author precluded him to perform such test, and forced him to rely totally on SGS opinion.

Table 5: Proficiency of KPT-1 certified reference material

	P ₂ O ₅	TiO ₂	FeO	SiO ₂
Accepted value	0.17%	0.90%	12.24%	54.14%
Accepted variation	0.002%	0.004%	0.034%	0.102%
Count	35	35	35	35
Average	0.16%	0.93%	12.06%	54.16%
Std-dev	0.001%	0.005%	0.023%	0.095%
Dev-Coefficient	0.34%	0.57%	0.19%	0.17%
Avg/accepted	0.94	1.03	0.99	1.00

Quality control for the 2009 exploration drilling included only a single reference material and a single blank sample, for 2% of control.

A tighter quality control protocol for the 2009 definition drilling on Paul zone has been recommended by the author, which has been partly followed by d'Arianne. It included the systematic insertion of blanks (pure grenvillian quartz provided by IOS) and adequate certified reference material such as NCS-DD-79003 from Sylab (6.06% P₂O₅) and SARM-32 from Mintek (39.96% P₂O₅), for a total of 110 analyses, or 10%. Results are pending.

¹¹ Analytical method is not indicated on SGS-Lakefield certificates neither in SGS-Geostats report. The author concluded to XRF, according to the element package reported.

ITEM 16: DATA VERIFICATION

The author carried a limited amount of verification on d'Arianne database by redrawing of drill-holes sections and maps. A few certificates of analysis were compared with the database provided by d'Arianne. Data were verified by Duplessis (2009) in the course of resources estimation.

ITEM 17: ADJACENT PROPERTIES

Mineral property ownership was verified by the author on the 16 of December 2009 on MRNF on-line registry *Gestim*. They were described on Item 6.7. Of these, only the MHY property of Virginia-Soquem, located to the east of d'Arianne, is of interest for its copper and nickel potential. It is uncertain if this property hosts any apatite occurrence, but the proper lithofacies were reported. The four (4) claims owned by Wayne Holmstead to the south-west cover a former set of Soquem-Virginia drill holes, which are reputed to include some apatite bearing gabbro. No adjacent apatite occurrences known to the author which are currently staked by third parties.

ITEM 18: MINERAL PROCESSING AND METALLURGICAL TESTING

18.1 GENERALITIES

Nelsonite processing for the production of apatite and ilmenite concentrates is an old issue. Processes were developed as early as 1913 (Waggaman) in order to treat such ore from Nelson county, Virginia. Patent was recorded in 1933 (US n° 1,999,825) by Saklatwalla and Dunn, using simple magnetic separator. The main mineral constituent of Lac-à-Paul nelsonite being contrasting, separation of these is not considered as difficult.

18.2 IOS WORK IN 2001

A series of test have been conducted by IOS between 1998 and 2001 for the FMSLSJ, and subsequently for d'Arianne.

A first test was carried upon a nelsonitic gabbro from an unknown location on behalf of the FMSLSJ (Girard, 1998), which has been pulverized <2 mm by the client.

- A 22 kilograms aliquot was submitted to gravimetric separation on a shaking (Wilfley derivative) table. Apatite did not separated well, due to a small density contrast with other silicate minerals (actinolite, olivine, etc.).
- A 2 kilograms aliquot was submitted to heavy liquid separation, using tetrabromomethane at a density of 2.90 g/cc, which performed rather well. The heavy concentrate was then subjected to high field magnetic separation with the used of a Frantz isodynamic separator, which was arduous. A clean apatite concentrate was obtained, while the ilmenite concentrate contained more than 50% silicate.
 - The apatite concentrate was submitted for assaying and was near stoichiometric at 40.55% P₂O₅, with less than 3.37% impurities. Deleterious contaminants were not analyzed.
 - Ilmenite was separated manually under a binocular, and submitted to analysis. Titanium dioxyde was assayed by gravimetric method, and returned 47.2% to 48.0%. Such grade is near to stoichiometric for ilmenite. Contaminant grades were low, with 0.45% MgO, 0.37% Cao.

A second test was performed for d'Arianne Resources in 2001 by IOS (Villeneuve, 2001). A series of 10 samples, 30 to 500 kilograms each, have been collected on zone n° 1 and its vicinities. These samples were mainly desegregated anorthositic gabbro interlayered of nelsonitic gabbro, typical of zones n° 1 to n° 3, and were targeted assuming that the low apatite grade could be compensated by low mining and grinding cost of this loosen material.

- Samples were crushed with a 6" jaw crusher, then with a 3/8" gyratory crusher, and finally milled with a porcelain disk pulverizer. Granulometry curves and power consumption were measured, and work index calculated (Aubin, 2000). Work indexes calculated with this protocol do not comply with Bond's index, and shall be used only as comparatives.
- Aliquots from the various grinding test were submitted to heavy liquids separation with methylene iodide at a density of 3.32 g/cc, which enable separation of ilmenite and magnetite from other minerals. The light fraction was reprocessed with tetrabromoethane at 2.90 g/cc, which enable separation of ferromagnesian and apatite from plagioclase.
- The >3.32 g/cc fraction as well as the <3.32->2.90 g/cc fraction were processed with a hand magnet to remove magnetite, and then with a Frantz isodynamic separator with an increasing field intensity. The various fractions were evaluated under binocular.
 - A clean >96% ilmenite concentrate was obtained at >3.32 g/cc and 0.2 amperes, upon grinding finer than 250 µm.

- A clean >90% apatite concentrate was obtained at 3.32-2.96 g/cc and diamagnetic fraction.
- Recovery was reported as rather low, mass balance calculation was not achieved.
- Cleanliness of the concentrates is attributed to physical property contrast between ore and gangue, absence of hornblende which could contaminate the ilmenite concentrate, absence of aluminosilicate which can contaminate the apatite concentrate, and the neat mineral contacts enabling easy liberation.
- Quality of the concentrate is apparently not sensitive to grinding mesh.
- Ilmenite assays, using ICP-OES after sodium peroxide fusion, range between 45.94% and 47.54% TiO₂, which is near stoichiometric (52.6% TiO₂). Such concentrate is better quality than usual commercial ilmenite, which typically grades 35% TiO₂. Magnesium stands at 0.06%, far below deleterious level. Calcium is assayed at 0.2 to 2.0%, likely caused by the presence of apatite. Other deleterious elements were below industry's requirements.
- Apatite grades about 41.39% P₂O₅, which is near the stoichiometric value of 42.4% P₂O₅. Deleterious contaminant levels are very low, with lead below 5 ppm, cadmium below 0.3 ppm, arsenic below 6 ppm, and other elements below detection limits. Uranium, thorium, fluorine and chlorine were not measured.

Another set of metallurgical test was commissioned to SGS-Lakefield in 2008 (Yu and Raabe, 2009, **figure 12**). Three samples were submitted, from Paul, Manouane and zone n° 2. Scope of the test was to produce clean apatite concentrates.

- Samples were crushed to 1/2 inch, split, crushed to 10 meshes, and composite into 2 kilogram charges. Four samples resulted, one for each zone plus a composite.
- Gravity separation for ilmenite was tested and promptly abandoned.
- Magnetic separation removed efficiently 30% of the iron, likely as magnetite, which is a flotation depressor. It did not prove efficient for titanium recovery.
- Rougher flotation, using soda ash as pH modifier, caustic starch as iron depressor and FA2 as collector enable a P₂O₅ recovery of 88.6% to 95.8% and TiO₂ recovery mostly negligible but up to 66.6%.
- A cleaner flotation upon the best concentrate obtained on the rougher provided a final recovery of 80.1% to 91.5%, if a few failed test are excluded, with a concentrate grading 37.0% to 40.2% P₂O₅.
- High intensity wet magnetic separation (WHIMS) upon apatite concentrate did not improve concentrate quality.

- High intensity wet magnetic separation (WHIMS) upon flotation tailings did not provided conclusive results.
- Deleterious contaminant in the apatite concentrates were:
 - Chlorine: 884 to 1201 ppm
 - Fluorine: 1.53 to 1.82%
 - Uranium: <20 ppm
 - Cadmium: <2 ppm
 - Lead: <30 to 50 ppm.

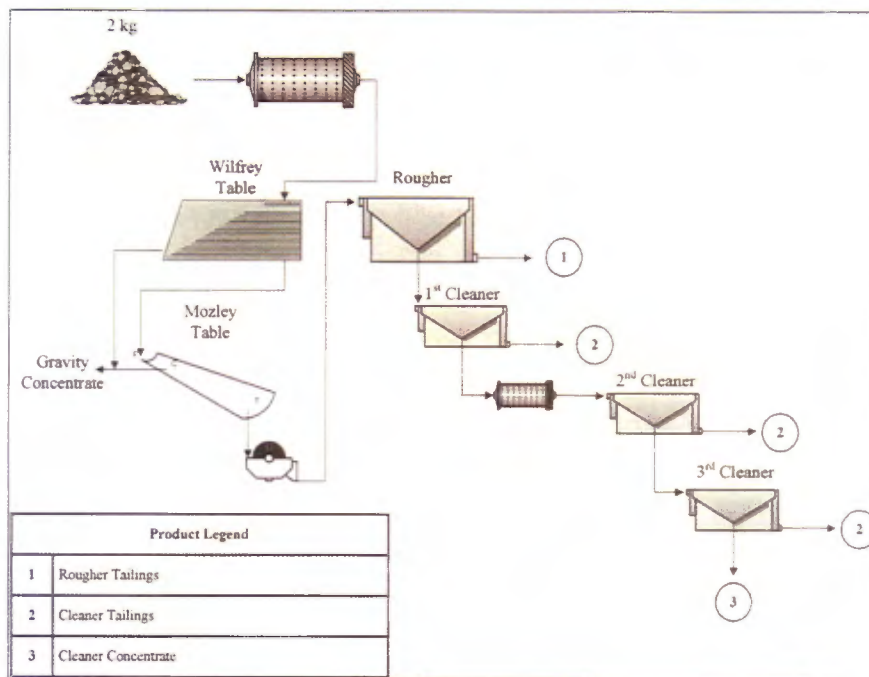


Figure 12: Flowsheet diagram used by SGS-Lakefield in their bench-scale metallurgical test (Yu and Raabe, 2009).

All these bench scale metallurgical tests are not optimized and will necessitate further development and testing. They shall only be used as indicative of what could be achievable in a full scale mill.

ITEM 19: MINERAL RESOURCE ESTIMATES

A first evaluation of the resources was attempted by d'Arianne based upon 2001 drilling campaign on zones n° 1 and n° 2 (Boulianne, 2001). These calculations are not CIM guidelines compliant and shall not be stated in a 43-101 compliant report.

A second evaluation of the resources, considered as CIM guidelines compliant, were calculated in 2009 by SGS-Geostats for zones Paul, Manouane and zone n° 2 (Duplessis, 2009). These resources are:

- Based upon historical and 2008-2009 drill campaign.
- Topography and elevation as well as available collars were certified by a land surveyor.
- A drill hole database was provided by d'Arianne on May 8th 2009, and duly verified by SGS-Geostats for errors and inconsistencies.
 - 57 drill holes, total of 5708.46 metres.
 - 2440 assays including P₂O₅, TiO₂ and other major oxides.
 - 707 lithology descriptions.
 - 36 deviation tests.
- Mineralized envelope was based mostly upon P₂O₅ grades. Lithology and structures are not sufficiently described to be usable.
- Density measurements made both by SGS on Manouane zone and d'Arianne on Paul a n° 2 zones. It is in the author opinion that these measurements are not sufficiently abundant and accurate to support accurate resource estimates. A significant density difference is expected between nelsonites and anorthosite, and proper density shall be assigned to each resources blocks. Such density can be calculated from the analyses if a set of accurate density is calibrated for a set of samples. Fixed density were used for calculation:
 - 3.23 t/m³ for zone n° 2.
 - 3.58 t/m³ for Paul zone.
 - 3.58 t/m³ for Manouane zone.
- Volume calculations were made by using SECTCAD and BLOCKCAD software, proprietary to SGS-Geostats. These calculations can not be reviewed by the author, who fully relies on C. Duplessis for such.
- Sample's length was standardized at 3 metres through compositing and application to dimensionless points.
- No capping on grade has been applied.
- Missing assays and intervals were assumed to be zero grade.

- Interpolation grid, or voxel size, is set at 10 metres wide, 10 metres long and 10 metres thick, parallel to base line.
 - Zone n° 2: 161 columns, 179 rows, 32 benches, 20272 voxels
 - Paul zone: 171 columns, 81 rows, 32 benches, 30669 voxels.
 - Manouane zone: 141 columns, 104 rows, 32 benches, 40698 voxels.
- Grade (%P₂O₅, %TiO₂) is interpolated by inverse of distance on every nearby 3 metres composites.
- Search ellipsoid was set at 350 metres by 150 metres by 75 metres, maximum of 10 composite points and 4 from same hole, minimum of 2 composite points.
- No variograms were provided.
- Resources calculations were provided for cut-off grades of 0%, 2%, 4% 6% and 8% P₂O₅ (**figure 13**).
- All resources were classified as INFERRED, as indicated in *table 6*.

Table 6: Mineral resources estimate at 2% P₂O₅ cut-off grade.

Zone	Class	Tonnage	Density	%P ₂ O ₅	TiO ₂
Paul	Inferred	99,315,000 t.	3.58 t/m ³	7.84%	8.24%
Manouane	Inferred	140,632,000 t.	3.58 t/m ³	5.77%	9.01%
Zone n° 2	Inferred	64,099,000 t.	3.23 t/m ³	4.52%	4.51%
Total	Inferred	304,046,000 t.	3.51 t/m ³	6.18%	7.81%

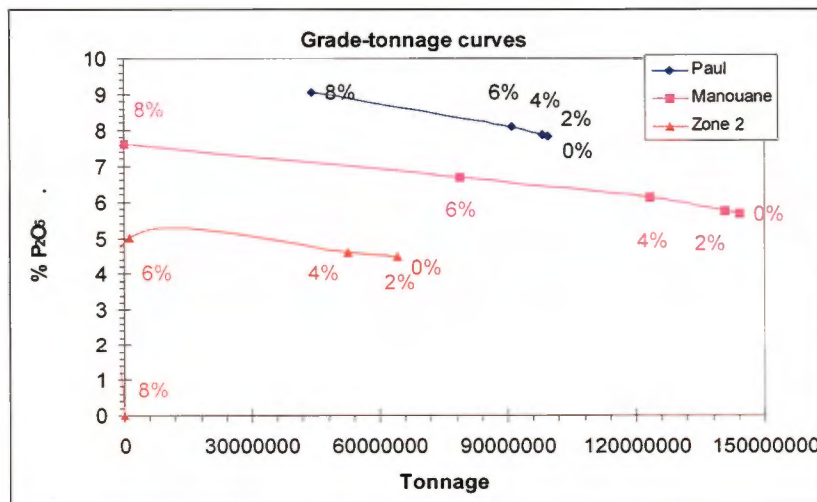


Figure 13: Relationship between grade and tonnages as calculated for the Paul, Manouane and zone 2, using various cut-off grades. Estimates made by SGS-Geostats. Tonnages at 0% cut-off are constrained by available drilling.

The author does not have the ability nor the software needed to reproduce SGS-Geostats calculation, and has to rely on C. Duplessis. However, the author did manually calculate simple block diagrams which enable him to approximate SGS-Geostats results within 20-25%. Such reproducibility is considered sufficient considering the "inferred only" classification and the various shape assumption made by SGS-Geostats. It is in the author opinion that:

- SGS-Geostat calculations are acceptable, within the precision needed for inferred resources.
- There is no urge to review this calculation in order to refine the model until more drilling is available to constrain the model.
- Largest errors are likely related to volume extrapolation outside the drill pattern, but not to interpolation methods and computation algorithms. Density measurements, geometric control and assays precision will also need to be addressed.
- Considering that all three deposits are open at depth, it is considered that tonnage can easily be increased.
- Largest uncertainties in regard to economic models are still related to resources.
- Resources models using 2% P₂O₅ cut-off are unconstrained and shall be considered as open.

ITEM 20: OTHER RELEVANT DATA AND INFORMATION

20.1 FOREWORDS

The scope of the current report was to provide d'Arianne with a preliminary economic assessment of the Lac-à-Paul project in regard to apatite production. This assessment is intended as a decisional tool in regard to justifying further investment to bring the project into prefeasibility.

The author considered d'Arianne project strictly as a mining operation, producing apatite concentrate. It did not consider the opportunity for d'Arianne for refining its apatite concentrate into phosphoric acid.

The author considered d'Arianne project strictly as a mining operation, producing apatite concentrate. It did not consider the opportunity for d'Arianne for refining its apatite concentrate into phosphoric acid. Assuming the mining operation being viable, this option will have to be considered in the future. However, such evaluation is outside the expertise of the author and will require involvement of specialized firms.

20.2 PHOSPHATE MARKET

Phosphate is a non-renewable, non-recyclable and non-substitutable commodity, however an essential commodity.

Although the fifth largest mineral commodity in term of value produced in the world, phosphate is an industrial mineral, with all its market peculiarities. Understanding of this market is needed to address the economic assessment and the project's viability. Most of the information in this section is inspired from a confidential report produced by British Sulphur Consultant, details of which can not be disclosed¹².

20.3 USAGE

All the phosphates produced in the world go into phosphoric acid production (H_3PO_4). This acid is used either by the fertilizer industry (87% in 2007) as "green merchant grade" (or MGA) or by food additive and other industrial chemical industry as "white technical grade" phosphoric acid. MGA is produced by attacking phosphate rocks by sulphuric acid, which represent 72% of total phosphoric acid production. Upgrading merchant grade to technical grade is made by solvent extraction, to produce a "purified wet process acid" or PPA. Production of reagent grade (very pure) acid, such as used in

12 D'Arianne bought a copy of the market study published by British Sulphur Consultant. For such, they signed a confidentiality agreement not to disclose or disseminate the study. D'Arianne made an arrangement with BSC to allow the author to use the study for the specific purpose of the present report. Detail from this study cannot be publicly disclosed by D'Arianne, an issue which shall be considered with care by the author.

chemical industry, requires a different process, where phosphate rocks are reduced in arc furnace into elemental yellow phosphorus, which is then burn in the air to produce phosphorus pentoxide (P_2O_5), dissolve in water to produce the acid. Technical grade phosphoric acid is used animal feed supplement, detergent, human food additive and various other applications (*figure 14*).

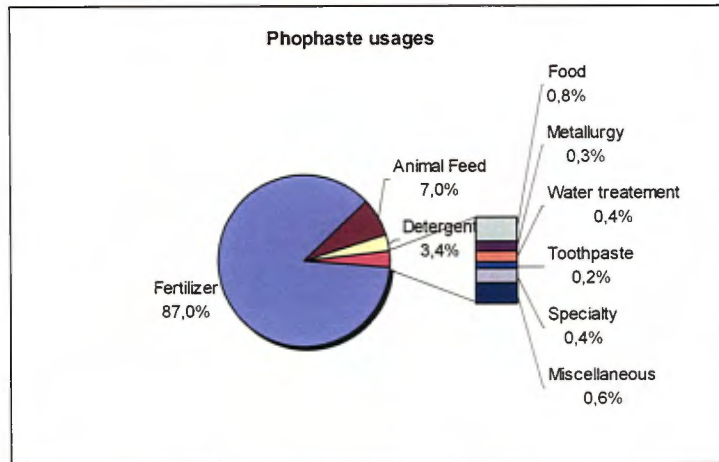


Figure 14: Phosphates uses. All but fertilizer require technical grade phosphoric acid.

Phosphoric acid is transform into a variety of chemical compound: MAP, DAP, TAP (mono, di, tri-ammonium phosphate) for the fertilizer industry, DCP, MCP, DFP for the feed industry, STTP (sodium tripolyphosphate) for detergent, etc. Although there is only handful of phosphoric acid conversion plant in North America, there is numerous plants (clients) converting acid into fertilizer. This relates to the fact that nitrate-base fertilisers being hazardous material, their transportation costs are elevated and plants are located close to markets.

20.4 MARKET STRUCTURE

The main end-product for phosphate is fertilizers. Fertilizer demand is driven by crop production. Crop production, mainly as grain, is expected to increase steadily due to human population growth, changing feed habits of emerging middle class from developing economies (BRIC), and potentially the increase in biofuel demand in mature economies. This increase in fertilizer demand have to be balanced by an increase in phosphate production, both at mining level and phosphoric acid conversion level. Increase in world demand is expected to grow at 2.1% per annum according to BSC.

The world phosphate rock consumption hovers around 170 millions tons per year (2007). The world phosphate resource base exploitable at less than US \$40/ton is pegged at 32 billions tons; triple this number for us \$60/ton cut-off. This represent about 200 years of reserve. There is no mid-term commodity shortage.

Phosphate production capacity is roughly in equilibrium with phosphoric acid production capacity. Phosphate price on the market is dictated by production cost, not by availability. Phosphate rock production is limited by the phosphoric acid plants capacity. Therefore, phosphate production is constrained both downward by mining capacity and upward by refining capacity. No premium is paid for the resource itself. Furthermore, most fertilizer producers are vertically integrated. Therefore, phosphoric acid plants are located near phosphate mines, which are in a captive market. Phosphate price is usually not volatile, and only temporary imbalance between production capacity and consumption can cause prices to fluctuate on the spot market. Mining capacities are currently estimated at 211 millions tons/year, operating at 82%. Stimulated by last year price soar, producing capacities are expected to expand to 281 millions tons/year by 2017, while consumption is expected to expand to 216 millions tons, for 77% operation capacity. Phosphate market is globally expected to deteriorate due to this increase in capacity.

Most phosphate producers are vertically integrated, if not government run. Therefore, phosphate is not a significantly traded commodity on the international market.

Phosphate deposits are scattered around the world. Phosphates are consumed by agriculture, thus all around the world. Most phosphate producers are vertically integrated, if not government run. Therefore, phosphate is not a significantly traded commodity on the international market, with only 31 millions tons traded, or 18%. Only about half of this trade is related to intercontinental exchanges. Trading fluxes (2007) are indicated on **figure 15** (taken from BSC).

- Exports are dominated by Morocco.
- European market is dominated by import from Russia and Morocco.
- North American deficit is imported from Morocco.
- Asian deficit, caused by Chinese export reduction, is imported from Africa.

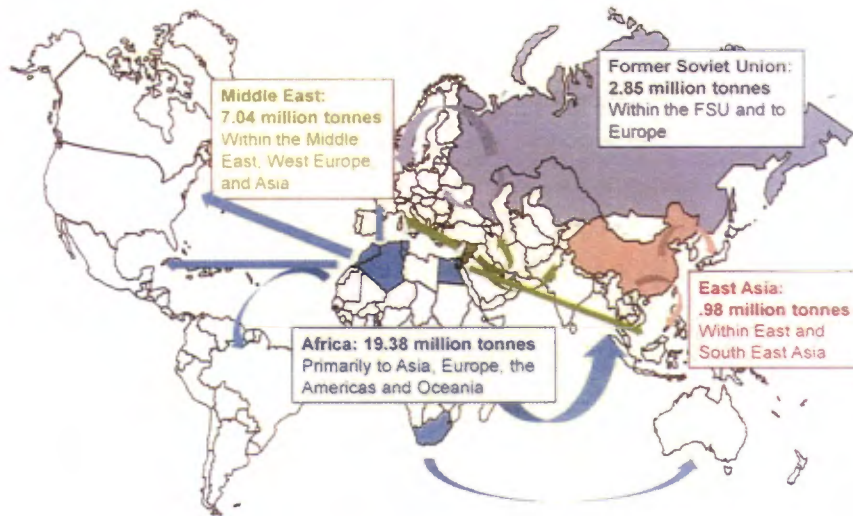


Figure 15: International phosphate trading routes for 2007 (Taken from BSC 2008).

Morocco, with the largest base resource and port proximity to producer, dominates the export market. Phosphates prices are usually stated as FOB Casablanca, for a 72% BPL¹³ (32% P₂O₅). To this price, shipment cost to importing country shall be added.

As many other mineral commodity, phosphate price shows a long term decline until 2007, when it reach its minimum at US \$50/ton (**figure 16**). This decline is related strictly to mining methods improvement. In 2007, the market underwent a dramatic increase in phosphate prices, which peaked at US \$450/ton. Causes are multiple, some being conjectural, some being structural. Among the structural causes are the increase in fertilizer demand, withdraw of China as net exporter, and consolidation among producer. BSC forecast mid-term price to stabilize around US \$70/ton, FOB Morocco 72% BPL.

¹³ BPL: Bone phosphate of lime, the standard unit used by the industry to express tricalcium phosphate grade, Ca₃(PO₄)₂. 100% BLP = 45.8% P₂O₅.

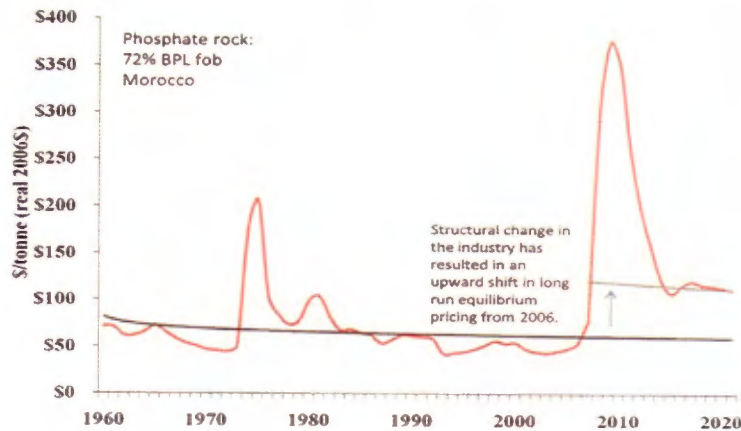


Figure 16: Phosphate price through time (taken from BSC 2007).

Transportation cost must be added to the commodity price to evaluate the competitiveness of a project.

Phosphate is a bulk commodity, the value of which can be lower than its transportation cost. Transportation cost must be added to the commodity price to evaluate the competitiveness of a project in regard to a specific market. Transportation savings can then maintain viable a high-cost producer if close to its market.

D'Arianne project is likely to be a medium cost producer. It will not be capable to compete against Morocco or Middle-East producers on their traditional export market. D'Arianne project is considered to be likely viable on the domestic North American market, and maybe on the Western Europe market, where its production cost can be compensated by low delivery cost, and where its low contaminant level is beneficial.

20.5 COSTS FOR TRANSATLANTIC SHIPMENTS

Morocco phosphate 72% BPL is thus estimated to cost US \$110-120 per ton delivered in North America.

Expediting bulk commodity by boat usually requires chartering of the vessel. Chartering contracts are highly volatiles, and can shift by an order of magnitude depending on availability and market, as exemplified on the Baltic Dry

Index¹⁴ Bulk carrier vessels chartered for dry commodities such as Phosphate are usually Handymax class vessels (35,000-75,000 tons), typically at us \$50,000 per day. Including loading, unloading, stand-by time and seafaring, transatlantic shipment costs are estimated at US \$40-50 per ton. This cost has to be added to FOB Morocco phosphate delivered in Tampa, or inversely, d'Ariane shipment delivered in Rotterdam. Morocco phosphate 72% BPL is thus estimated to cost US \$110-120 per ton delivered in North America.

20.6 NORTH AMERICAN MARKET

North America is characterized by a mature and industrialized agriculture, which traditionally relies on chemical fertilizer. North America demand amounted at 34.8 millions tons in 2007, the bulk of which (98%) is in United States. This demand is expected to decrease to 31.3 millions tons by 2012, and then stabilized (**figure 17**). This decrease is related to more efficient agricultural practices and environmental constraints. North America production capacity currently set at 36.9 millions tons (2007), but is expected to decline to 34.7 millions tons. This decline takes account of the new producers such as Phoscan. Despite this capacity, North America produced 28.5 millions tons in 2007, for 84% utilisation. This represents a deficit of production of 2.8 millions tons in 2007, which required to be imported from Morocco. Production is not expected to increase significantly for the next ten years and the deficit is considered as endemic.

Filling the endemic phosphate rock deficit of North America shall be considered as prime opportunity for d'Ariane.

¹⁴ <http://www.dryships.com/pages/report.asp>

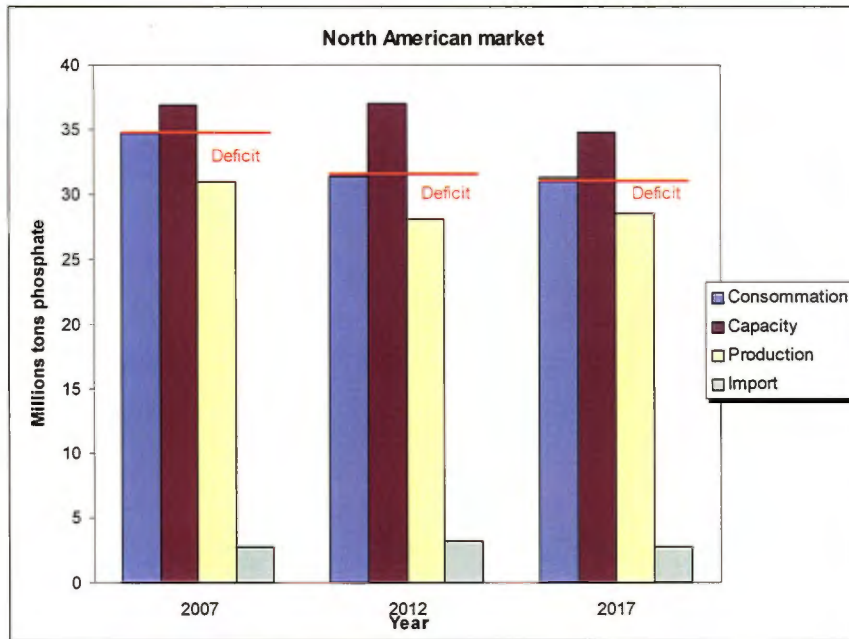


Figure 17: North American phosphate market outlook (source of Data: BSC).

Best phosphate deposits from Florida are exhausted, four mines are planned to close in the next 10 years, while environmental restrictions and social acceptability prevent opening of new mines.

North American phosphate consumption is dominated by Mid-West wheat and corn belt. North America phosphate production is dominated by Florida, in the Tampa area (figure 18). Large open pit mines runs on sedimentary phosphorite, feeding adjacent phosphoric acid plants. Mosaic is the dominant player. However, best deposits are exhausted, four mines are planned to close in the next 10 years, while environmental restrictions and social acceptability prevent opening of new mines. Production is in decline, even if capacity is maintained. Bulk of imports from Morocco is dedicated as replacement feed for Mosaic acid plants. Prices of these phosphate rocks delivered on Tampa are not disclosed.

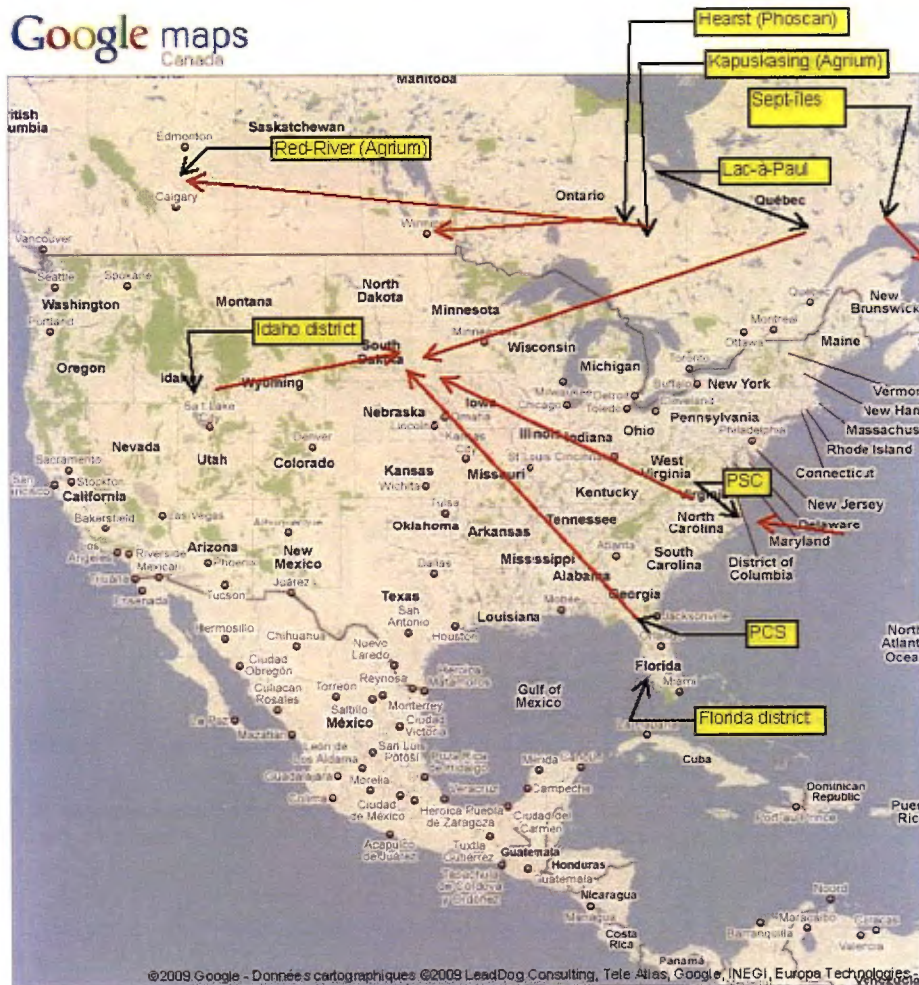


Figure 18: Map of North America with location of the main phosphate producer and shipping route. United State mid-west markets typified as South Dakota.

Potash Corporation of Saskatchewan (PCS) is the second largest player. It runs two operations located in northern Florida and North Carolina. Production is expected to be stable in foreseeable future.

Idaho is the second American production center, with mines and phosphoric acid plants runs by CF Industries, Agrium, J.R. Simplot and Monsanto.

Idaho is the second production center, with mines and phosphoric acid plants runs by CF Industries, Agrium, J.R. Simplot and Monsanto. Steady production is expected, except for Agrium mines which are near to exhaustion. Providing Agrium phosphoric plant shall be considered as a potential market for d’Arianne.

Finally, Northern Ontario has emerged as phosphate district, with Agrium's Kapuskasing mine and the advanced Phoscan project in Hearst. Both of these projects are mining apatite-bearing carbonatite (known as "foskorite"), and thus produce clean apatite concentrates, similar to d'Arianne concentrate. Kapuskasing concentrate is shipped by rail to Red River phosphoric acid plant in Alberta. Phoscan is expected to build a phosphoric acid plant directly in Hearst, but to ship the acid in Manitoba for ATP conversion. Selling price for apatite concentrates is not disclosed.

20.7 SHIPMENT COSTS WITHIN NORTH AMERICA

While most phosphate production is from Florida, fertilizers are sold all over North America, and principally in the corn-belt and wheat-belt, in the American mid-west. North America is disserved by a dense and efficient railway network, which account for most of the domestic bulk commodity shipment. Hauling charges by rail are volatiles and complex, being quoted on spot price. Most localities are disserved by a single railway therefore origin and destination are usually disserved by different companies with complex agreements. Dry commodities, such as phosphates and fertilized, are typically shipped by covered hoppers, 90-100 tons per car. Hauling charges are usually by car-loads, chartered or contracted.

D'Arianne production is likely to represent 60-80 carloads per day, or a complete block-train. Railcar shipment from d'Arianne could be loaded either at Dolbeau or Alma. The Dolbeau-Chambord line is run by *Northern Québec Local Interest short line* (CFILNQ), subsidiary from Canadian National Railway. Loading from Alma will require a tracking right up to Saguenay-Power on the Roberval & Saguenay (former Alma and Jonquière), a private general carrier short-line owned and operated by Rio Tinto Alcan. From Saguenay-Power to Chambord, and then from Chambord to Garneau, the line is operated by the CFILNQ, with mainline standard 286,000 lbs gross-weight capacity. However, this segment may show some congestion, and may require more sidings to accommodate d'Arianne traffic. From Garneau, the line connects with Canadian National network. Hauling charges over expected routes were extracted from the Canadian National web-site and are reported on **table 7**.

Table 7: Railway hauling charges

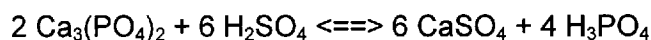
From-To	Line	Destination	Line	\$/ton	
Dolbeau	CFILNQ-CN	Red-River (AB)	Agrium	CN	\$113.50
Alma	RS-CN	Red-River (AB)	Agrium	CN	\$111.80
Dolbeau	CFILNQ-CN	Mobile (AL)	Mexican Gulf	CN-IC	\$95.58
Dolbeau	CFILNQ-CN	Tampa (FL)	Mosaic	CSX	\$40.26
Dolbeau	CFILNQ-CN	Hearst (ON)	Phoscan	ON	\$43.73
Dolbeau	CFILNQ-CN	Montreal harbour	Atlantic port	CN-CP	\$29.81
Dolbeau	CFILNQ-CN	Soda-Spring (ID)	Monsanto	UP	\$72.86
Hearst (ON)	AC-CN	Red-River (AB)	Agrium	CN	\$66.60
Chutes-Des-Passe ¹⁵	CFILNQ-CN	Montreal harbour	Atlantic port	CP	\$34.86

Rented 100 tons covered hopper, dry commodity, October 26th 2009.

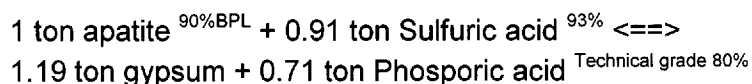
Prices in **table 7** include hauling charge and car rental. No discounts for large order were included. Fuel overcharge are not included, but are not significant compared to price volatility. The option for d'Arianne of purchasing its own fleet of hopper car has not been evaluated. The seasonal effect of grain shipping has not been evaluated in regard of hopper availability or the possibility of using their return trip to the prairies.

20.8 SULFURIC ACID

Conversion of apatite to phosphoric acid is the largest end-user of sulphuric acid, and these two markets can not be dissociated and transportation cost of phosphate, sulphuric acid and phosphoric acid must be integrated. Basic reaction is:



This translates into the following tonnages ratios:



¹⁵ Chutes-des-Passes hauling charges calculated using Chibougamau as example.

Converting apatite to phosphoric acid in Dolbeau offers about \$50 per ton (30%) saving in transportation compared to shipping the apatite concentrate.

Conversion of d'Arianne apatite production will require 1.8 millions tons per year of sulphuric acid. This is quarter the total acid produced by Canadian smelters (± 6.4 millions tons per year), or comparable to all canadian-based Ex-Strata smelters (copper, nickel and zinc). D'Arianne demands would likely exceed the sulphuric acid availability on the Eastern Canadian market. Production of sulphuric acid from sulphur combustion will likely be needed, which option was retained by Phoscan project in Hearst. Sulphur, a by-product from oil refineries, need to be hauled from Alberta. One ton of sulphur is required to produce 3.3 tons of sulphuric acid ^{93% technical grade}. Therefore, half million tons of sulphur is needed for d'Arianne project. Shipping costs of these commodities are listed in **table 8**, from Dolbeau to Calgary, according to Canadian National Railway web site. Converting apatite to phosphoric acid in Dolbeau offers about \$50 per ton (30%) saving in transportation compared to shipping the apatite concentrate. Phosphoric acid is currently sold at about us \$400 per ton, so this transportation saving represent a significant 10% of production cost.

Table 8: Rail shipping cost for commodities involved in phosphoric acid production¹⁶.

Reagent	From-to	100 t car	Per ton of apatite
Apatite	Dol ¹⁷ -Cal	\$13569	\$136
Sulphur	Cal-Dol	\$9127	\$24
Sulphuric acid	Sud-Dol	\$4468	\$46
Phosphoric acid	Dol-Cal	\$8453	\$60

20.9 WEST EUROPEAN MARKET

The only phosphate production in Western Europe is in Finland, for about 830,000 tons per year. Western Europe has to support a strong and industrialized agriculture relying on fertilizer. All phosphate and phosphoric acid have to be imported, either from Morocco and Middle East for Spain and Greece acid plants, or from Kola Peninsula in Russia for Belgium plants. Imports from Russia are apatite concentrate, similar to d'Arianne. The Russian production mainly comes from Khibiny mine, which produces 10.9 millions tons per year. Surface open-pit reserves are apparently near exhaustion, but underground reserves are of 4 billion tons at 15% P₂O₅.

¹⁶ Quoted on December 26th 2009

¹⁷ Dol: Dolbeau; Cal: Calgary; Sud: Sudbury

Russian apatite concentrate is currently sold at US \$170/ton, FOB delivered in Rotterdam. Minus the transatlantic shipment cost, this leaves about US \$130-140/ton selling price to d'Arianne. At such price, d'Arianne may consider Western Europe as a potential market.

20.10 ADVANTAGES OF APATITE COMPARED TO PHOSPHATE ROCKS

Bulk of phosphate production comes from phosphorite, an impure sedimentary rock typically associated with limestone or evaporite sequence. About 21.53 millions tons of apatite is produced from igneous source, or 12% of world phosphate production. Igneous deposits are usually higher cost producers, but also have advantages, its pros and cons being:

- Both igneous and sedimentary deposits are dominantly exploited by open-pit methods. Stripping ratios are very diverse for both types.
- Igneous deposits require a 1:3 to 1:6 enrichment factors to produce apatite concentrates, compared to 1:1.5 for typical sedimentary deposits. Mining and milling costs increase accordingly.
- Milling of igneous rocks is more energy intensive.
- Cost of production of typical apatite concentrate is estimated as twice the phosphate from sedimentary rock.
- Quality of phosphate produced from sedimentary rock is in a constant decline. From an average of 71% BPL in 1975, it averages 64% BPL today.
- Apatite concentrate from igneous origin has higher phosphorous grades than phosphate from sedimentary origin. Russian concentrates grades 86% BPL, Martison deposit is expected at 83% BPL, while d'Arianne is expected at >90% BPL. D'Arianne apatite contains 25% more phosphorous than Morocco phosphates. This shall reflect directly on:
 - Selling prices, expected 25% higher on the mere phosphorous content.
 - Shipping cost, expected 80% of Morocco on a weight basis.
 - Processing cost, since 80% of volume needs to be process.

Phosphate rock 72% BPL wet processing releases about one sixth of its weight as carbon dioxide.

The excess of %BPL is typically carbonate of lime (calcite). A typical 72% BPL Morocco phosphate contains 25-28% carbonate. Using the wet process, supplementary sulphuric acid is required to neutralize this lime. Phosphoric acid produced from 72% BPL phosphate rock requires about 30% more sulphuric acid

than from apatite. Furthermore, the end-product of lime neutralization is carbon dioxide, a greenhouse effect gaz. Phosphate rock 72% BPL wet processing releases about one sixth of its weight as carbon dioxide.

- A CaO:P₂O₅ of Morocco phosphate is typically of 1.50:1, compared to 1.34:1 for d'Arianne.
- Phosphate rocks from sedimentary origin contain significant amount of contaminant compared to apatite concentrate (**table 9**).
- Part of the contaminant, among them uranium, are partitioned into the phosphogypsum, a by-product of the wet process. This gypsum being contaminated, there is basically no industrial application for it, and is considered as a dangerous industrial residue. It then requires to be buried, adding to production cost and environmental liabilities. Phosphogypsum produced from apatite is much less contaminated and may be used as by-product, such as for wall board.
- Being more contaminated, purifying pregnant liquor from merchant to technical grade is more expensive for phosphate rock than apatite.
- Some contaminants from the wet process partly partition into pregnant liquor, thus into the merchant grade phosphoric acid. This acid is then transferred into fertilizer, soil and food chain. Stringent regulations on contaminant levels, mainly uranium and cadmium, are currently pending approval in European Union countries, which are delayed due to the lack of clean phosphate. A premium is likely to be paid in future for noxious contaminant-free phosphate source. Similar regulation is likely to be applicable for other mature agriculture, such as North America.

Table 9: Contaminant content.

	Morroco72%BPL	Russia	d'Arianne
P ₂ O ₅	31-37%	37-40%	39-40.5%
CaO	50-52%	50-51%	50-52%
CaO/P ₂ O ₅	1.50:1	1.30:1	1.34:1
Fluorine	3.6-4.1%	1-2.9%	1.5-1.8%
Chlorine	Below 500 ppm	if possible	800-1000 ppm
Cadmium	20-35 ppm	1-7 ppm	<2 ppm
Uranium	?	?	<20 ppm
Organic C	Below 0.2%	if possible	0.1-0.6%

In accordance to these, pricing of high %BPL phosphate clearly reflect on the market (**table 10**).

Table 10: Market price for various phosphate grades.

Origin	Grade	2007 \$/ton	2008 \$/ton
Russia	86% BPL	US \$80	US \$390
Morocco	80% BPL	US \$83	US \$388
Morocco	72% BPL	US \$79	US \$300
Morocco	70% BPL	US \$68	US %213
Egypt	66% BPL	US \$50	US \$168
Tunisia	60% BPL	US \$41	US \$173

20.11 ILMENITE BY-PRODUCT

The titanium minerals ilmenite and rutile are the main sources of titanium, a low density, strong and corrosion resistant metal that is important in the aerospace industry. However, the chief use (94%) of titanium minerals is in the form of titanium dioxide, a white pigment used in paint, plastics, rubber and paper.

Annual production capacity by d'Arianne is expected to be about 1 million tons ilmenite per year, or 460,000 tons TiO₂ per year.

The "*Blanc de titane*" world production is estimated at 3.8 millions tons per year. D'Arianne ilmenite (FeTiO₄) concentrate is expected to grade about 46-47% TiO₂. Annual production capacity by d'Arianne is expected to be about 1 million tons ilmenite per year, or 460,000 tons TiO₂ per year. This represents about 12% of the world consumption, or more than half the North American

market. The bulk of titanium source is from heavy sand, dominated by weathered ilmenite and pseudorutile, with TiO₂ exceeding 60%. Such ore is amenable directly to chlorine process, the preferred route. Unweathered ilmenite grades between 35% and 45% TiO₂, and is not amenable to chlorine route, and then either requires processing by sulphate route or upgrading by various processes. It is therefore more cost and capital intensive.

Rio-Tinto Iron and Titanium, formerly QIT, is the largest ilmenite consumer in the world. Based in Sorel, Québec, this plant is smelting DSO ilmenite into pig-iron and titanium-rich slag ("*Sorelslag*" and "*Upgraded slag*"). The slag is sold to be process through chlorine route to produce "*Blanc de Titane*". Although a large producer, and although its proximity to d'Arianne project, RTIT can not be targeted as market by d'Arianne. D'Arianne's ilmenite will be in the form of powdery concentrate, and would need to be pelletized or sintered prior to be smelt by RTIT process.

Selling price of ilmenite is around US \$100 per ton. However, the author is sceptical that the volume anticipated to be produced by d'Arianne can be sold entirely. A thorough market review is needed prior to take ilmenite into account in the economical assessment. Ilmenite can not, for the moment, be considered as a co-product of apatite concentrate, but just as by-product.

As ilmenite can be easily recovered from WHIMS, it recommended to d'Arianne to simply stock-pile this ilmenite and sell-it on spot market according to opportunities. *Blanc de titane* production by d'Arianne may also be a future opportunity. Ilmenite revenues were not included in the current preliminary economic assessment.

20.12 MAGNETITE AND VANADIUM BY-PRODUCT

It is estimated that nelsonite from Paul zone contains as much magnetite as ilmenite or apatite. No magnetite recovery tests were made yet, and factual magnetite content is not currently available, nor is any magnetite assays. From the ore microscopy study, it is seen that magnetite contains abundant ilmenite micro-exsolutions. This ilmenite can not be separated by conventional beneficiation. Titanium contamination up to 2-4% TiO₂, which render this magnetite not suitable for most iron smelting, and too low grade for titanium recovery. However, according to author's experience, a vanadium grade of 0.8-1.2% V₂O₃ is expected, which might make it suitable for vanadium recovery through alkali roasting process. Some chromium credits are also expected. It is recommended to carry Davis tube testing and magnetite assaying in order to test such possibility. The magnetite can easily be recovered from the LIMS and stock piled at minimal cost.

20.13 COPPER, NICKEL AND COBALT

Form 1994 to 2004, Virginia Gold Mines and Soquem carried exploration for nickel mineralisation in Lac-à-Paul vicinities. The nickel mineralization is disseminated or scattered as pods in peridotite and pyroxenite. These rock types are closely associated with the apatite-ilmenite bearing nelsonite. Therefore, some sulphide mineralization is expected as dissemination in the apatite ore, although not described in abundance nor assayed. If in sufficient amount, sulphides shall be separated by floatation after the magnetic separation. This will likely produce a commercial copper-nickel-cobalt concentrate while eliminating the acid generating minerals from the tailings. This will have to be evaluated in the course of metallurgical testing.

20.14 SCALING OF LAC-À-PAUL PROJECT

A production rate of 2 millions tons of concentrate has been used for d'Arianne project:

1. If Khibiny is excluded, all apatite mining operations are producing between 1 and 3 millions tons per year.
2. 2 millions tons per year seems to be realistic in term of phosphoric acid plant operation.
3. Actual resources in Paul zone are about 100 millions tons, thus about 20 millions tons of apatite. This allows a 10 year mining live, which is typical for starting mining project.
4. It is in the author opinion that the resources can be significantly enlarged, simply by deepening the pit and maintaining stripping ration below 1:1. A 20 years life for Paul zone alone is realistic.
5. Production of such tonnage of concentrate will require mining of 10 millions tons per year, or about 30,000 tons per day. For comparison, it represents:
 - a. Half the mining rate planned Osisko's Malartic project.
 - b. Twice the maximum mining rate obtained in Troillus mine.
 - c. Comparable to the various iron ore mining operation in Labrador.
6. No significant scale economy is made for a mining rate above 30,000 per year mining, due to limitation in equipment size.
7. Expediting of 2 millions tons per year is realistic with actual transport infrastructure.
8. This production is comparable with actual phosphate deficit in North America.
9. This volume represents about 6% of the North American market. It is unlikely that it will destabilize the market.

20.15 TRANSPORT LOGISTIC

Initial arguments against Lac-à-Paul project were its remoteness, and therefore the elevated cost for concentrate shipping to closest railhead, seaport, or town. These costs have to be included in production cost, and therefore deleterious to project economics. Three alternatives were evaluated: trucking, slurry pipeline and rail. These alternatives were reaching either a rail-head (Dolbeau or Alma) or a seaport facility (St-Fulgence or Forestville) (*figure 19*). All capital and operation expenditures were imbedded in the economic model, adjusting to throughput, fuel cost, etc.

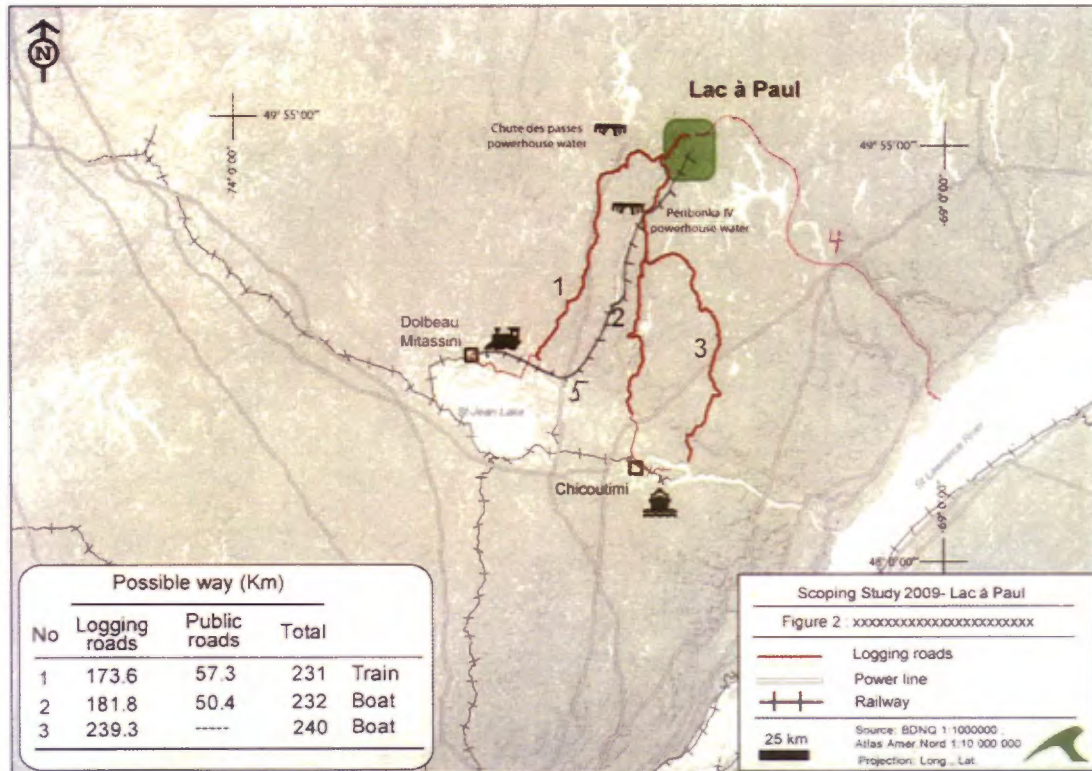


Figure 19: Shipment route available to d’Arianne. Options 1 to 4 are either for trucking or pipeline construction. Option 1 is the current “Chutes-des-Passes” road, which will have to be maintained in the event of pipeline or rail shipment. Railway route is indicated as option 5. Map modified from a d’Arianne internal report (Tolarie et Neron 2009). Option 1: Chutes-des-Passes road to Dolbeau, Option 2: Zec Onatcheway road to Alma, Option 3: Zec Martin-Valin road to St-Fulgence, Option 4: Labrieville road to Forestville, Option 5: Railway along Péribonka River.

20.16 DESTINATIONS

If d’Arianne chose the Western Europe or the Florida market, sea shipping shall be considered. If d’Arianne chose the conterminous North American market rail shipment will be needed.

Transport infrastructures will be dictated by the targeted market for the apatite concentrate. If d’Arianne chose the Western Europe or the Florida market, sea shipping shall be considered, and expedition to a sea port will be needed. If d’Arianne chose the conterminous North American market, Idaho or Alberta phosphoric acid plants for example, rail shipment will be needed. Rail-to-vessel or vessel-to-rail reloading must be avoided.

Rail shipment will require construction of a private railyard capable of handling 70 cars block-trains (4 lines of 1.2 kilometres long: in, out, waiting and escape), 10,000 cubic metres storage bins and its handling equipment, plus the spur line from railyard to shortline. Two railheads are available, in Dolbeau and Alma. Both face a similar difficulty, being located south of a large river, while oversize trucks come from the north of the same river. On both cases, construction of a bridge, if supported as part of the project, will be costly, likely the costliest item of the project.

Ocean shipping will require construction of a deep-sea port, capable of handling Handymax class vessels. Access to *Grande-Anse* or *Powell* sea-ports are not realistic, requiring routing through densely municipalized area. Sea-port appropriate sites are *L'Anse-à-Pelletier*, 16 kilometres east of St-Fulgence on the Saguenay Fjord, and Forestville on the St-Laurent Estuary. The St-Fulgence site is accessible by oversize truck through the Martin-Valin Zec road. An off-shore pier will be needed for docking. Forestville is one of seldom places along the St-Laurent where deep-sea harbour can be built with conventional docks. It can be accessed by the Labrieville road. Both installations will require a dry storage silos for 50,000 cubic metres (100,000 tons), plus various handling equipments, conveyor, etc. Construction cost for such facility is estimated at \$40 millions¹⁸.

20.17 OVERSIZE TRUCKS

These oversize trucks currently haul 150 tons charges in tandem trailers. Main forestry roads and bridges are constructed to support such charges.

Oversize trucks are currently used in the Saguenay-Lac-St-Jean area by the forestry industry, logging area being separated hundreds of kilometres from sawmills. These oversize trucks ("*Pacifiques*", "*Mastodontes*", "*Mégaloads*"), 10-14 feet wide, currently haul 150 tons charges in tandem trailers. Main forestry roads and bridges are constructed to support such charges. They can share the roads with general traffic, but are not allowed on public roads. They are restricted to privately built but publicly owned roads, dedicated for their traffic. Similar trucking logistics can be used by d'Arianne:

- Using 150 tons, tandem trailer, is realistic, which trailers will be overloaded, but not oversized as are logging trucks.

¹⁸ Estimation made by comparison made with a New-Orleans dock with similar capacity, actualized and upgraded with necessary ancillary.

- Custom built covered hopper, 75 tons, 30 feet long, will be required. Tractors for such are commercially available.
- Speed limitation is 45 km/h, which will require about 10 hours per round-trips. A fleet of 17 vehicles is needed, assuming 70% availability, at the cost of \$600,000 pieces.
- Road improvement will be needed for any of the alternative, and a share of the road maintenance has to be assumed by d'Arianne.
- Loading and unloading facilities, storage facilities at receiving end, and maintenance facilities were added.
- A private rail yard is needed if railway expediting is retained. Similarly, a private seaport facility is needed if seaborne shipment is used.
- These trucks being custom built for a single client, they will have to be bought and operated by d'Arianne. An initial investment of \$31.2 millions is required, including facilities (*tables 11 and 12*).
- Transportation cost of \$13.61/ton is calculated for the shortest route, from Lac-à-Paul to Mistassini.

Table 11: Operating cost for trucks

	Standard	Pacific	Megaloads
Load (tons)	32	90	150
Speed, km/h	70	50	45
Buying cost	\$200 000	\$400 000	\$600 000
Maintenance	\$120 000	\$240 000	\$360 000
Life expectancy	500 000	700 000	700 000
\$/km	\$0,64	\$0,91	\$1,37
Fuel L/100 km	60	100	120
Salaries \$/h	\$50	\$50	\$55
Fuel cost \$/l	\$0,90	\$0,90	\$0,90
Hourly Opex	\$137	\$146	\$171
T/Km Opex	\$0,061	\$0,032	\$0,025
Distance	410	410	475
\$/tons	\$25,04	\$13,28	\$10,37
Trailer lenght	4,0	11,3	18,8
Size	16', 2 axles	35', 4 axles	2x35', 4 axles

Table 12: Capex-Opex estimates for trucking (Lac-A-Paul to Mistassini option)

	Units	Unit cost	Capex	Unit	Op. cost	Opex/year	Opex/ton	
Road MariaChap. MRC	km	165	\$20 000	\$3 300 000	km	\$5 000	\$825 000	\$0,41
Road LacStJean MRC	km	40	\$100 000	\$4 000 000	km	\$10 000	\$400 000	\$0,13
Bridges	--	2	\$2 500 000	\$5 000 000		- \$	- \$	- \$
Trucks	--	17	\$600 000	\$11 200 000	t/km	\$0,025	\$20 702 188	\$10,37
Transboarding	--	1	\$5 000 000	\$5 000 000	\$/h	\$1 000	\$3 840 000	\$1,92
Rail	\$/km	5,5	\$500 000	\$2 772 897	\$/h	\$200	\$1 536 000	\$0,77
Total				\$31 272 897			\$27 303 188	\$13,61

Four different routes are available for trucking:

Lac-à-Paul to Mistassini:

- Shortest distance, lowest investment, lowest operating cost.
- 205 kilometres one way.
- Using a network of all-year maintained forestry roads: Manouane road, Chutes-des-Passes road, Brûle-Neige road, Petite Péribonka road.
- Limited road upgrading is required, likely about 40 kilometres from *Chutes-des-Passes* to the project. Two bridges to be upgraded (Serpentine and Petite-Péribonka rivers).
- Unloading facilities in the planned Mistassini industrial park.
 - Using Mistassini as terminal requires the construction of a rail spur from Bowater paper mill, on the south shore of Mistassini River, to the industrial park, across the river. This project is currently in feasibility by the regional municipality (MRC Maria-Chapdelaine). Bridge construction is estimated at \$30 millions.
 - In the absence of a rail bridge across the Mistassini River will require to build the terminal in L'Afrique, on the south side of Dolbeau. This will add about 40 kilometres to the distance, plus bridges across Mistassini, Mistassibi and Aux-Rats rivers. This will add substantial expenditures and operation cost, and will likely makes Dolbeau as a second choice.

Lac-à-Paul to Alma:

- Considered as second best option.
- 232 kilometres, one way.

- Using a poorly-maintained gravel road network over 182 kilometres, through the Onatcheway ZEC and reservoir.
- The gravel road will require upgrading, estimated at \$27 millions.
- A 50 kilometres private road will have to be built from Onatcheway Reservoir to Alma.
- A private bridge will have to be built to allow crossing of Grand-Décharge (Saguenay River). Construction cost of such a bridge (400 metres span, 30 metres high) is poorly constrained, but likely in the excess of \$15 millions.
- Unloading facility and rail yard have to be built on east side of Alma, on Ilse Maligne, an area devoided municipal infrastructures, but still close to residential areas.
- Capital expenditures are estimated at \$74 millions, with an operating cost of \$15.59 per ton.

Lac-à-Paul to St-Fulgence:

- Not studied in detail, needed only if ocean shipping is retained.
- 210 km, one way.
- Major road upgrading and construction. Cost in excess of 30 millions

Lac-à-Paul to Forestville

- Not studied in detail, needed only if ocean shipping is considered
- 222 kilometres, one way
- About 50 kilometres to be built, plus 50 kilometres to be upgraded.
- About 80 kilometres on paved highway (Labrieville to Forestville). Right of way to be negotiated with Québec Department of Transport. If not granted, construction will be required.
- Crossing of a small urban area. Might not be socially acceptable.

20.18 SLURRY PIPELINE

The use of slurry pipeline is getting more and more acceptance in the mining industry, even in northern climate.

The use of slurry pipeline is getting more and more acceptance in the mining industry, even in northern climate. D'Ariane requested a estimate from Pipeline System Incorporated (PSI, Mackowiak, 2009) for the construction and operation cost of such pipeline from Lac-à-Paul to Saguenay River (Chicoutimi).

Configurations were:

- 231 kilometres.
- 1 millions tons per year of apatite, plus 0.5 million tons per year of ilmenite, in batch operation.
- 8" OD steel pipe.
- 2 piston diaphragm pumps at mine site, plus tanks, etc.
- 2 intermediate pumps, at km 77 and km 154, powered by diesel generator.
- Diesel pipeline, 4" OD steel pipe.
- All the ancillary equipments, tanks, agitator, Scada, communications, etc.
- Construction cost: \$232 450 000.
- Operating cost: \$20 676 000 per year, or \$13.78/tons.

This estimate suggests an operating cost higher than for trucking, atop of the humongous construction cost. The bulk (>70%) of operating cost is electrical power for the pumps. A revision of this estimate was done by the author in collaboration with PSI.

Power requirements are dictated by fluid rheology. This can be diminished by either reducing slurry's viscosity, which may cause settling, or increasing the pipe diameter (lesser volume/surface shear strength). Increasing the pipe diameter will increase the pipe cost (a direct function of diameter and steel requirement) but does not increase significantly construction costs. Using 14" OD steel pipe will likely reduce shear strength sufficiently to remove the requirement of auxiliary on-line pumps, cutting power consumption by 70%. Energy costs were adjusted to Hydro-Québec's G-rates. The revised cost estimate to built an operate a slurry pipeline from Lac-à-Paul to Dolbeau is indicated in **table 13**, and comparison between different destination in **table 14**. The costs here presented were compared with various other slurry pipeline (Martison (Phoscan), Kémag and Labmag (New Millenium) and seems realistics.

Table 13: Construction and operation cost for various pipeline options.

Option 1: Pipeline to Albanel		Unit	Unit cost	Investment	Unit cost	Operation cost /year	Opex/ tons
Access road	km, \$/km	175	\$20 000	\$3 500 000	\$5 000	\$875 000	\$0.44
Pipeline infrastructure		1	\$28 347 354	\$28 347 354	\$5 718 241	\$5 718 241	\$2.86
Pipeline	km, \$/t/km	205	\$631 493	\$129 455 968	\$0,0127	\$5 217 136	\$2.61
Bridges		4	\$1 000 000	\$4 000 000	- \$	- \$	- \$
Handling equipments		1	\$5 000 000	\$5 000 000	\$1 000	\$3 840 000	\$1.92
Railyard	km, \$/h	5,5	\$1 000 000	\$5 545 795	\$200	\$1 536 000	\$0.77
Total				\$175 849 117		\$17 186 377	\$8.61
Option 2: Pipeline to Forestville		Unit	Unit cost	Investment	Unit cost	Operation cost /year	Opex/ tons
Access road. construction	km. \$/km	50	\$100 000	\$5 000 000	\$1 000	\$50 000	\$0.03
Access road. maintenance	km. \$/km	165	\$20 000	\$3 300 000	\$5 000	\$825 000	\$0.41
Pipeline infrastructure		1	\$62 353 000	\$62 353 000	\$6 170 000	\$6 170 000	\$3.09
Pipeline	km. \$/t/km	222.5	\$631 493	\$140 507 087	\$0.0117	\$5 217 136	\$2.61
Bridges		5	\$1 000 000	\$5 000 000	- \$	- \$	- \$
Handling	\$/hour	1	\$5 000 000	\$5 000 000	\$1 000	\$3 840 000	\$1.92
Sea port	\$/t	1.0	\$38 929 131	\$38 929 131	\$5	\$9 982 431	\$5.00 ¹⁹
Total				\$260 089 218		\$26 084 566	\$13.07
Option 3: Pipeline to St-Fulgence		Unit	Unit cost	Investment	Unit cost	Operation cost /year	Opex/ tons
Access road. construction	km. \$/km	20	\$100 000	\$2 000 000	\$1 000	\$20 000	\$0.01
Access road. maintenance	km. \$/km	165	\$20 000	\$3 300 000	\$5 000	\$825 000	\$0.41
Pipeline infrastructure		1	\$62 353 000	\$62 353 000	\$6 170 000	\$6 170 000	\$3.09
Pipeline	km. \$/t/km	210	\$426 983	\$89 666 364	\$0.053	\$5 217 136	\$2.61
Bridges		5	\$2 000 000	\$10 000 000	- \$	- \$	- \$
Handling	\$/hour	1	\$5 000 000	\$5 000 000	\$1 000	\$3 840 000	\$1.92
Sea port	\$/t	1.0	\$38 929 131	\$38 929 131	\$5	\$9 984 431	\$5.00
Total				\$211 248 495		\$33 135 084	\$13.05

¹⁹ Usually included in ocean shipping cost.

Table 14: Comparison between different pipeline options, handling terminal not included

	PSI-Initial	PSI-Dolbeau	PSI-Forestville	PSI-St-Fulgence	Martison
Length km	231	205	222.5	210	86
Diamètre "	8	16	16	16	8.6
Throughput. t	1 500 000	1 996 486	1 996 486	1 996 486	1 160 000
Pumps	3	1	1	1	1
Denivellation m.	360	360	470	470	-20
Slope	0.16%	0.18%	0.21%	0.22%	-0.02%
Power cost kW/h	0.447 \$	0.447 \$	0.447 \$	0.447 \$	
Pumps kW	1331	1331	1331	1331	1331
Capital expenditures					
Pompe 1 and Slurry tanks	21 739 964 \$	21 739 964 \$	21 739 964 \$	21 739 964 \$	21 739 964 \$
Pressure Monitoring Stations	\$958 36	\$958 364	\$958 364	\$958 364	\$479 182
Pompe 2	\$17 480 566	- \$	- \$	- \$	- \$
Pompe 3	\$17 480 566	- \$	- \$	- \$	- \$
Terminal station and tanks	\$3 088 063	\$3 088 063	\$3 088 063	\$3 088 063	\$3 088 063
Pipe material	\$25 107 017	\$44 562 239	\$48 366 332	\$45 649 122	\$9 347 201
Pipeline construction	\$78 692 365	\$83 802 259	\$90 956 110	\$85 846 216	\$21 972 543
Etylene Glycol flush	\$25 000 000	\$50 000 000	\$50 000 000	\$50 000 000	- \$
Scada-Leak detection system	\$1 064 849	\$1 064 849	\$1 064 849	\$1 064 849	\$1 064 849
Telecom	\$1 496 113	\$1 496 113	\$1 496 113	\$1 496 113	\$1 496 113
Cathodic protection	\$1 229 901	\$1 091 471	\$1 184 645	\$1 118 092	457 885
Total	\$193 337 77	\$207 803 322	\$218 854 441	\$210 960 785	\$59 645 802
Total indiqué dans leur rapport					\$48 839 127
Ancillary cost	\$63 308 48	\$28 347 354	\$28 347 354	\$28 347 354	\$27 868 172
Cout au Km	\$454 672	\$631 493	\$631 493	\$631 493	\$369 507
Yearly operation cost					
Salaries	\$3 482 057	\$3 482 05	\$3 482 057	\$3 482 057	\$3 482 057
Power kW/h	\$35 014 333	\$11 671 444	\$11 671 444	\$11 671 444	\$11 671 444
Power cost	\$15 651 407	\$5 217 136	\$5 217 136	\$5 217 136	\$5 217 136
Maintenance. consommables	\$2 342 669	\$1 490 789	\$1 490 789	\$1 490 789	\$1 118 092
Service contract	\$266 212	\$266 212	\$266 212	\$266 212	\$266 212
Emergency plan	\$266 212	\$266 212	\$266 212	\$266 212	\$266 212
Management	\$212 970	\$212 97	\$212 970	\$212 970	\$212 970
Total cost	\$22 221 527	\$10 935 377	\$10 935 377	\$10 935 377	\$5 345 544
Cost per ton	\$14.81	\$5.48	\$5.48	\$5.48	\$9.11

It can be noticed that operation cost for the various options are very similar, regardless of pipeline length. Handling cost at seaport includes boat loading, which is usually attributed to shipping cost. It shall be considered that slurry velocity shall not be reduced in order to avoid settling. A larger diameter pipe also implies larger throughput. In fact, a 14-16" pipeline can handle more than 10 millions tons per year throughput, 5 times d'Arianne production. Batch operation will be required, with according storage and handling capacity.

Freezing of the pipeline is frequently raised as an issue for winter operation. A detailed study of such situation is presented in New Millenium's project, carried by Brass Engineering International LLC, who proposed the following precautions. Allowing these, they calculated that the slurry can withstand a temporary stall up to 8 days without freezing. The following precautions were included in design and cost evaluation:

- Insulation of the pipe with 1" polyurathane foam coating.
- Pipe burring at 1-1.5 metres depth.
- Keeping the pipeline running with water between batches.
- Flooding the pipe with glycol in case of protracted emergency stall.

A residual risk related to pipeline freezing will always be present in such operation. Freezing of the pipe would stall shipments until the following spring, which can be judiciable to d'Arianne.

Shipment costs of concentrate with the use of a pipeline are about 60% of trucking costs, or about \$8 per ton. But considering the large initial investment and forecast d'Arianne tonnage, a 14 years payback time is estimated. At the current tonnage, pipeline construction is not considered profitable. At the least twice the tonnage would be required.

20.19 RAIL

Construction of a private railway has been briefly evaluated (the author had various discussion with Canarail Consultants Inc. on this issue). Usually, railway construction is usually not considered profitable for less than 5 millions tons per year, considering its large capital investment. However, in the event that rail shipment from Dolbeau to North America is retained, construction of a short line to the deposit shall be evaluated.

From the Canadian National Railway website, cost increase for hauling over a supplementary 200 kilometres of shortline is estimated at approximately \$5 per ton. Rail

construction. across the rugged Canadian Shield, is roughly estimated at \$2 millions per kilometres (standard gauge, 120 lbs/yard, welded continuous. single track):

- Earthwork, 50.000 m³ per kilometre at \$20/m³: \$1 000 000/km.
- Railbed and formation: 10.000 m³ per kilometre at \$50/m³: \$500 000/km
- Steelwork: 120 t/km at \$500/ton, plus \$50/tie, 2000 ties/km, x2 for installation, about \$500 000/km

A suitable route was identified along the Peribonka River. a total distance of 190 km to Alma, or 200 kilometres to Dolbeau. On either route, a major bridge has to be built, either across Grande Décharge near Alma, or across Peribonka River to Dolbeau. Construction cost is expected in excess of \$400 millions. Compared to trucking, rail haulage bring an operation saving of about \$8/ton (60%), and will minimally require 5 millions tons production per year for a 10 years payback.

Being connected to the national network, the rail line will require a general carrier licence. Some traffic can be expected from the logging industry.

20.20 CONCLUSIONS REGARDING TRANSPORT LOGISTICS

With the current scope of producing 2 millions tons per year, the trucking option is recommended to d'Arianne.

With the current scope of producing 2 millions tons per year, the trucking option is recommended to d'Arianne. A significant increase in resource base and a much larger mining operation are needed to consider other transport options.

It shall be considered that tucking is the least acceptable option in regard of social and environmental impact. Trucking the concentrate consume about 3.2 litres of fuel per ton, producing 12 kilograms of carbon dioxide, or 1% of the shipped weight. It is estimated that 40 truckloads per day will be needed, both way, plus workers, fuels and supply vehicles. Such increase in traffic, added to logging and other activities, will cause increase in dusting, noise, road maintenance and collision with wildlife, along with safety issues for smaller vehicles. Since the *Chutes-des-Passes* road is heavily travelled by local folks for fishing, hunting, cabins, etc., the increase in traffic must be addressed. Also to be considered, about 100 local jobs would be needed to keep the fleet running. Thorough impact assessment is needed.

20.21 MINE SITE PREPARATION

Various investments are needed, exclusive to mining site and mill constructions. These are listed in **table 15**. Notice the inclusion of the feasibility study, which is roughly estimated at \$8.000.000, according to author's experience. Also included is the rehabilitation fund, which needs to be entrusted with government to obtain mining licence.

Table 15: Preparation cost.

Costs US \$		Unit cost	Investment	Unit cost	Yearly operating cost
Feasibility study	1	\$8 000 000	\$8 000 000		
Power line (km. 161 kV)	36	\$300 554	\$10 819934	\$1.00	\$302 400
Mine site prep (M3)	840000	\$20	\$16 800 000		
Tailing pond m3	2160000	\$10	\$21 600 000	\$1.00	\$2 160 000
Reclamation m2	940000	\$10	\$9 400 000		

20.22 MINING OPERATIONS

Since estimated resources are only categorized as *Inferred*, it is in the author's opinion it is too early to provide an elaborate mining plan. A better resource qualification is needed prior.

In order to produce 2 millions tons of concentrate per year, 11.8 millions tons per year need to be mined or 36.800 tons per day.

The Paul zone can be seen as an oblong body, 1000 metres in length and 150-350 metres wide. About 35 millions tons can be extracted of such zone by open pit without mining the wall rock, or 3.5 years. An 8.5 year mining operation will require an ultimate pit 1.6 kilometres long, 600 metres wide and 300 metres deep, with an overall 1:1 strip ratio and 100% slope.

The fleet of equipment needed to operate such mine has been established by comparing with similar mines. The following estimates are provided as guideline only, based upon comparison. Sizing of mining equipment is outside the usual field of expertise of the author, and significant margin of errors are attached to these evaluation. Pricing and operation cost were established using the *Mine and Mill Equipment Cost Estimator's Guide*, published by *Infomine USA Inc.*, converted to Canadian dollars and provided in **table 16**. A fleet of 7 earth movers, 170 tons each, and a 30 m³ hydraulic shovel shall be sufficient as long as no wall rock needs to be removed. This fleet is doubled once a 1:1

strip ratio is needed. Mining cost is established at CND \$4.64 per ton, either ore or waste.

Table 16: Mine capital expenditure and operating cost.

MINE		Unit cost	Investment	Hourly cost	Yearly operating cost
Drill	2	\$1 255 990	\$2 511 980	\$127.17	\$1 820 003
Loader 33 m ³	1	\$4 725 801	\$4 725 801	\$248.79	\$1 780 288
Shovel 30 m ³	1	\$6 495 581	\$6 495 581	\$449.18	\$3 214 237
Truck (170 t)	7	\$2 649 345	\$18 545 416	\$177.19	\$8 875 538
Dozer 570 HP)	2	\$1 107 443	\$2 214 887	\$93.03	\$1 331 406
Grader 16'	1	\$711 106	\$711 106	\$54.30	\$242 850
Impact-Hammer	1	\$954 978	\$954 978	\$79.23	\$566 953
Water truck, 14000 gal	1	\$823 129	\$823 129	\$114.35	\$511 415
Compactor	1	\$120 541	\$120 541	\$15.41	\$41 352
Fuel-Lube truck	1	\$146 268	\$146 268	\$4.13	\$18 471
Maintenance truck	1	\$71 345	\$71 345	\$9.56	\$42 756
Tire truck	1	\$168 246	\$168 246	\$13.86	\$61 987
Welding tuck	1	\$106 485	\$106 485	\$10.00	\$44 724
Pickup+bus	8	\$53 242	\$425 940	\$10.00	\$572 463
Light plant	8	\$23 475	\$187 797	\$2.01	\$71 916
Ambulance	1	\$106 485	\$106 485	\$100.00	\$89 447
Fire truck	1	\$319 455	\$319 455	\$100.00	\$89 447
Dewatering pump	4	\$82 121	\$328 485	\$29.20	\$1 044 745
Buildings	5000	\$2 130	\$10 648 493	\$20.00	\$100 000
Miscellaneous	1	\$500 000	\$500 000	\$100.00	\$672 000
Powder bunker	1				
Dynamite	9931500	- \$		\$0.10	\$993 150
Labour (hours)	359160			\$54	\$19 394 640
Total			\$50 112 416		\$41 579 787
Cost per mined ton			\$0.50		\$4.19

20.23 MILL OPERATION

A milling and beneficiation plant will be needed near the mining site. Milling circuit requires a primary gyratory crusher, conveyor, 34' semi-autogenous mill, screening, and terminal rod-mill. The beneficiation circuit is quite simple, using spirals, low intensity magnetic separator, wet high intensity magnetic separator and rougher plus cleaner flotation columns, plus ancillary equipments. Rotary drum filters and dryer will be required; either at mine site or pipeline destination, which items are costly to operate. Capital investment and operating cost, as extracted from *Mine and Mill Equipment Cost*

Estimator's Guide, published by Infomine USA Inc, converted to Canadian dollars and are listed in **table 17**.

Table 17: Milling and beneficiation capital investment and operating cost.

MILL	Unit	Cost/unit	Investment	Hourly Op-cost	Yearly Operating cost
Gyratory crusher 7'	1	\$12 962 837	\$12 962 837	\$1 303.38	\$9 853 519
Impact hammer	1	\$294 857	\$294 857	\$35.97	\$271 938
Conveyor	1	\$4 320 094	\$4 320 094	\$335.67	\$2 537 684
Semi-autogenous mill 34'	1	\$20 610 159	\$20 610 159	\$1 987.25	\$15 023 638
Screen 250 pi2	20	\$83 910	\$1 678 203	\$4.91	\$742 234
Cyclones 48"	6	\$25 769	\$154 616	\$0.38	\$17 389
Rod mill	1	\$741 135	\$741 135	\$55.72	\$421 270
Mixer	2	\$196 252	\$392 503	\$15.54	\$234 907
Spirales	100	\$1 810	\$181 024	\$0.12	\$88 553
LIMS	10	\$103 823	\$1 038 228	\$4.82	\$364 677
WHIMS	10	\$141 625	\$1 416 250	\$7.89	\$596 524
Thickner	1	\$362 049	\$362 049	\$25.65	\$193 931
Pumps 1000 gpm	10	\$19 913	\$199 127	\$2.46	\$185 961
Flotation column	8	\$302 497	\$2 419 977	\$19.99	\$1 208 827
Overhead crane 20 tons	1	\$170 695	\$170 695	- \$	- \$
Back-up Generator. 2.25 mw	2	\$68 044	\$136 088	\$39.44	\$66 263
Fuel tanks, 20.000	5	\$44 191	\$220 956	\$1.84	\$69 635
Power station 1mw	2	\$107 188	\$214 375	\$4.46	\$67 461
Building	10000	\$2 130	\$21 296 986	\$21.30	\$212 970
Communications	1	\$1 597 274	\$1 597 274	\$106.48	\$805 026
Ore Storage. 250.000 tons	1	\$21 296 986	\$21 296 986	\$106.48	\$805 026
Piping, Electricity, Miscell.	1	\$20 000 000	\$20 000 000	\$532.42	\$4 025 130
Thickner	1	\$362 049	\$362 049	\$25.65	\$193 931
Filtrer 900 pi2	5	\$260 675	\$1 303 376	\$12.26	\$463 293
Dryer 20 t/h (72.000.000 btu)	15	\$1 432 222	\$21 483 335	\$1 171.33	\$9 839 208
Labour (hours)	102720		- \$	\$54	\$5 546 880
			- \$		- \$
Total			\$134 853 179		\$53 835 874
Cost per ton milled			\$1.36		\$5.42

The capital expenditure and operating cost here obtained were compared to other mills, and seem realistic. Evaluating such equipment needs is not within the author usual field of expertise, and significant margin of error are to be kept.

20.24 CAPITAL EXPENDITURES AND OPERATING COST

Total capital expenditures are estimated as follow, in Canadian dollars, assuming shipping of concentrate by truck to Dolbeau:

	Expenditure	Exp/ton apatite²⁰
Site preparation:	\$66 619 934	\$3.92 / t
Mining equipment:	\$50 112 416	\$2.95 / t
Mill:	\$134 853 179	\$7.90 / t
Trucking transport:	\$31 272 897	\$1.84 / t
EPCM:	\$42 428 764	\$2.50 / t
Total Capex	\$325 287 190	\$19.13 / t

Yearly operation costs are estimated as follow, in Canadian dollars, assuming shipping of concentrate by trucks to Dolbeau:

	Yearly opex.	\$/ton apatite²¹
Site operation:	\$2 462 400	\$1.23 / t
Mining:	\$41 579 787	\$20.78 / t
Mill:	\$53 835 874	\$26.91 / t
Trucking transport:	\$27 303 188	\$13.61 / t
Total Opex	\$125 171 249	\$62.53 / t

Assuming phosphate rocks are sold at US \$50 per ton, FOB Casablanca, d'Arianne apatite is expected to be sold at CND \$118 per ton, FOB Dolbeau. Using such, revenues are estimated at:

Revenues	\$236 000 000 / year	\$118.00 / ton
Expenses	\$125 171 249 / year	\$ 62.53 / ton
Gross profit	\$110 828 751 / year	\$ 55.47 / ton
Gross profit margin		47.0%
Selling mark-up		1.89x

²⁰ Based on 8.5 year mining life at 2 millions tons of apatite per year.

²¹ Nominal production of 2 millions tons of apatite per year.

20.25 CALCULATED CASH-FLOWS

Cash-flows for the project were calculated with the following assumptions²²:

- 2 millions tons of apatite per year.
- Initial capital cost and operating cost as indicated on Item 20.21 to Item 20.24.
- Operating capital equivalent of 4 months operating cost of year 1. Variations on operating capital in subsequent years balanced with post-tax profits.
- Paul zones only, grades as calculated by SGS-Geostats.
- Initial resource of 100 millions tons for Paul zone, as indicated by SGS-Géostats.
- 8.5 year mining life with actual resources if no ramping up is allocated.
- Start-up in 2014.
- Ramping-up of production over 3 years (0.5x, 0.8x, 0.9x).
- No credits for ilmenite and other by-product.
- Trucking of concentrate to Dolbeau.
- Selling price of CND \$118 per ton.
- 1% NSR.
- 0% Inflation.
- 3% Discount atop inflation for DNPV.
- Resale values of equipment based on 15% depreciation per year.
- Initial capex according to no-waste mining. Second investment needed once the pit is wide enough to require removal of wall-rock.
- Profit based taxation as follow:
 - Mining tax: 12%
 - Federal income tax: 12%
 - Provincial income tax: 8%
 - Processing allocation: -8% of initial mill value
 - Depreciation allocation: Up to 100% of depreciated value.
- NPV, DNPV and IRR calculated by Excel's equations. No manual verification of equation's exactness was made by the author.

Forecast on revenues and operating cost through time, assuming no fluctuation of the input parameters (selling price, etc.) are provided on **figure 20**. Four phases are discernable:

- 2014-2017: Ramping-up in production.

²² Slight variations are present compared to d'Arianne press released (November 20th 2009) due to minor adjustment in input parameters.

- 2017-2019: Nominal production without stripping.
- 2019: Investment to increase the mining fleet.
- 2020-2023: Nominal production with wall-rock stripping.
- 2024-2025: Shutting down and sales of residual equipments.

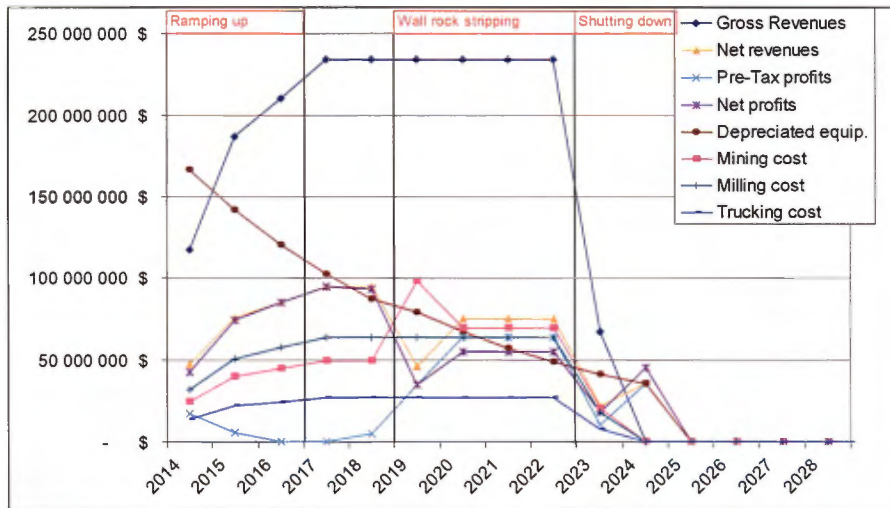


Figure 20: Modelled cash-flows throughout mining life.

Yearly cash-flows are provided in **table 18** (item 26). Internal rates of return (IRR) and net present values (**NPV**) are listed in **table 19**:

Table 19: Result of financial analysis.

	IRR	NPV	DNPV
Pre-tax:	19.95%	\$421M	\$306M
Post mining tax:	18.98%	\$385M	\$278M
Post income tax:	17.66%	\$349M	\$248M

20.26 TAXATION AND NSR

A residual 1% NSR is attached to the cells on which Paul zone is located. Although this NSR can be bought back by d’Arianne for 1 million dollars, it has been considered in the cash-flow model, and subtracted from revenues. It will be more profitable to d’Arianne to buy the NSR and add the cost to the Capex.

Taxation is usually not taken into account in cash-flow model, being too complex to implement. A brief attempt is made, assuming the project as a stand-alone fiscal entity, not as a subsidiary of a large corporate entity.

Taxation in Québec¹ and Canada is based upon net profits, 12% for provincial plus 8% for federal.

Taxation in Québec²³ and Canada is based upon net profits, 12% for provincial plus 8% for federal. There are no per-tons or per-value royalty to be paid to government. A provincial mining tax is applied in-lieu of the royalty, equivalent to 12% of the profits. These add to 32% of profits. Municipals taxes were not evaluated.

Various allowances are allowed for mining operation, which can be reduced from mining revenues. First is an accelerated fiscal depreciation of the investment, up to 100% of the residual value in a single year. This means that the investment can be applied against profits for the first years, postponing tax payment. This also have the effect that fiscal depreciation and profits diverges from accounting depreciation and profits. In the financial model, this allowance has been applied in order to leave sufficient profits to covers the needed re-investments²⁴. A second allowance is applicable if the ore is processed in Québec, corresponding to 8% of the mill value. It is uncertain to the author if this allowance applies against initial or residual mill value, and if beneficiation of the ore is sufficient or if phosphoric acid conversion is needed.

Rate of returns and net present value were calculated for pre-tax and post-tax scenario, as well as if only mining tax is applied.

20.27 OTHER PRODUCTION RATES

The financial model has been run for 1 million tons and 5 millions tons per year apatite production capacity, assuming enough resources are available for 20 years of production. For such, equipments were resized and capital expenditures plus operating cost were estimated²⁵ and listed in **table 20**. It can be seen that a production rate of 1 million tons of apatite per year, similar to Phoscan's Martinson project, is not viable.

²³ Provincial mining taxation regime is expected to be reviewed in the coming year, the terms of which are not currently available.

²⁴ According to such taxation system, if d'Arianne is integrated into phosphoric acid production, apatite selling price shall be balance with production cost, so profits are deferred to the phosphoric acid plant, where mining tax does not apply.

²⁵ Precision on these estimate are approximate and some elements might not be realistic.

Inversely, no significant improvement in profitability is gained by increasing mining rate to 5 millions tons of apatite per year, assuming sufficient resources are outlined.

Using the 5 millions tons per year scenario, transportation of concentrate using pipeline is viable and the most profitable option (**figure 21**). Rail construction up to the mine is profitable at such rate, but significantly less than pipeline. Further increase in production rate would be needed, likely 10 millions tons of concentrate per year.

Table 20: Estimations for different project sizes.

	1 mt/y	2 mt/y	5 mt/y
Resources needed	100 mt	200 mt	500 mt
Capex	\$216 M	\$279 M	\$417 M
Mining Rate	15.500 tpd	31.250 tpd	78125 tpd
Mining cost	\$5.85/tons	\$4.16/tons	\$2.78/tons
Milling cost	\$9.15/tons	\$5.38/tons	\$3.23/tons
Production cost	\$104/tons	\$69.58	\$47.19/tons
IRR	-7.71%	28.50%	29.37%
DNPV	\$-124 M	\$618 M	\$1.164 M

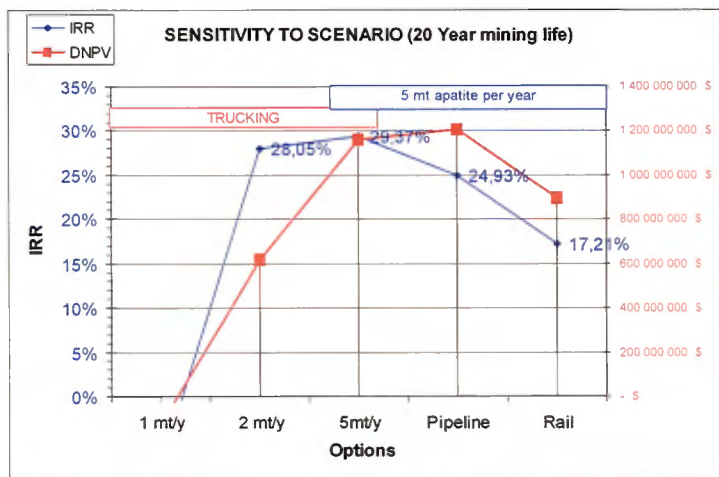


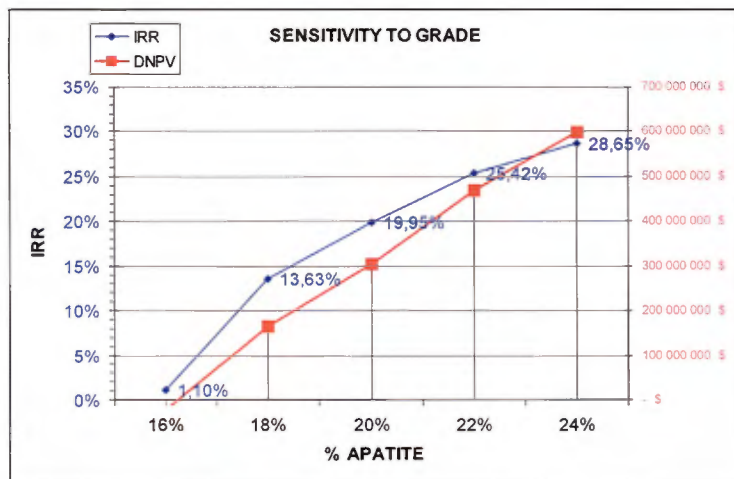
Figure 21: Estimated IRR and DNPV for the various scenarios. All scenarios involve a 20 years mining life, assuming sufficient resources are made available. First three options involve trucking of concentrate with various production rates (1.2 and 5 mt/y of apatite), with proper sizing of equipment and production cost. The last two options involve 5 mt/y production rates with shipment by pipeline or rail.

20.28 SENSITIVITY ANALYSIS

Sensitivity analysis has been carried, using the financial model and varying the different input parameter. Rather than using the conventional percentage variation, the model has been run using rounded increments realistic in regard of operation or markets. Variations on IRR and DNPV are not linear function of the various input parameters, due to some non-linear function (ex.: interest), some incremental/decisional functions (ex.: investment needed once wall-rock need to be removed), complex interactions between parameters (ex.: Trucking cost per ton is a function of tonnage) as well as caused by retroactive loops (ex.: fiscal depreciation). The mill and mine size, and therefore their capital expenditures, were kept constant, except otherwise indicated.

20.29 SENSITIVITY OF GRADE

The IRR and DNPV vary almost linear with grade. IRR decrease by 3.5% for each % grade of apatite lost (0.39% P_2O_5). While SGS-Geostats indicated 20.1% apatite in the deposit, a drop to 18% (7% P_2O_5) would make the project marginal, and no profitability will be obtained at 16% apatite (6.2% P_2O_5). The project will be sensitive to mining



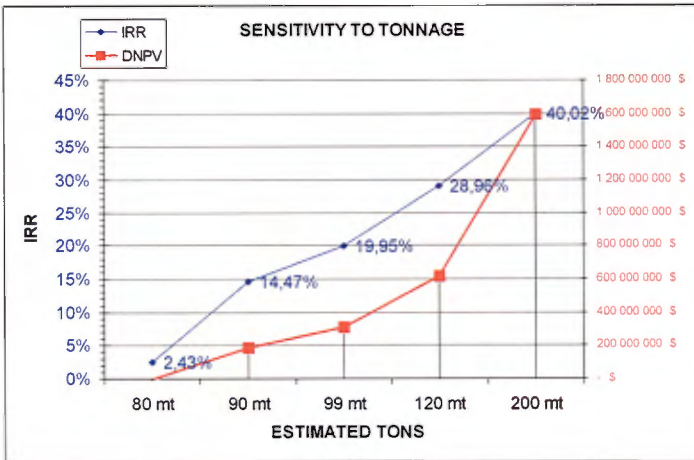
model, cut-off grade, and assaying precision. Mine and mill conception will have to be carefully balanced with available grade. The effect of recovery will be very similar.

According to the financial model (**figure 22**), it is not realistic to attempt starting a production on Manouane zone, even less on zone 2.

Figure 22: Sensitivity of the financial model to estimated grade. Notice a slight change in grade may change profitability significantly. SGS-Geostats indicated 7.84% P_2O_5 , or 20.1% apatite.

20.30 SENSITIVITY TO TONNAGE

Tonnage is apparently the most sensitive variable on the model, assuming a constant mine-mill capacity regardless of available resources (**figure 23**). NPV and IRR being calculated on cumulative profits once the investments are paid, last years of operation are the most profitable. The project offers a marginal profitability at 90 millions tons, which drops drastically below 85 millions tons and generate no profits at 81 millions tons.

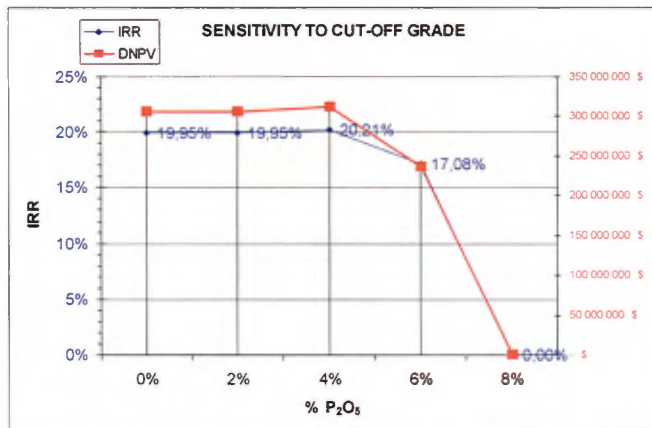


This clearly indicates that d'Arianne shall dedicate efforts to increase its resource base, without declining the average grade. The effect of bringing Manouane zone into production once Paul zone is exhausted, with lower grade and higher production cost, has not been calculated.

Figure 23: Sensitivity of the financial model to estimated tonnage with a constant 2 mt/y production rate. It is suggested that only a slight drop in tonnage may ruin the profitability. SGS-Geostats indicated 99 millions tons of inferred resources. It is in the author opinion that supplementary tonnage can be outlined with sufficient drilling effort.

20.31 EFFECT OF CUT-OFF GRADE AT THE MINE

SGS-Geostats provided resources estimates using different cut-off grades. Using 6% P₂O₅ cut-off compared to 0% merely decrease tonnage by 10%²⁶. However, tonnage drops dramatically above 6%, falling by 50% at 8% P₂O₅. The financial model has been run using the resources at various cut-off provided for Paul zone (**figure 24**).



Diminution of tonnage with increasing grade is detrimental to the economics of the project if a cut-off grade is used above 4% P₂O₅, or 10% apatite.

Figure 24: Sensitivity of the financial model to resources estimated with different cut-off grades. Base-case scenario is at 2% P₂O₅. The project is not sensitive up to 8% cut-off grade, where tonnage diminishes drastically.

20.32 EFFECT OF SELLING PRICE

The effect of the international pricing of Moroccan phosphates rocks is intuitive, and shows a direct relation to profitability. The base case scenario was calculated using the historical US \$50 per ton, FOB Casablanca, which is a very conservative assumption (**figure 25**). British Sulfur Consultants suggest US \$70 per ton as realistic future pricing. The project is calculated to reach a zero profitability assuming price drop to US \$30 per ton. The effect of trans-Atlantic shipment costs is cumulative to Casablanca selling price, and their effect, dollars to dollars, will be identical. However, they are characterized by volatility and are less accurately evaluated.

²⁶ Tonnage and grades reported by SGS-Geostats using 0% and 2% P₂O₅ are identical, which is kind of unusual. The low-grade tonnage might have been biased considering that core without sufficient apatite (<2%) has not been assayed. Since the base case scenario use 2% cut-off, the impact of this situation can be non-negligible. Theoretically, tonnage at 0% cut-off is equivalent of the volume defined by all drill holes and shall be considered as open on any direction. Can a similar assumption been made for 2% cut-off grade? Since the base case scenario use 2% cut-off, the impact can be non-negligible.

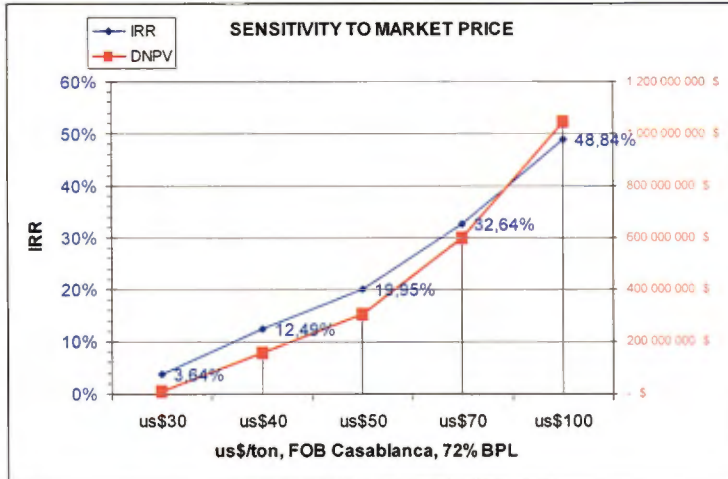
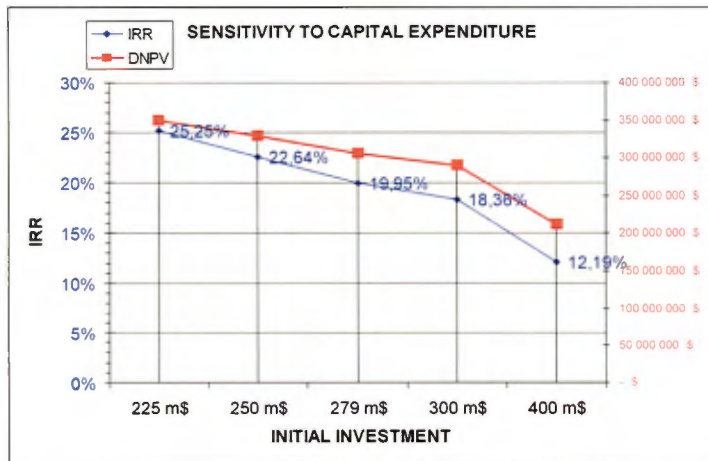


Figure 25: Sensitivity of the financial model to selling price of 72% BPL Moroccan phosphate rocks, FOB Casablanca, assuming constant trans-Atlantic shipping cost. A direct relationship is visible. The financial model used the historical US \$50 per ton for base case scenario.

20.33 EFFECT OF CAPITAL EXPENDITURES

The internal rate of return being a function of the profit versus the investment, IRR



shows an inverse relation to capital expenditures (**figure 26**). Increasing these investments by 50% still allows a 12% IRR, suggesting robustness of the project to variation in required capitals.

Figure 26: The small sensitivity of the financial model to the initial capital requirement suggests robustness in this regard.

20.34 EFFECT OF OPERATING COSTS

Operating cost, including mining, milling and shipping to Dolbeau are directly subtracted from revenues. They therefore have a similar effect than selling price, inversely affecting IRR and NPV with an almost linear effect (figure 27). It shall be considered that reducing significantly operating cost is a difficult task, and that there is not much margins to manoeuvre.

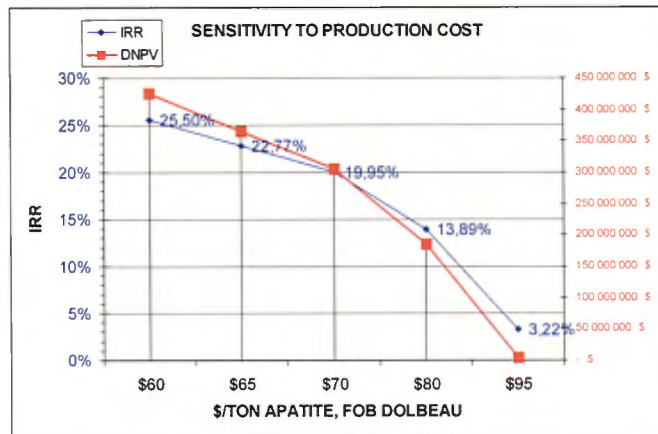


Figure 27: The sensitivity of the financial model to the operating suggests some robustness in this regard. More effect will be gained if efforts are dedicated in increasing revenues rather than reducing expenses.

20.35 EFFECT OF INFLATION

Inflation has the peculiarity to affect both the revenues and the operating cost, but not the initial investment. Therefore, the expenses/capital ratio decreases with time and inflation. But if the initial investment is discounted to compensate inflation, the IRR is near constant. It assumes that selling price and operation cost are equally affected by inflation, which is unlikely. On overall trend, commodity price are affected by deflation. The main drive behind inflation is likely to be fuel cost, which account for about 30% of all operating cost. The discounted rate on NPV is set at 3% above inflation (figure 28).

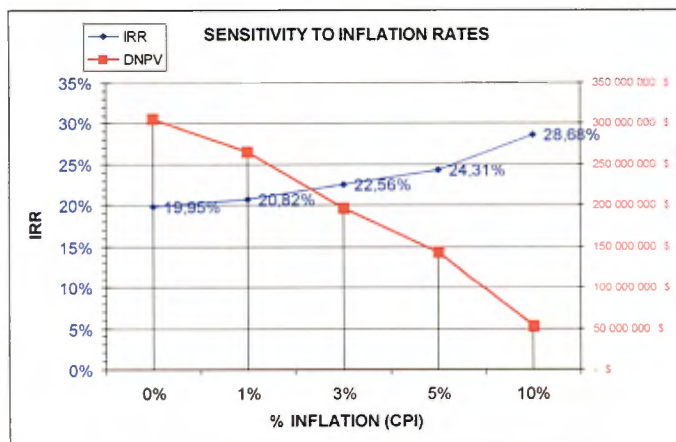
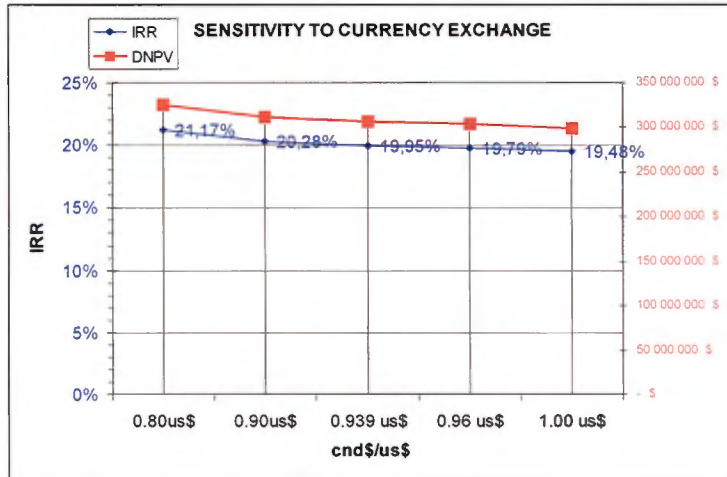


Figure 28: Inflation is beneficial to the IRR of the project, but detrimental to NPV. Gains in IRR are nearly balanced by inflation percent points. Notice the base case scenario is 0%

20.36 CURRENCY FLUCTUATION

The Canadian dollar, in regard of its American *vis-à-vis*, has shown significant fluctuations in the last two decades, departing from its optimal US \$0.90 value to wander between US \$0.63 to US \$1.10. Consequent of the 2008 financial crisis, US dollar is expected to decline in value compared to most currency, including its Canadian counterpart. Currency fluctuation is considered as not affecting construction cost (taken into account in Capex variations), but to affected production cost and revenues. About



50-60% of the operating costs are affected by currency, naming fuel, equipment and parts. Inversely, reference phosphate price are expressed in US dollars. Modelling the currency fluctuation suggest a very limited effect of project's cash-flows (**figure 29**).

Figure 29: The project is not affected by currency fluctuation.

20.37 COMPARISON WITH PHOSCAN'S MARTISON PROJECT

Phoscan Chemical Corporation, a junior mining company traded on TSX (since February 2009), is currently developing a phosphate project, integrated from the mine to fertilizer production. Prefeasibility on the project, including a detailed market study and the environmental impact assessment study, is completed and positive and full feasibility is currently on its way to be completed. Road construction and land purchase are completed.

The Martison deposit is an apatite-rich zone hosted in the Martison carbonatite complex, about 70 kilometres north of Hearst, Northern Ontario. These carbonatites are weathered, and their phosphatic residuum constitutes the bulk of the mineralization. Resources are currently estimated at:

1. Measured and indicated resources: 62.2 millions tons at 23.55% P₂O₅, for 37 millions tons apatite.

2. Inferred resources: 55.7 millions tons at 21.87% P_2O_5 , for 21 millions tons apatite.

The apatite is expected to be mined in order to produce 1 million tons of apatite concentrate per year, grading 37% P_2O_5 . The concentrate will be shipped by pipeline (86 km) to Hearst to be converted into wet process phosphoric acid, either merchant grade (MGA; 461.000 tons per annum) or superphosphoric acid (SPA. 213.000 tons per annum). This phosphoric acid is to be railed to Brandon, Manitoba, to be converted mainly into MAP (mono-ammonium phosphate, 474 000 tons per annum) or to superphosphate. Fertilizers are expected to be sold to grain grower in United States mid-west and Canadian Prairies.

Phoscan's economic assessment is based on a phosphate rock selling price of \$40/ton and 20 years mining life. Since the project is integrated with phosphoric acid production, mining cost and profitability is not available, and direct comparison with d'Arianne is not possible.

Phoscan will produce an apatite concentrate grading about 37.2% P_2O_5 . This concentrate (81% BPL) is better quality than Moroccan phosphate, but is slightly lower grade than expected concentrate from d'Arianne. Contaminant levels are not indicated.

Contrarily to d'Arianne, Phoscan project targets directly the fertilizer market. The volume of phosphate rock, about 1 million tons per year, is well under the current North American deficit, and shall not have significant impact on the overall North American market. Development of Phoscan project shall not be considered as a treat to d'Arianne. However, in the event d'Arianne decides to produce phosphoric acid, Phoscan will be competing for the access to the limited sulphuric acid supply.

Table 21: Comparison between d'Arianne, Phoscan and Soquem

	d'Arianne	Phoscan	Soquem
Tonnage	99 mt	62 mt	148 mt
Grade P ₂ O ₅	7.84%	23.55%	6.2%
Grade Apatite	20.21%	62.8%	15.9% ²⁷
Total Apatite	20 mt	38 mt	23 mt
Production	2 mt/y	1 mt/y	0.6 mt/y
Selling price	116\$/ton	40\$/ton?	n/a
Production cost	62.53\$/ton	40\$/ton?	n/a
Distance to rail	200 km	86 km	no access
Capex	325 m\$	361 m\$ ²⁸	n/a
IRR	19.31%	20.6% ²⁹	n/a

20.38 COMPARISON TO SOQUEM'S SEPT-ÎLES PROJECT

Soquem, a SGF subsidiary and Québec's crown corporation, has worked for years into developing its Sept-Îles apatite deposit. This deposit shows several similarities with d'Arianne, being nelsonite hosted in a gabbroic-anorthositic complex. The deposit is located near the town of Sept-Îles, on St-Laurence North Shore, in close proximity to Arnaud railway and Sept-Îles seaport. However, what may look as an advantage might be prejudicial to the project, not having direct access to the North American rail network. In this venture, Soquem is in 50-50 partnership with Yara International ASA, a Norwegian fertilizer producer dedicated to European market. Complete feasibility and environmental impact studies were completed in 1997, and were considered as profitable according to the sales of ilmenite and magnetite as co-product. The project has been halted for years due to undisclosed reasons, but has apparently been recently reactivated (personal communication to N. Tollari). It is obvious to the author that its apatite production is dedicated to European market, and that co-production of ilmenite concentrate is likely considered a hindrance to Yara.

²⁷ Concentrate grade not available, assumed as 39% P₂O₅, as for d'Arianne

²⁸ Mine, mill and transportation infrastructure included.

²⁹ Includes mining, concentration, phosphoric acid conversion and fertilizer production.

20.39 GENERAL COMPARISON WITH OTHER OPEN-PIT MINES

A brief survey of Canadian open-pit operation (data taken from Canadian-American mines handbook, 2008 and various feasibility studies) indicates that, regardless of the commodity and throughputs, no mines operate with an in-situ ore value less than CND \$18 per ton. With concentrate sold at \$118 per ton, minus the mine-Dolbeau shipping cost, d'Arianne in-situ value is estimated at slightly below \$20 per ton. It shall then be comparable to project like Osisko's Malartic and Highland Valley's porphyry copper (*figure 30*).

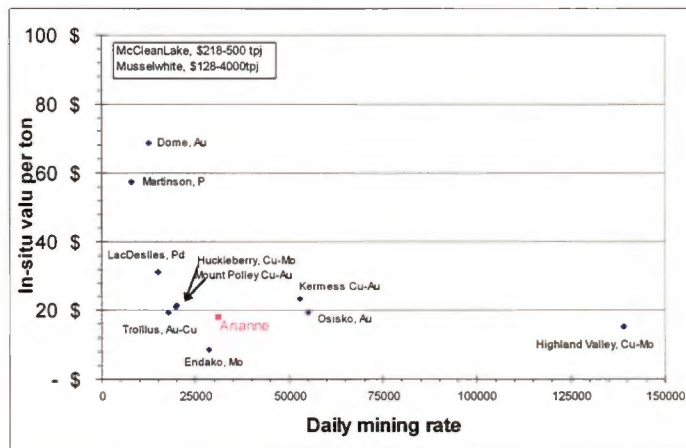


Figure 30: Compilation of the in-situ ore value per ton in various Canadian open-pit mines. D'Arianne project is comparable to numerous other operating mines. Notice Endako was sporadically closed, indication of non-robustness.

ITEM 21: INTERPRETATION AND CONCLUSIONS

According to the financial model developed for the Lac-à-Paul project, and based upon resources estimates provided by SGS-Geostats on Paul zone, it is considered that the current project is likely to be profitable as long as the apatite concentrate is sold above CND \$100 per ton. The model indicates the following internal rates of return depending on selling price (*table 22*). The FOB price in Dolbeau is estimated as the Moroccan phosphate price plus \$65/tons for its trans-Atlantic shipping and port-to-rail handling, without premium for higher BPL%:

Table 22: Internal rate of returns in regard of selling prices.

FOB Casablanca 72%BPL	FOB Dolbeau 90% BPL	IRR
US \$30/ton	CND \$97/ton	3.64%
US \$40/ton	CND \$107/ton	12.49%
US \$50/ton	CND \$118/ton	19.95%
US \$70/ton	CND \$139/ton	32.64%
US \$100/ton	CND \$159/ton	48.84%

The base case was calculated at US \$50/ton for the Moroccan phosphate, which is underestimated according to British Sulphur Consultants. However, uncertainties remain in regard of trans-Atlantic shipment cost.

D'Arianne shall foresee filling the North American phosphate production deficit. Two phosphoric acid plants located in conterminous North America are likely to lack phosphate-rock feed in following years, Agrium plant in Soda Spring, Idaho, and Agrium plant in Red River, Alberta. These shall be targeted by d'Arianne, as Lac-à-Paul can be delivered at these plants at competitive prices compared to Moroccan phosphate. Inversely, d'Arianne has a disadvantage compare to Moroccan phosphate in regard of Florida plants, in regard of \$40 per ton rail shipping cost. Finally, d'Arianne may also be competitive on the Western Europe market, which is currently supplied by Russian apatite concentrate.

The Lac-à-Paul project envisions producing 2 millions tons apatite per year. Smaller project is unlikely to be economically robust. With the current 99 millions tons of resources in Paul zone, this allows for a short 8.5 years of production. D'Arianne will have to improve its available tonnage to render its project attractive, hopefully to 200 millions tons. It is in the author opinion such tonnage can be delineated.

Sensitivity analysis indicates the project reacts to the different input conditions as follow:

Market price:	Sensitive, IRR increase with price
Shipping to market:	Very sensitive
Tonnage:	Very sensitive, IRR increase with tonnage
Grade:	Sensitive, IRR increase with grade
Cut-off grade:	Robust
Cost of production:	Little sensitive, IRR decrease with cost
Capital exp.:	Robust, IRR decrease with cost
Inflation:	Totally insensitive
Currency:	Totally insensitive

ITEM 22: RECOMMENDATIONS

In order to bring the Lac-à-Paul project into prefeasibility, d'Arianne will have to improve its resource base, to demonstrate the efficiency of the metallurgical process, and address the market situation in details. A budget is provided on **table 23** based upon author's experience, details of which has to be elaborated later.

22.1 RESOURCES IMPROVEMENT

A drilling campaign has just been carried on Paul zone with the scope of improving the resource from inferred to indicate. The drilling pattern used by SGS-Geostats for the current estimate was irregular with drill fences every 200 metres. The last campaign completed the pattern with fences every 100 metres (**figure 4**), which shall be sufficient to bring most of the inferred resources into indicated category.

However, tonnage will have to be enlarged, hopefully doubled. This can be achieved by deepening the zone to 200-250 metres, and by completing sections. For examples, sections 7+00W to 4+00W were tested with a single vertical hole, which intersected up to 160 metres of ore-grade nelsonite. Along with resource-oriented drilling, rock mechanic parameters will have to be measured, as well as some geotechnical holes in regard of pit stability, water pumping test and mill site decommission holes will be needed. A rough estimate of 15.000 metres of drilling will be needed, for \$3 millions budget.

22.2 RESOURCE ESTIMATION UPDATE

Results from drilling will have to be included in the database and a new resource estimate been calculated. This resource calculation shall include block model ready to be integrated into Whittle Pit Design Software, and the resource model be integrated with the production cost model. A budget of \$100 000 is needed.

22.3 GEOTECHNICAL STUDY

Geotechnical study, including slope stability and hydrogeology will have to be implemented along with the resource drilling. A budget of \$100 000 will be needed.

22.4 METALLURGICAL TESTING

All metallurgical testing carried up to now has been limited bench-scale testing. More bench-scale testing will be required to improve the flotation recipe, the milling circuit and power requirement, as well as to test recoveries for ilmenite and sulphides. From there, a pilot plant testing will be required, using likely 50 tons bulk samples. This pilot plant test shall produce enough apatite concentrate to be provided to different phosphoric acid producer in order to test its suitability into their process. A \$2 millions dollars budget shall be allocated.

22.5 BASELINE ENVIRONMENTAL CHARACTERIZATION

Environmental characterization of the project site will have to be carried prior to cause severe perturbation to the site. Such studies shall be initiated as soon as feasible, with a \$250 000 budget.

22.6 MARKET ASSESSMENT

The phosphate market situation, including all transport issues, is a key element on this project. A detailed market assessment will have to be contracted to a specialized and reputed firm, such as Secor or British Sulphur Consultant. Such a study is expected to cost in the order of \$500 000.

This total investment of nearly \$6 millions is a prerequisite to bring the project into prefeasibility. The author formally recommends pursuing the investment, the project having reasonable chances of being economically viable.

Table 23: Budget, in priority order.

Market Study	\$500 000
Baseline environmental study	\$250 000
Metallurgical testing and bulk testing	\$2 000 000
Definition drilling, 15 000 metres	\$3 000 000
Resource calculation and pit design	\$150 000
Geotechnics	\$100 000
Total	\$6 000 000

ITEM 23: REFERENCES

- Aubin, A., 2000. Essais de broyage et calculs de l'indice de Bonds sur des minerais d'apatite-titane, projets Lac-à-Paul et Mirepoix. GM 58774, 398 pages.
- Avramtchev, L., Piché, G., 1981. Catalogue des gîtes minéraux du Québec : région de Laurentides-Saguenay. DPV 809, 62 pages.
- Barrette, J.P., 1997. Rapport final, projet d'exploration des cibles géochimiques Ni-Cu-Co, secteur du Réservoir Pipmuacan, districts miniers Saguenay-Lac-Saint-Jean et de la Côte-Nord. GM 57008, 26 pages.
- Barrette, J.P., 1995. Rapport d'évaluation et de prospection minière sur les sites potentiels et sur les indices minéraux Cu-Ni, Cu-Au, Zn-Pb-Ag, de marbre et de wollastonite de la région du Saguenay-Lac-Saint-Jean. GM 57004, 91 pages.
- Boivin, M., 2009. Note de service, traitement des données magnétiques aéroportées et terrestres, projet Lac-à-Paul. 5 pages.
- Boivin, M., 2009. Review of a helicopter-Borne AeroTEM, electromagnetic and magnetic survey, Haut Plateau project. GM 64268, 73 pages.
- Boivin, M., 2001. Projet Samson (1091), rapport du levé TEM en forage. GM 58784, 9 pages.
- Boivin, M., Paré, P., 2002. Levé électromagnétique transitoire de type « Sirotem », projet Chutes-des-Passes (1279).GM 60717, 23 pages.
- Boulianne, D., 2002. Rapport de la campagne d'exploration, automne 2001, propriété du Lac-à-Paul, projet 197. GM 59784, 192 pages.
- Boulianne, D., 2001. Rapport de la campagne d'exploration, propriété du Lac-à-Paul, projet 197. GM 58767, 148 pages.
- Cimon, J., 1994. L'apatite de Sept-Îles. PRO 94-08, 7 pages.

- Corriveau, L., Perreault, S. & Davidson, A., 2007. Prospective metallogenic settings of the Grenville Province. *In* Goodfellow, W.D. (ed.), Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods. Geological Association of Canada, Mineral deposits Division, Special Publication No. 5: 819-847.
- Duplessis, C., 2009. Technical report, phosphate and titanium resource estimation of the Lac-à-Paul property deposit, 126 pages.
- Fonds minier du Saguenay-Lac-Saint-Jean, 1999. La propriété Apa-Ti, projet de minéraux industriels, apatite-titane. GM 58151, 32 pages.
- Fonds minier du Saguenay-Lac-Saint-Jean, 1998. Rapport des travaux 1997, projet Chutes-des-Passes. GM 56023, 261 pages.
- Fonds minier du Saguenay-Lac-Saint-Jean, 1998. La Trappe, rapport des camps de prospection 1998. GM 58152, 84 pages.
- Fonds minier du Saguenay-Lac-Saint-Jean et Mines d'Or Virginia inc., 1997. Levé électromagnétique et magnétique hélicoptéré, Région du Lac-Saint-Jean. GM 56149, 43 pages.
- Force, E.R., 1991. Geology of Titanium-Mineral Deposits. Geological Society of America, Special Paper 259.
- Geosearch Consultants limited, 1971. Electromagnetic survey, Chutes-des-Passes project. GM 27460, 7 pages.
- Geosearch Consultants limited, 1970. Electromagnetic survey on the Roberval county properties. GM 27033, 4 pages.
- Girard, G., Boudreault, A., 2000. Campagne de sondages d'exploration pour l'apatite et d'ilménite, projet Lac-à-Paul. GM 58768, 21 pages.
- Girard, G., 1998. Descriptions pétrographiques et essai de séparation minérale, échantillon de nelsonite, Chutes-des-Passes, 19 pages.
- Girard, G., 1997. Campagne de sondages d'exploration pour l'apatite et d'ilménite, projet Lac-à-Paul, 5 pages.

- Girard, G., 1995. Compilation géoscientifique des indices cuivre-nickel, région du Saguenay-Lac-Saint-Jean. GM 57006, 14 pages.
- Hébert, C., Beaumier, M., 2000. Géologie de la région du Lac-à-Paul (22E/15). RG 99-05, 34 pages.
- Hébert, C., 1998. Guide d'exploration pour l'apatite, le nickel et le cuivre dans la région du Lac-à-Paul. PRO 98-05, 9 pages.
- Hébert, C., Cadieux, A.-M. & Van Breeden, O., 2009. Région du Réservoir Pipmuacan , SNRC 22E, Synthèse géologique. RG 2009-01, 59 pages.
- Hébert, C., Cadieux, A.-M. & Van Breeden, O., 2003. Proterozoic magmatic events (1510-985 MA) and ilmenite-apatite mineralisations in the central Grenville Province, Québec, Canada. Geophysical research Abstracts 5 : 00881.
- Journal of Industrial and Engineering chemistry, vol 3, n°. 9.
- Lambert, G., 2008. Levés magnétométriques : Rapports sommaires sur des travaux géophysiques au sol.
- Laurin, A.F., & Sharma, K.N.M., 1975. Mistassini, Péribonka, Saguenay Rivers area (Grenville 1965-1967). Ministère des Ressources naturelles du Québec, RG 161.
- Laurin, A.F. & Sharma, K.N.M., 1972. Geology of the Mistassini river north, Mistassini River south, Peribonka lake, Pipmuacan reservoir, Chicoutimi and Baie-St-Paul map areas, Quebec: Grenville Project 1965, 1966, 1967. Ministère des Ressources naturelles du Québec, DP 126.
- Mines d'Or Virginia inc., 1998. Levés magnétométriques et d'EMH-MaxMin, prolongation de la grille MHY-A. GM 56382, 9 pages.
- Mines d'Or Virginia inc. et Services Techniques Geonordic inc., 1998. Levés de magnétométrie et d'EMH-MaxMin 1-10, grille Houlière, Duhamel, DNE, Lopo et Nourricier nord. GM 56422, 18 pages.
- Mines d'Or Virginia inc. et Services Techniques Geonordic inc., 1998. Rapport des travaux 1998, projet Chutes-des-Passes. GM 56578, 83 pages.

Mines d'Or Virginia inc., 1997. Levé électromagnétique et magnétique hélicopté Est de Chutes-des-Passes, région N.-E. du Lac-Saint-Jean. GM 57184, 65 pages.

Néron, P., Tollari, N., 2009. Dépôts de phosphore et titane du Lac-à-Paul, étude d'opportunité économique, rapport interne, 63 pages.

N.Q.N. Mines Ltd., 1971. Report on Chutes-des-Passes properties. GM 27034, 11 pages.

N.Q.N. Mines Ltd., 1971. Diamond drill record. GM 28000, 11 pages.

Ouellet, R., 1996. Rapport des camps de prospection, été 1996. GM 57007, 77 pages.

Pipeline Systems Incorporated, 2009. Order-of-Magnitude System Estimate/Description. 5 pages.

Poirier, M., Granger, B., 1997. Levés magnétométriques et d'EMH-MaxMin, grilles Nourcier A et B, MHY-A, Manouane et Paul. GM 56024, 18 pages.

Questor Surveys limited, 1970. Airborne electromagnetic survey report, area 1970-51, Péribonka lake area, Québec. GM 27031, 10 pages.

Robert and Depatie, 1969. Geological report on the East property. GM 26105, 10 pages.

Robert and Depatie, 1969. Geological and magnetic surveys, North property. GM 26106, 13 pages.

Roy, I., Chartrand, F., Trudeau, Y., 2004. Rapport sur la campagne de forage, secteur MHY, projet Chutes-des-Passes, GM 61185, 85 pages.

Roy, I., 2003. Rapport sur la campagne de forage, avril 2003, secteur MHY, projet Chutes-des-Passes (1279). GM 60730, 117 pages.

Roy, I., 2001. Rapport sur la campagne de forage, juin 2000, projet Chutes-des-Passes (1279). GM 58807, 191 pages.

Roy, I., 2001. Rapport sur la campagne de forage, octobre 2000, secteur MHY, projet Chutes-des-Passes (1279). GM 58815, 170 pages.

- Roy, I., 2001. Rapport sur la campagne de forage, juin 2001, projet Chutes-des-Passes (1279). GM 59143, 171 pages.
- Roy, I., 2000. Travaux d'exploration 1999, projet Chutes-des-Passes (1279-1). GM 58190, 149 pages.
- Roy, I., 2000. Travaux d'exploration 2000, projet Chutes-des-Passes (1279-1), volet apatite-ilménite. GM 58232, 48 pages.
- Saklatwalla, B.D. et al, 1932. Treatment of nelsonite ore.
- Simard, M.H., 1993. Visite, échantillonnage et analyses effectuées sur la veine de quartz du Lac-à-Paul. GM 52422, 8 pages.
- Simard, M.H., Landry Y., 1995. Veine de quartz du Lac-à-Paul, visite de contrôle. GM 53478, 4 pages.
- Simoneau, P., 2009. Levé de magnétométrie, Propriété du Lac-à-Paul, Grilles de la zone Nicole et de la zone Paul, région du Lac-St-Jean, 7 pages.
- Spalding, J., et al, 2008. N.I. 43-101 Technical report : Martison phosphate project, preliminary feasibility study, 176 pages.
- Tollari, N., Boulianne, D., 2008-2009. Rapport de la campagne d'exploration, propriété du Lac-à-Paul. Ressources d'Arianne, Saguenay-Lac-Saint-Jean.
- Tremblay, L., 1999. Description pétrographique section APA, apatite, Chutes-des-Passes. 6 pages.
- Tshimbalanga, S., 2003. Levé de gravimétrie, propriété Chutes-des-Passes (1279), Grille MHY. GM 60731, 13 pages.
- Tshimbalanga, S., 2001. Levé d'EMH-MaxMin II-5, grilles Houlière et MHY-A, région Chutes-des-Passes (1279). GM 58806, 18 pages.
- Villeneuve, P., 2000. Préparation et évaluation de la qualité d'un concentré d'apatite et d'ilménite, projet Lac-à-Paul. GM 58769, 9 pages.
- Watt, Griffis and McOuat Limited, 2007. A Technical review on the preliminary assessment study of the Kémag iron ore project, Québec, 148 pages.

Watt, Griffis and McOuat Limited, 2006. A Technical review of the pre-feasibility study of the Labmag iron ore project, Labrador, 153 pages.

Webb, P., et al., 2006. GEOPT18 - An international proficiency test for analytical geochemistry laboratories - report on round 18, 4 pages.

Yu, B., Raabe, H., 2009. Metallurgical testing on the Lac-à-Paul apatite deposit, 17 pages.

23.1 WEB REFERENCES

Principal iron and titanium showings in the Grenville Province

<http://www.mrn.gouv.qc.ca/english/mines/quebec-mines/2005-06/fer-titane-1.pdf>

Prospective metallogenic setting of the Grenville Province.

http://cgc.rncan.gc.ca/mindep/synth_prov/grenville/index_f.phpN° tphp

Daily market report on the Baltic Dry Index

<http://www.dryships.com/pages/report.asp>

A powerpoint presentation of PhosCan Chemical Corp. The Martison Phosphate Project: "It's Time Has Come".

<http://www.phoscan.ca/>

ITEM 24: CERTIFICATES OF QUALIFICATION

RÉJEAN GIRARD, PROFESSIONAL GEOLOGIST

I. Réjean GIRARD, P. Geo., do hereby certify that:

1. I am currently employed as a senior geologist by:
IOS Services Géoscientifiques inc.
1319, boulevard St-Paul
Chicoutimi, Québec, G7J 3Y2
2. I graduated with a degree in geology from *Université Laval* in Ste-Foy, Québec, in 1985. In addition, I completed 5 years of graduate studies in mineral resources at *Université du Québec à Chicoutimi*.
3. I am a member of the *Ordre des géologues du Québec*, n° 521.
4. I have worked as a geologist for 24 years since my graduation from university.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI-43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI-43-101), and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purpose of NI-43-101.
6. I am responsible for the preparation of the technical report entitled "*Preliminary economic assessment, the Lac-à-Paul apatite-ilmenite project, Saguenay-Lac-St-Jean area Québec, Canada: A NI-43-101 compliant technical report*", dated January 12th, 2010, relating to the Lac-à-Paul property. I visited the property at on September 14th 2009.
7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report of which the omission to disclose would make the Technical Report misleading.
8. I am independent of the issuer. Having applied all the tests in section 1.5 of National Instrument 43-101.
9. I have read National Instrument 43-101 and Form 43-101-F1, and the Technical Report has been prepared in compliance with that instrument and form.

10. I consent to the filing of the Technical Report with any stock exchange or other regulatory authority, and any publication of the Technical Report by them on their publicly accessible websites. I also consent to the use of excerpt of the report as long as it does not alter the content or the meaning of the report.

Dated January 22nd 2010

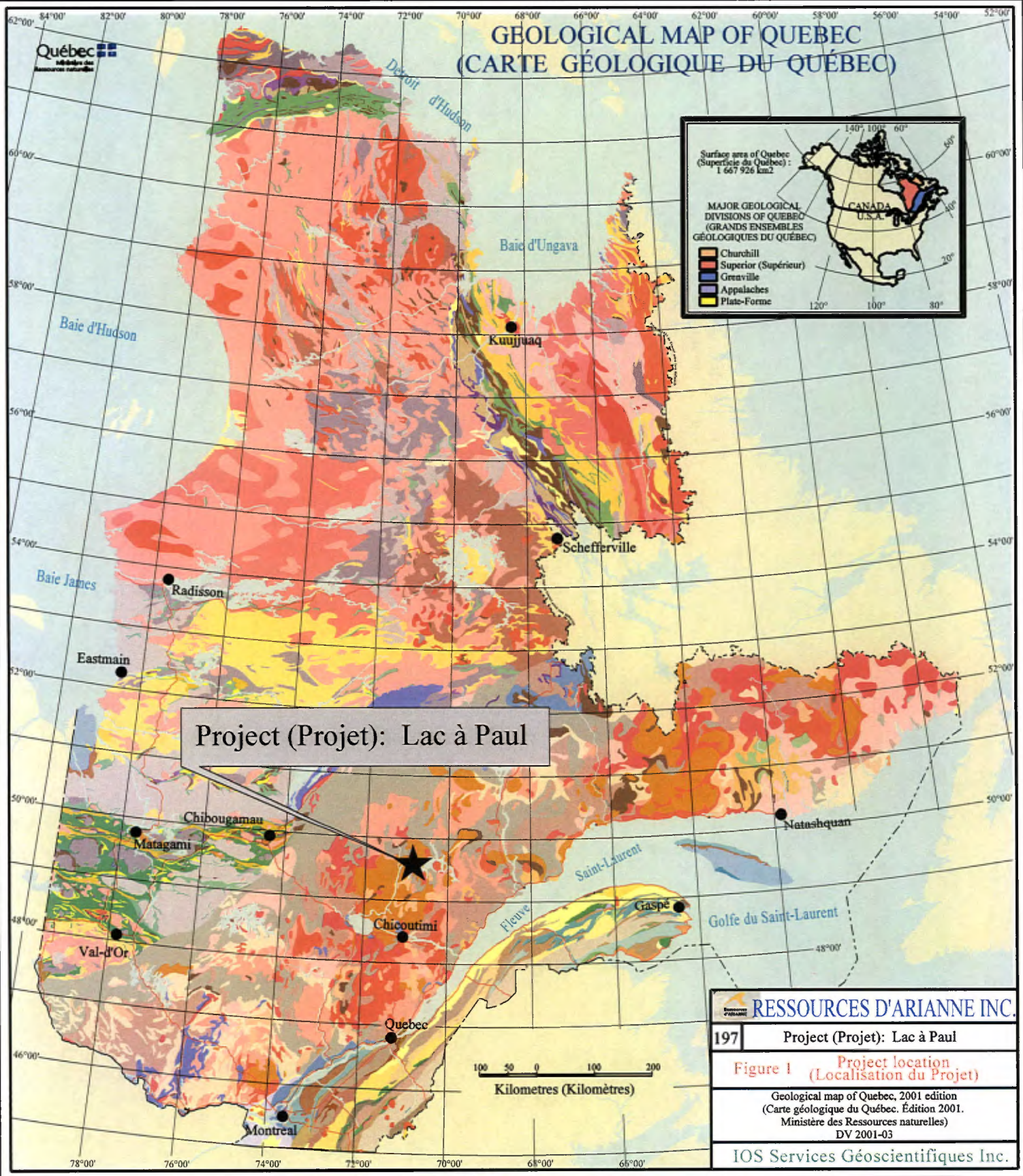


Réjean Girard, Professional geologist.
OGQ n° 521

ITEM 25: ADDITIONAL REQUIREMENTS FOR
TECHNICAL REPORTS ON DEVELOPMENT
PROPERTIES AND PRODUCTION PROPERTIES

Not applicable.

ITEM 26: ILLUSTRATIONS (FIGURES, SECTIONS
AND APPENDIX)



RESSOURCES D'ARIANNE INC.

197 Project (Projet): Lac à Paul

Figure 1 Project location (Localisation du Projet)

Geological map of Quebec, 2001 edition
(Carte géologique du Québec. Édition 2001.
Ministère des Ressources naturelles)
DV 2001-03

IOS Services Géoscientifiques Inc.

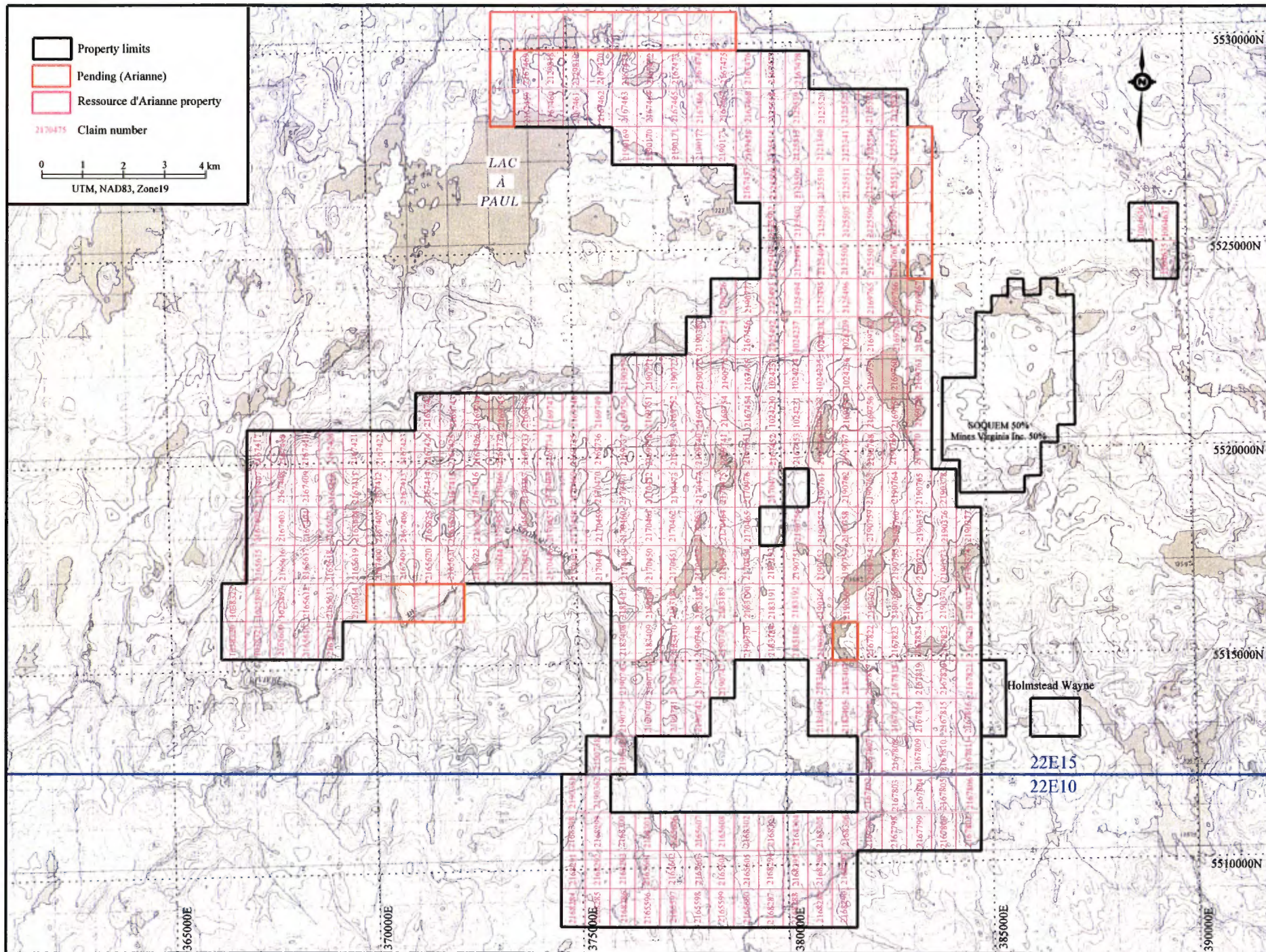


Figure 2: Claim map

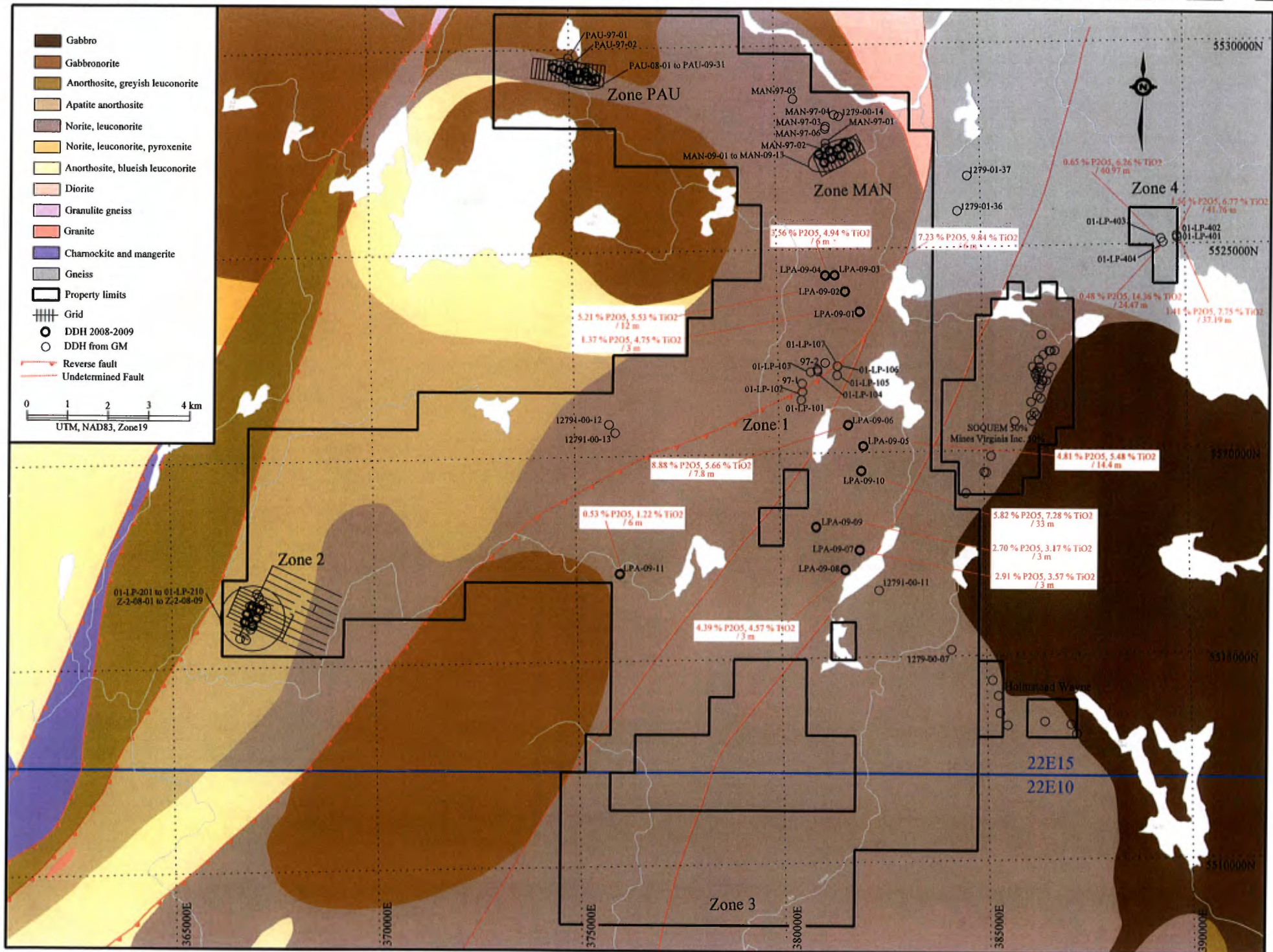


Figure 3: Regional geology

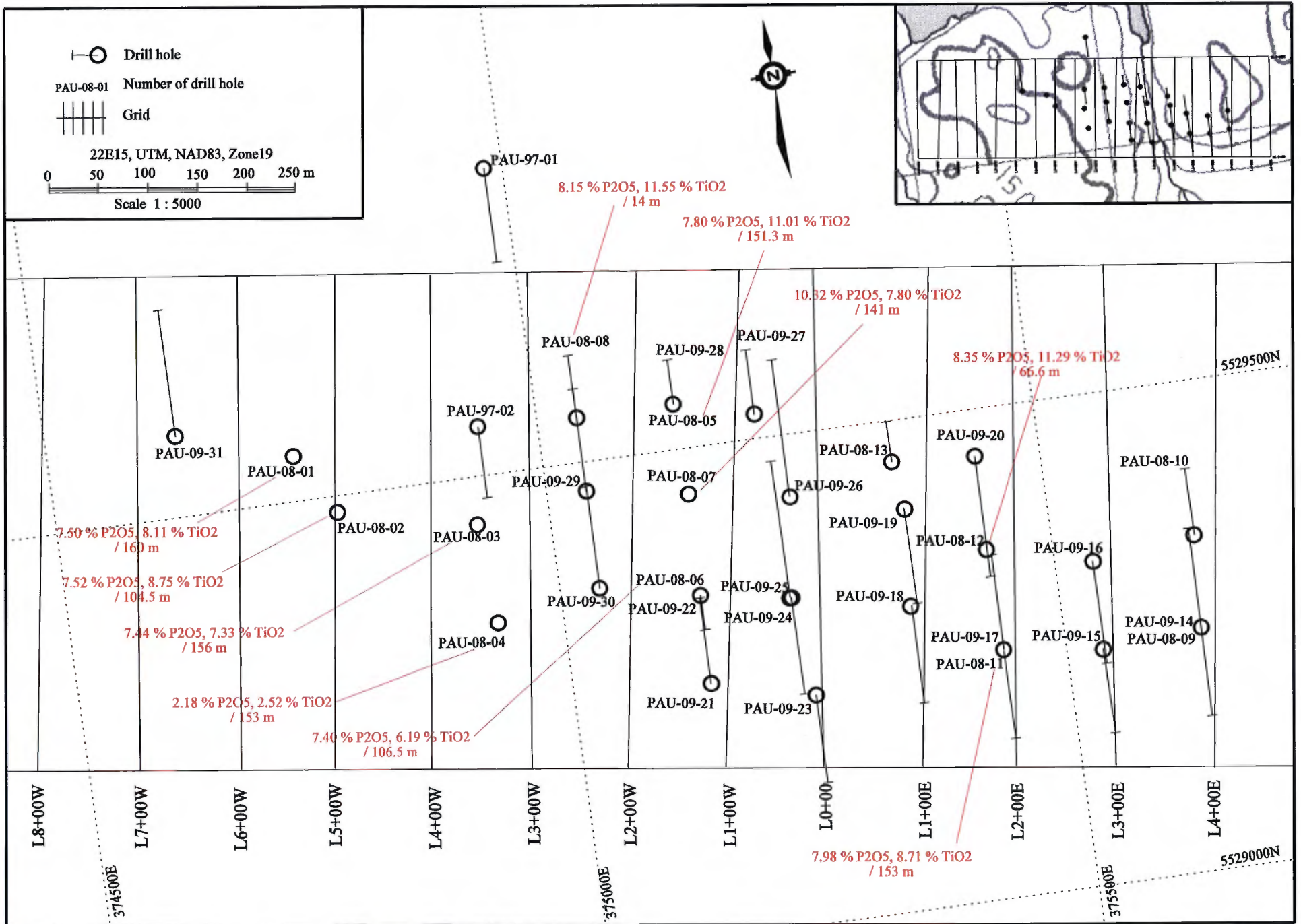


Figure 4: Drill holes location in the Paul Zone

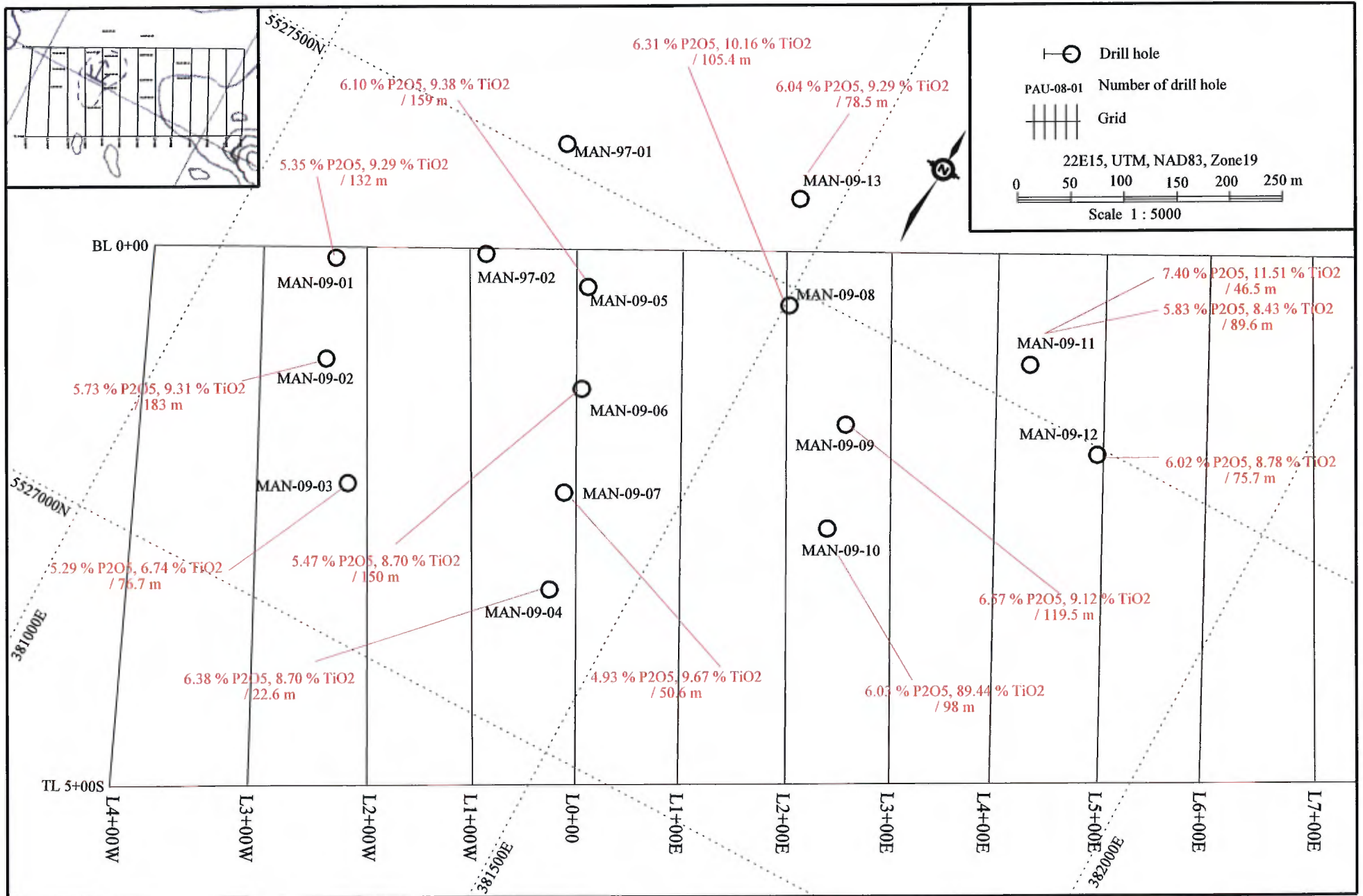


Figure 5: Drill holes location in the Manouane Zone

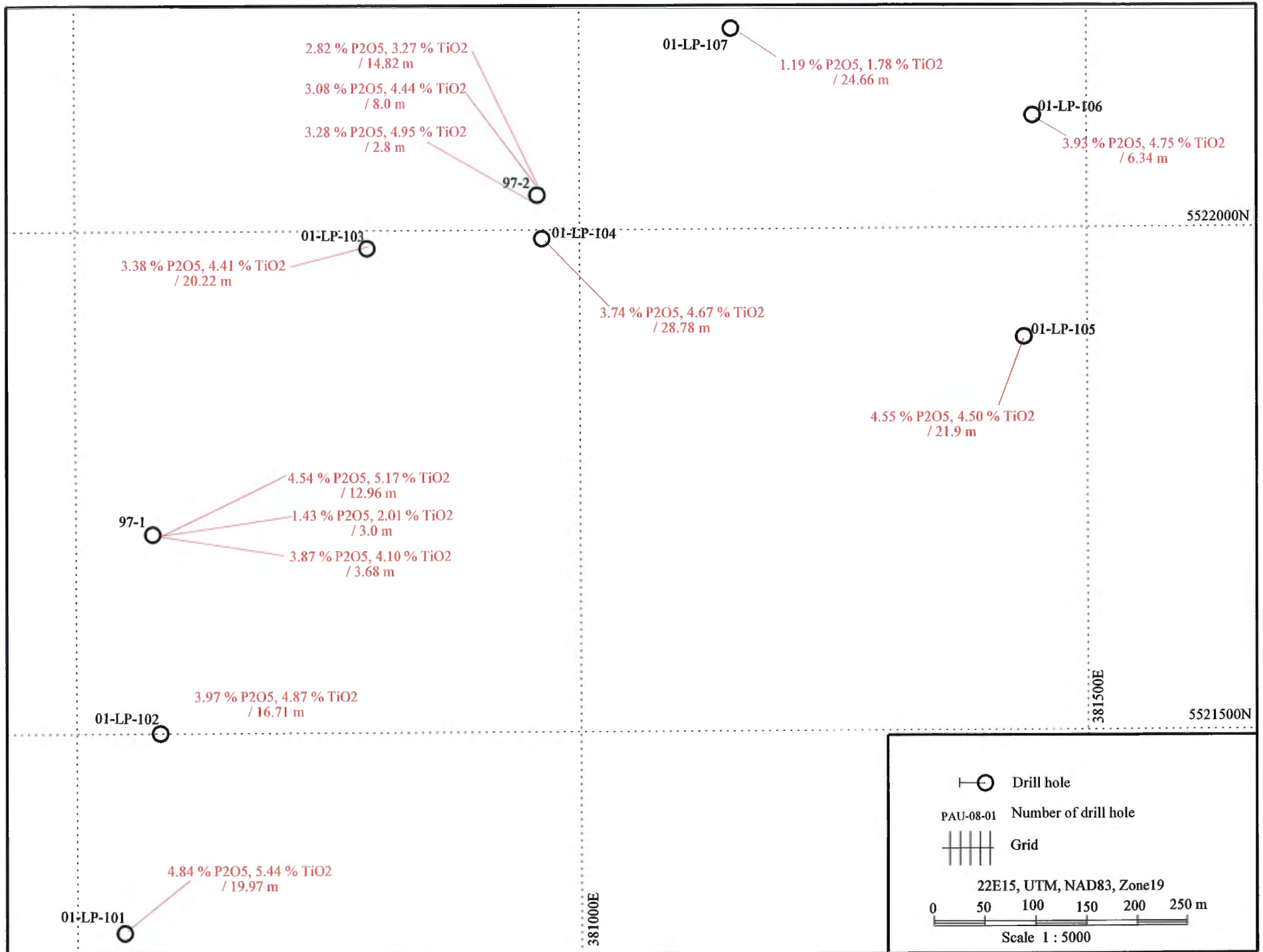


Figure 6: Drill holes location in the Zone 1

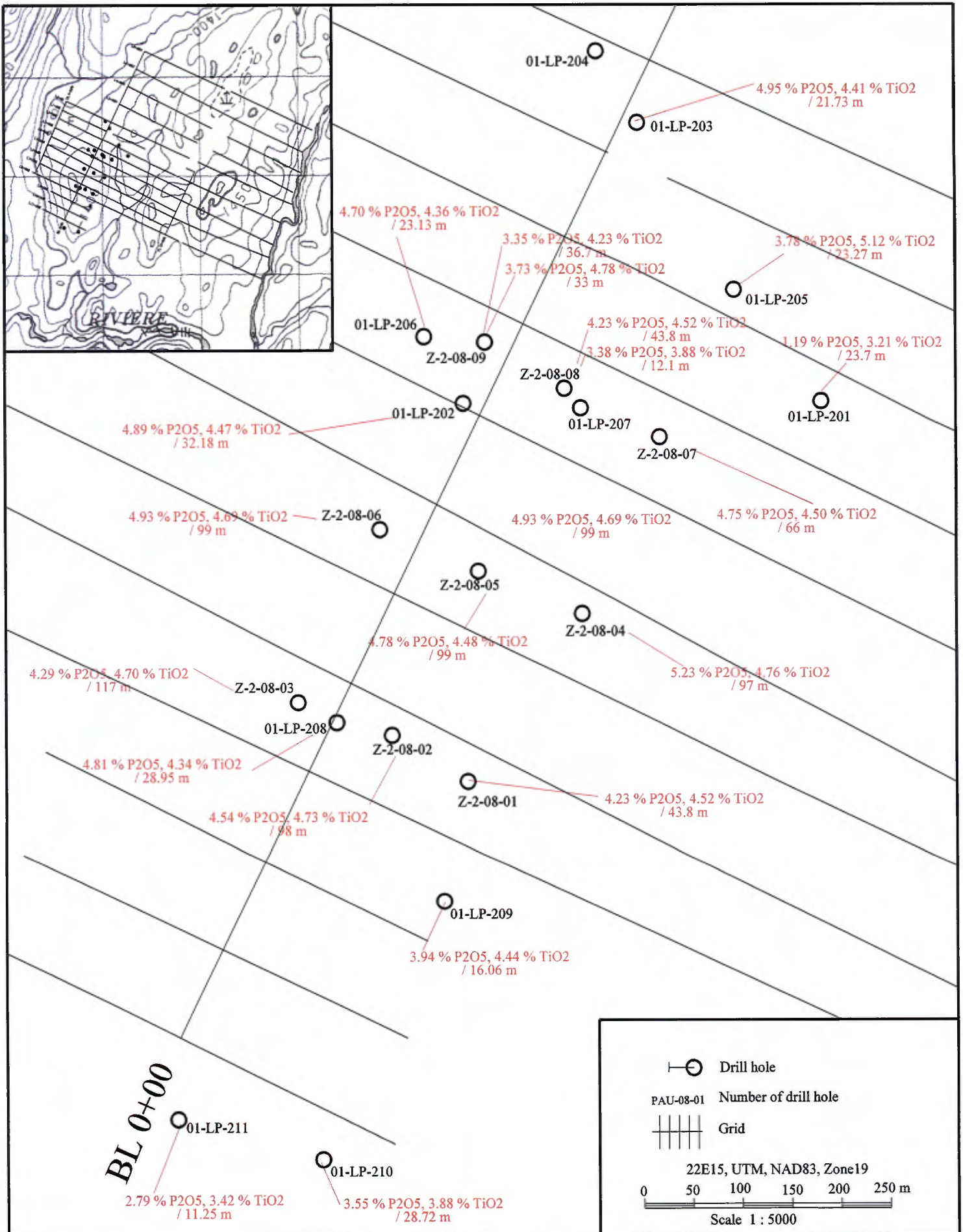


Figure 7: Drill holes location in the Zone 2

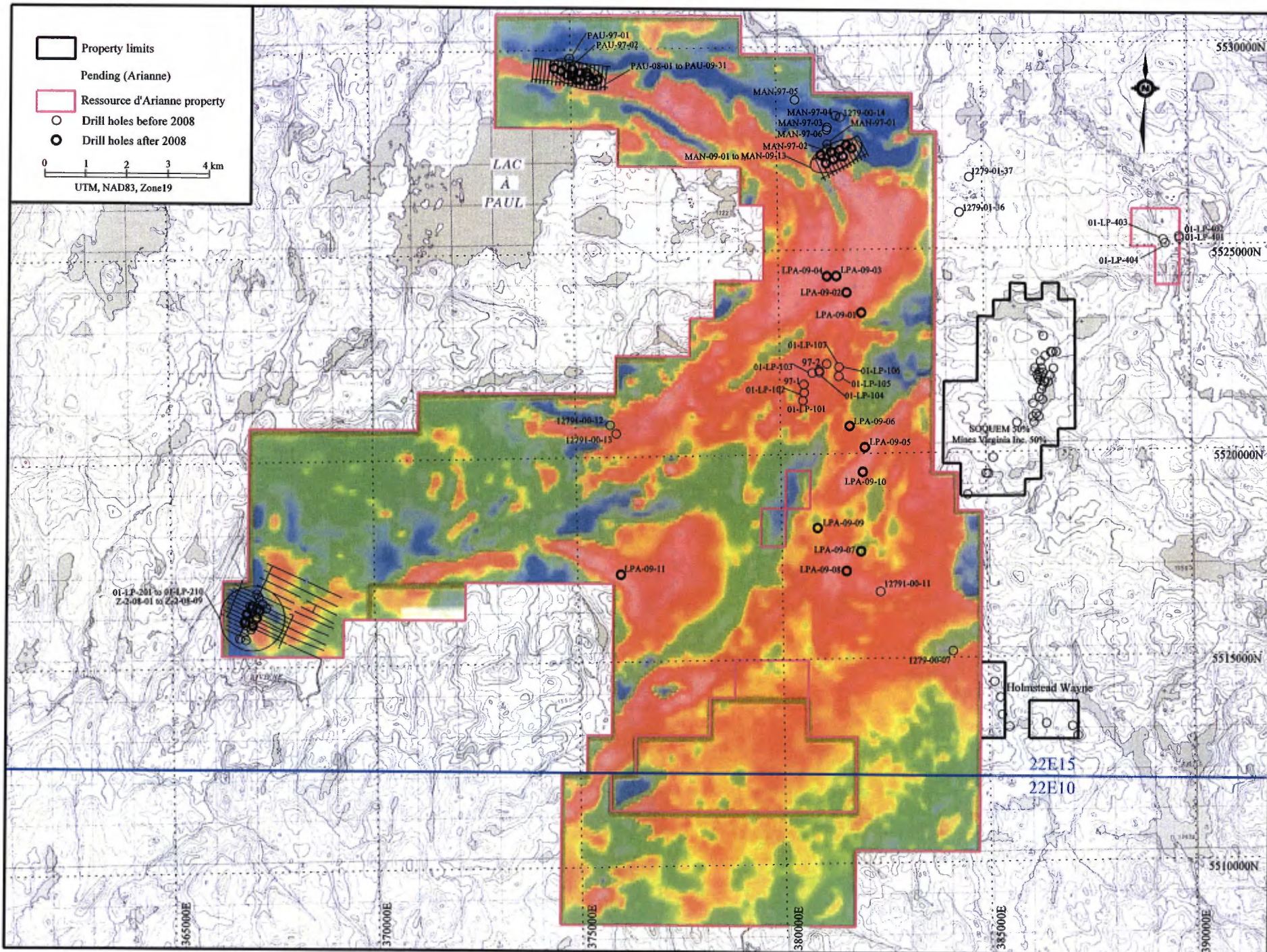


Figure 8: Airborne total field magnetic map

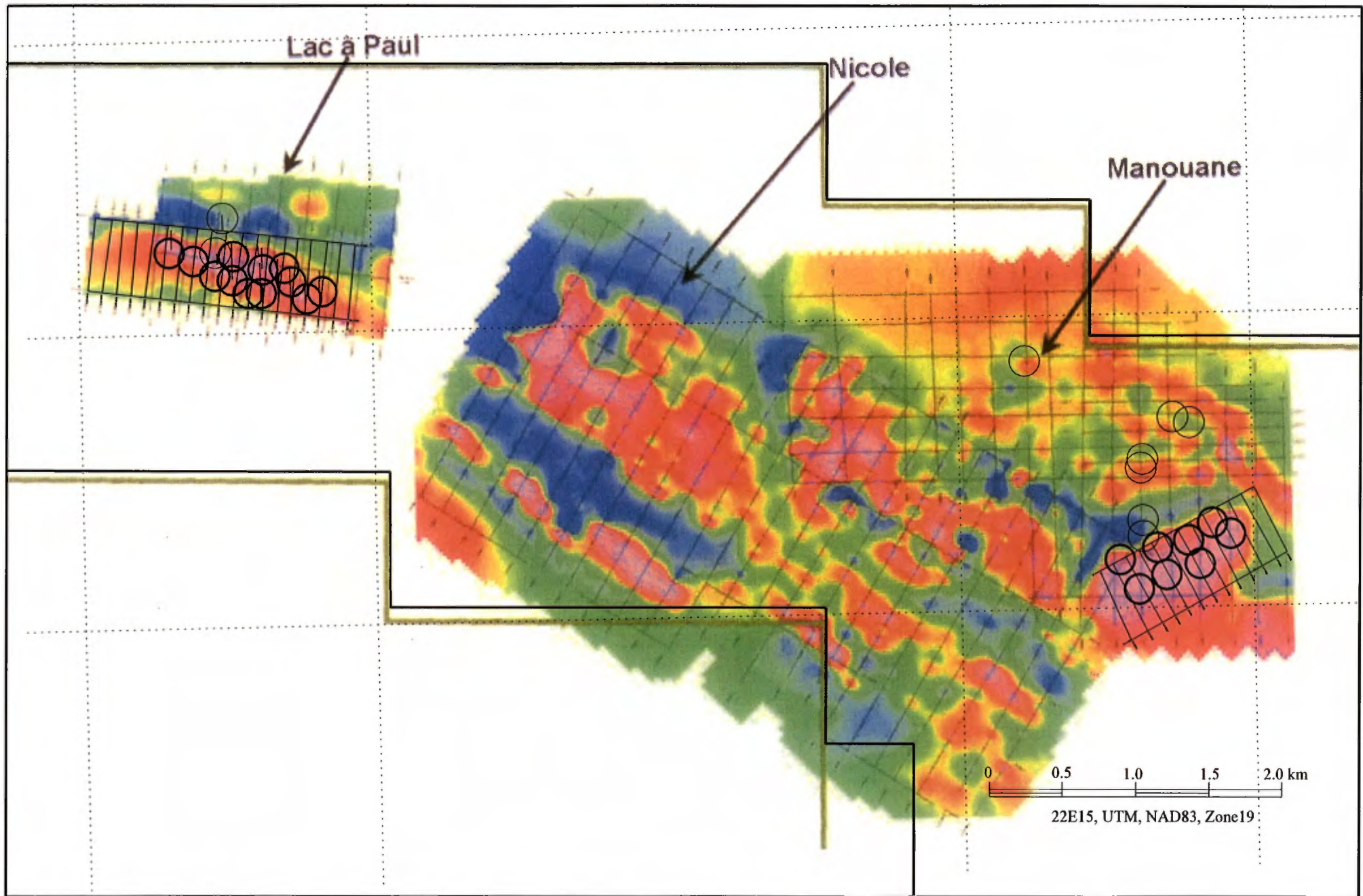


Figure 9: Ground magnetic survey for the Paul and Manouane Zone

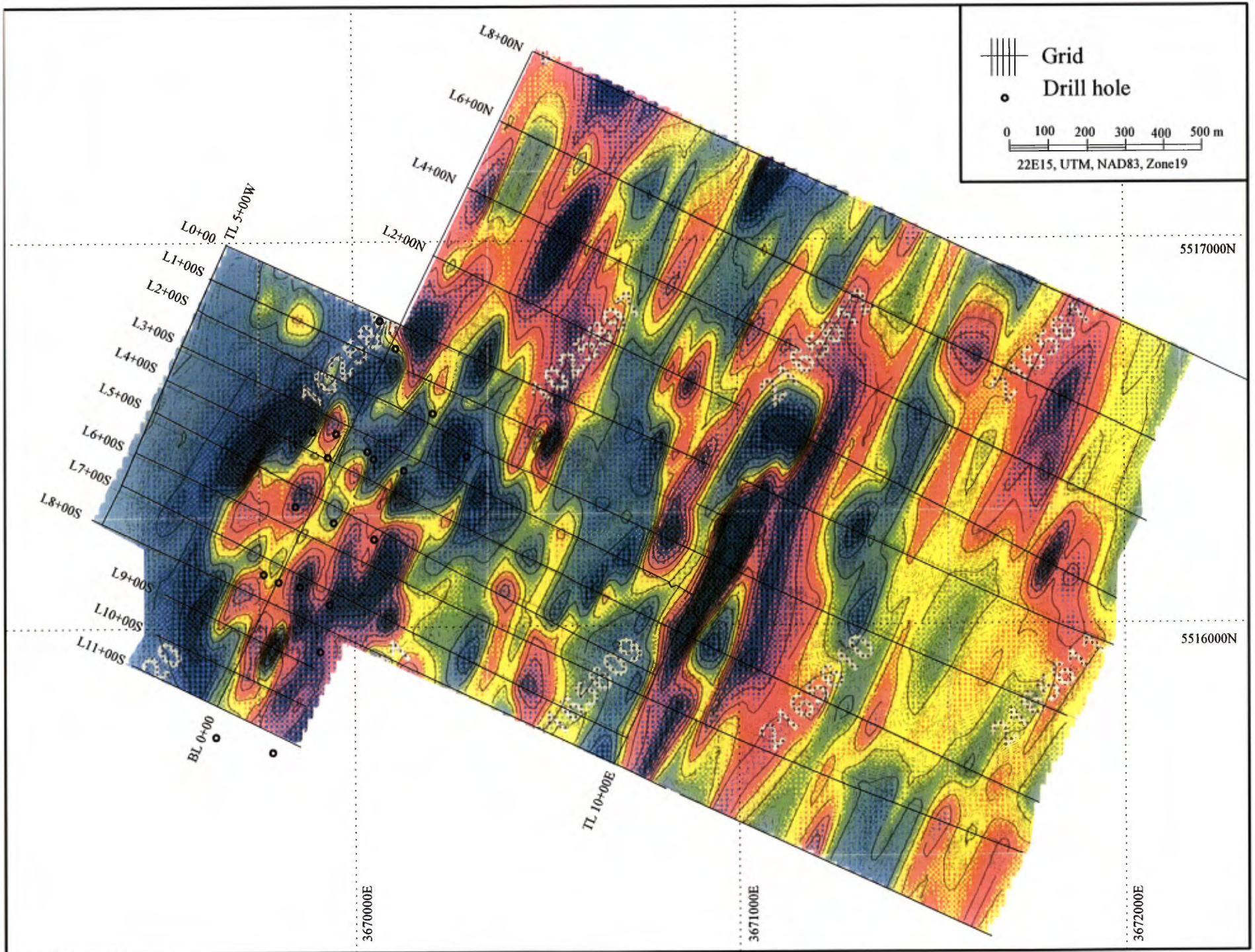


Figure 10: Ground magnetic survey for Zone 2

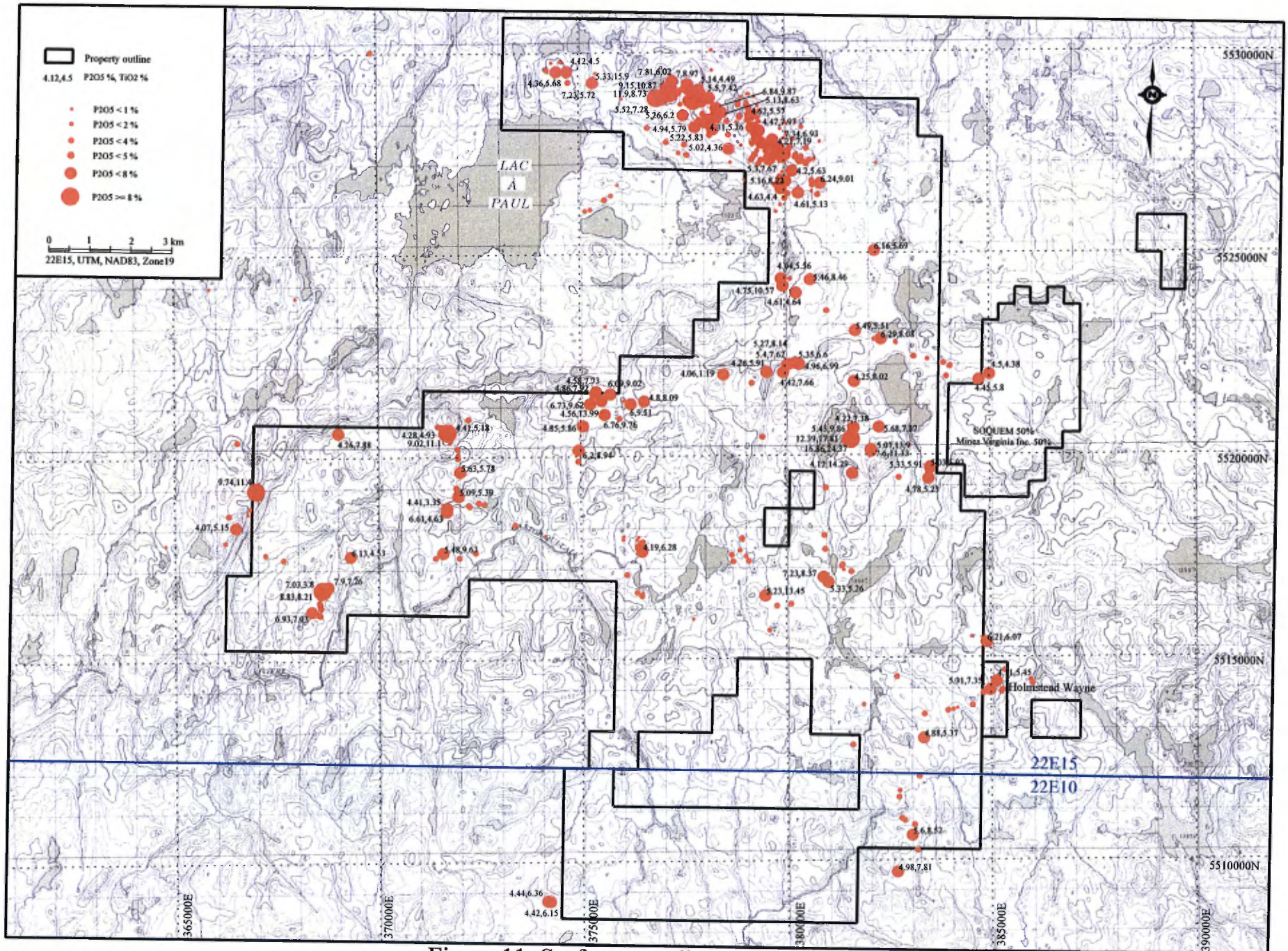
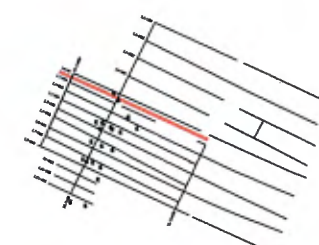
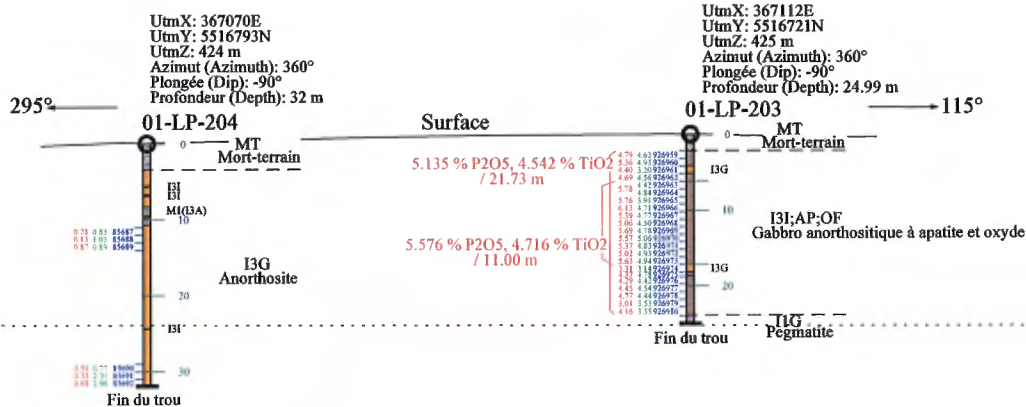


Figure 11: Surface sampling



MT	Mort-terrain (Overburden)	I3G	Anorthosite
I1B	Granite	I4B	Pyroxénoite (Pyroxenite)
I1G	Pegmatite	I4Z1	Néonite
I2D	Syérite (Syenite)	V1D	Dacite
I3A	Gabbro	M1	Gneiss
I3B	Diabase	M6	Gneiss granitique (Granitic gneiss)
I3I	Gabbro anorthositique (Anorthositic gabbro)	M8	Schiste
I3H	Anorthosite gabbroïque (Gabbroic anorthositic)	M16	Amphibolite

AP: Apatite
 BO: Biotite
 MG: Magnétite (Magnetite)
 OF: Oxyde (Oxide)
 OL: Olivine
 4.45 Ap₂O₃(%)
 3.55 TiO₂(%)
 4210023 Numéro d'échantillon (Sample number)
 20 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)

0 5 10 15 20 25 m
 Échelle 1 : 1000

RESSOURCES D'ARIANNE INC.

197 **Projet (Project): Lac à Paul**
Grille (Grid): Zone 2

Section L0+50S 01-LP-203,204

SNRC (NTS): 22E15
 UTM, Zone19, Nad83

DDH: LAB. S. L.
 Terrain: A. BOUDREAU
 (Field work) Fév (Feb). 2001
 Dessin: Sanmei Gao
 (Drawing)
 Date: Nov. 2009

Réjean Girard, Géo.

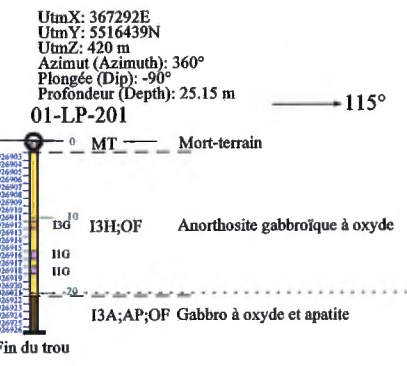
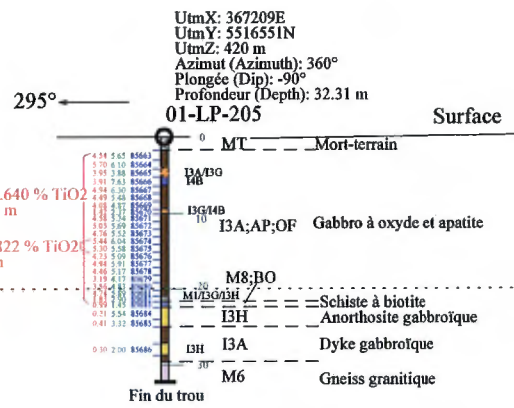
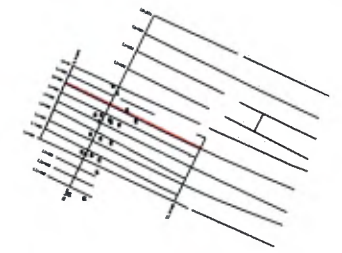
IOS Services Géoscientifiques Inc.

400 m
 375 m
 350 m
 325 m



AP: Apatite
 BO: Biotite
 MG: Magnésite (Magnesite)
 OF: Oxyde (Oxide)
 OL: Olivine
 4.61 Ap₂O₃ (%)
 2.55 TiO₂ (%)
 76310023 Numéro d'échantillon (Sample number)
 23 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)

0 5 10 15 20 25 m
 Echelle 1 : 1000



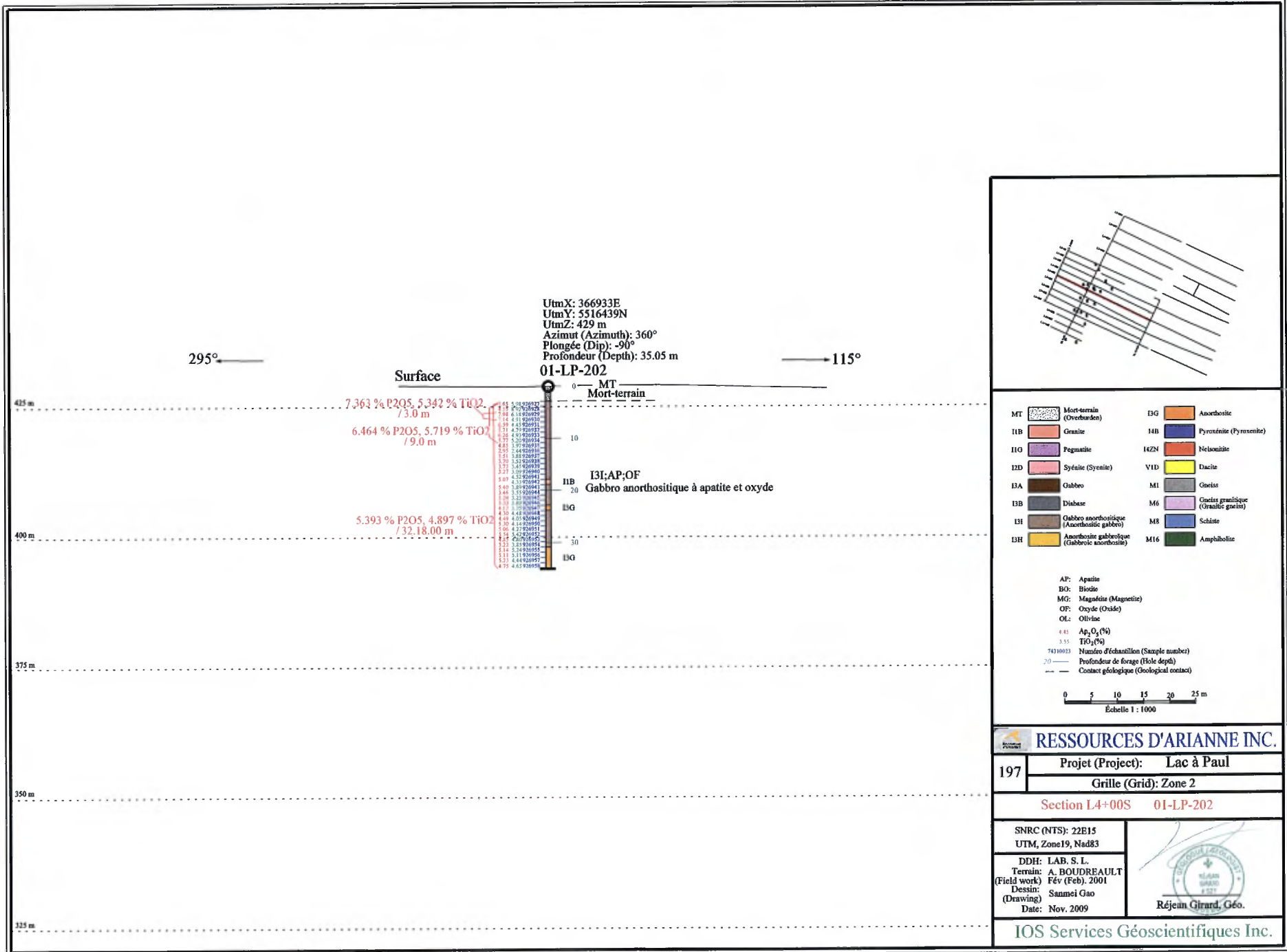
375 m

350 m

RESSOURCES D'ARIANNE INC.	
197	Projet (Project): Lac à Paul
Grille (Grid): Zone 2	
Section L2+00S 01-LP-201,205	
SNRC (NTS): 22E15 UTM, Zone19, Nad83 DDH: LAB. S. L. Terrain: A. BOUDREAU (Field work) Fév. (Feb). 2001 Dessin: Sanmei Gao (Drawing) Date: Nov. 2009	 Réjean Girard, Géo.
IOS Services Géoscientifiques Inc.	

NUMÉRIQUE

PAGE(S) DE DIMENSION HORS STANDARD
NUMÉRISÉE ET POSITIONNÉE À LA SUITE DES
PRÉSENTES PAGES STANDARDS.



295°

115°

UtmX: 366933E
 UtmY: 5516439N
 UtmZ: 429 m
 Azimut (Azimuth): 360°
 Plongée (Dip): -90°
 Profondeur (Depth): 35.05 m
 01-LP-202

Surface
 0 MT
 Mort-terrain

I3I:AP:OF
 Gabbro anorthositique à apatite et oxyde

7.363 % P₂O₅, 5.342 % TiO₂
 / 3.0 m

6.464 % P₂O₅, 5.719 % TiO₂
 / 9.0 m

5.393 % P₂O₅, 4.897 % TiO₂
 / 32.18.00 m

MT	Mort-terrain (Overburden)	I3G	Anorthosite
I1B	Granite	I4B	Pyroxénite (Pyroxenite)
I1O	Pegmatite	I4Z	Nelsonite
I2D	Syénite (Syenite)	V1D	Dacite
I3A	Gabbro	M1	Gneiss
I3B	Dabase	M6	Gneiss granitique (Granitic gneiss)
I3H	Gabbro anorthositique (Anorthositic gabbro)	M8	Schiste
I3H	Anorthosite gabbroïque (Gabbroic anorthosite)	M16	Amphibolite

AP: Apatite
 BO: Biotite
 MG: Magnésite (Magnetite)
 OF: Oxyde (Oxide)
 OL: Olivine

6.43 Ap₂O₃(%)
 3.55 TiO₂(%)

74310013 Numéro d'échantillon (Sample number)
 20 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)

0 5 10 15 20 25 m
 Échelle 1 : 1000

RESSOURCES D'ARIANNE INC.

197

Projet (Project): **Lac à Paul**

Grille (Grid): **Zone 2**

Section L4+00S **01-LP-202**

SNRC (NTS): 22E15
 UTM, Zone 19, Nad83

DDH: LAB. S. L.
 Terrain: A. BOUDREAU
 (Field work) Fév (Feb), 2001
 Dessin: Sanmei Gao
 (Drawing)
 Date: Nov. 2009

IOS Services Géoscientifiques Inc.

NUMÉRIQUE

**PAGE(S) DE DIMENSION HORS STANDARD
NUMÉRISÉE ET POSITIONNÉE À LA SUITE DES
PRÉSENTES PAGES STANDARDS.**

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115°

UtmX: 366910E
 UtmY: 5515936N
 UtmZ: 429 m
 Azimut (Azimuth): 360°
 Plongée (Dip): -90°
 Profondeur (Depth): 32.31 m

Surface 01-LP-209 MT
 -0-Mort-terrain

425 m

400 m

375 m

350 m

4.263 % P2O5, 4.959 % TiO2
 / 16.06 m

0.23	0.40	85595
1.64	1.81	85596
0.99	1.57	85597
8.13	1.20	85598
0.73	0.70	85599
1.18	1.41	85600
3.35	3.70	85601
1.64	1.90	85602
4.60	5.74	85603
1.70	1.90	85604
2.74	3.10	85605
3.21	3.40	85606
4.15	4.81	85607
2.15	2.50	85608
4.30	5.31	85609
1.67	2.00	85610
2.31	3.40	85611
1.34	1.51	85612
3.43	4.20	85613
1.82	6.30	85615

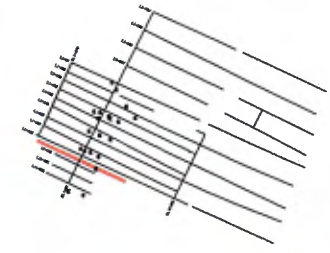
I3G
 Anorthosite

I3A;MG
 20

I3G
 I3I;OF;AP

I3I
 Gabbro Anorthositique à oxyde et apatite

Fin du trou



MT	Mort-terrain (Overburden)	I3G	Anorthosite
I1B	Granite	I4B	Pyroxérite (Pyroxenite)
I1G	Pegmatite	I4ZN	Nelsonite
I2D	Syéénite (Syenite)	V1D	Dacite
I3A	Gabbro	M1	Gneiss
I3B	Dabase	M6	Gneiss granitique (Granitic gneiss)
I3I	Gabbro anorthositique (Anorthositic gabbro)	M8	Schiste
I3H	Anorthosite gabbrotique (Gabbroic anorthositic)	M16	Amphibolite

AP: Apatite
 BG: Biotite
 MG: Magnétite (Magnetite)
 OE: Oxyde (Oxide)
 OL: Olivine
 +3: Ag₂O (%)
 +5: TiO₂ (%)
 7433023: Numéro d'échantillon (Sample number)
 -31: Profondeur de forage (Hole depth)
 ---: Contact géologique (Geological contact)

0 5 10 15 20 25 m
 Échelle 1 : 1000

RESSOURCES D'ARIANNE INC.

197 **Projet (Project): Lac à Paul**
Grille (Grid): Zone 2

Section L8+50S: 01-LP-209

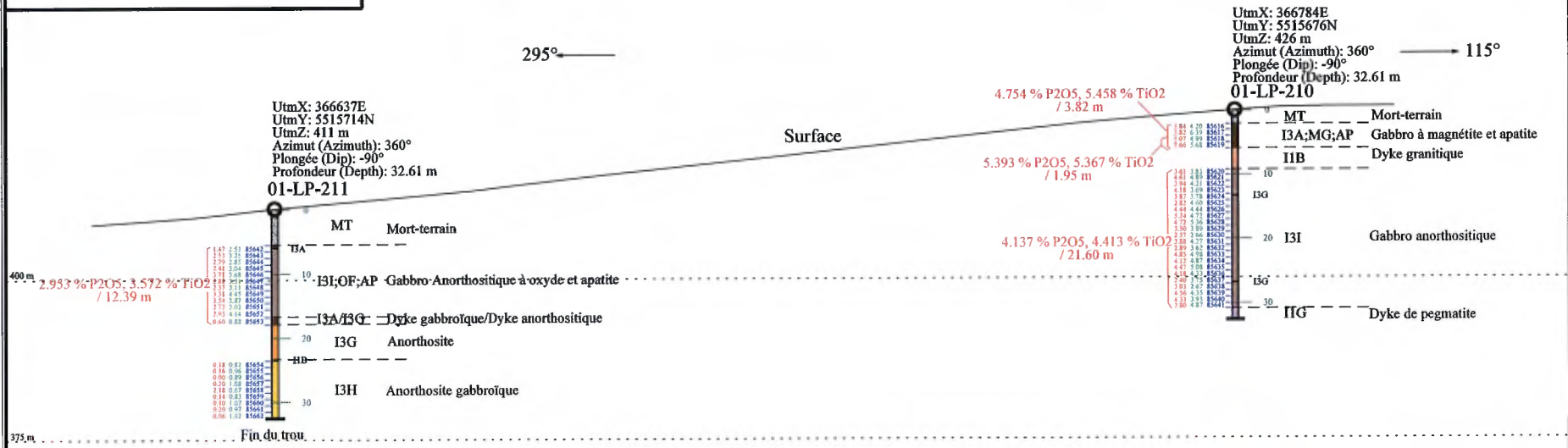
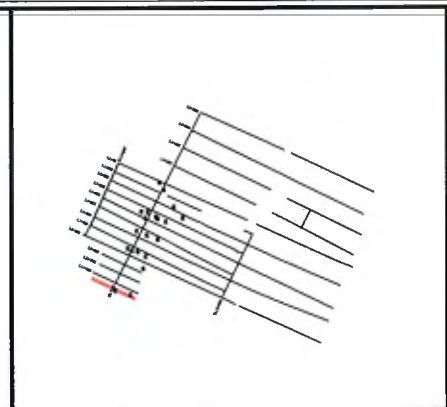
SNRC (NTS): 22E15
 UTM, Zone19, Nad83
 DDH: LAB. S. L.
 Terrain: A. BOUDREAU
 (Field work) Fév. 2001
 Dessin: Sanmei Gao
 (Drawing)
 Date: Nov. 2009



IOS Services Géoscientifiques Inc.



AP: Apatite
 BC: Biotite
 MG: Magnétite (Magnetite)
 OF: Oxyde (Oxide)
 OL: Olivine
 4.45 Ap₂O₃(%)
 3.55 TiO₂(%)
 74310033 Numéro d'échantillon (Sample number)
 201 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)



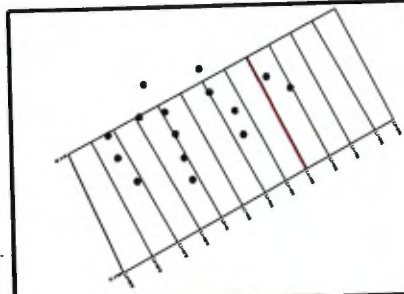
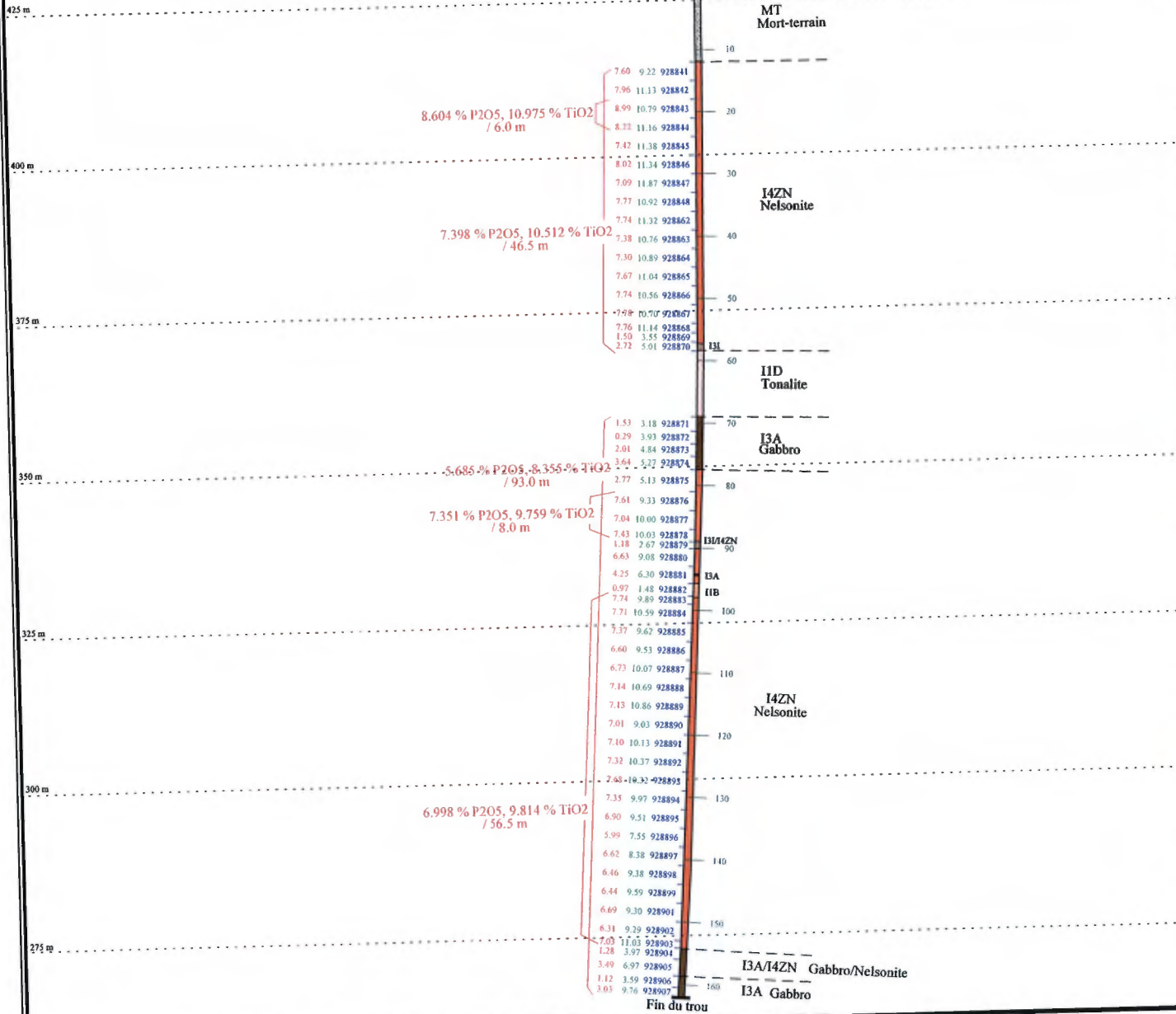
RESSOURCES D'ARIANNE INC.	
197	Projet (Project): Lac à Paul
Grille (Grid): Zone 2	
Section L11+50S: 01-LP-210,211	
SNRC (NTS): 22E15 UTM, Zone19, Nad83 DDH: LAB. S. L. Terrain: A. BOUDREAU (Field work) Fév (Feb). 2001 Dessin: Sanmei Gao (Drawing)	 Réjean Girard, Géo.
Date: Nov. 2009	
IOS Services Géoscientifiques Inc.	

333° ←

→ 153°

UtmX: 381730E
 UtmY: 5327539N
 UtmZ: 427 m
 Azimut (Azimuth): 360°
 Plongée (Dip): -90°
 Profondeur (Depth): 162.0 m

MAN-09-11



MT	Mort-terrain (Overburden)	I3H	Anorthosite gabbroïque (Gabbroic anorthosite)
I1B	Granite	I3G	Anorthosite
I1G	Pegmatite	I4B	Pyroxénite (Pyroxenite)
I1D	Tonalite	I4I	Péridotite (Peridotite)
I1J	Diorite	I4ZN	Nelsonite
I3A	Gabbro	M8	Schiste
I3B	Diabase	M12	Quartzite
I3I	Gabbro anorthositique (Anorthositic gabbro)	M16	Amphibolite

MG: Magnétite (Magnetite)
 4.83 P₂O₅(%)
 3.55 TiO₂(%)
 74310023 Numéro d'échantillon (Sample number)
 20 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)



RESSOURCES D'ARIANNE INC.

197 **Projet (Project):** Lac à Paul
Grille (Grid): Manouane

Section L4+00E: MAN-09-11

SNRC (NTS): 22E15
 UTM, Zone19, Nad83
 DDH: Forage Dami-Or
 Terrain: D. Boulianne, 2009
 Dessin: Sanmei Gao
 (Drawing)
 Date: Dec.09



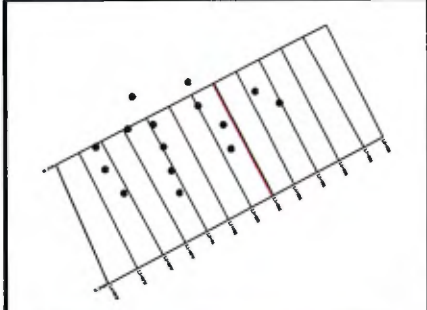
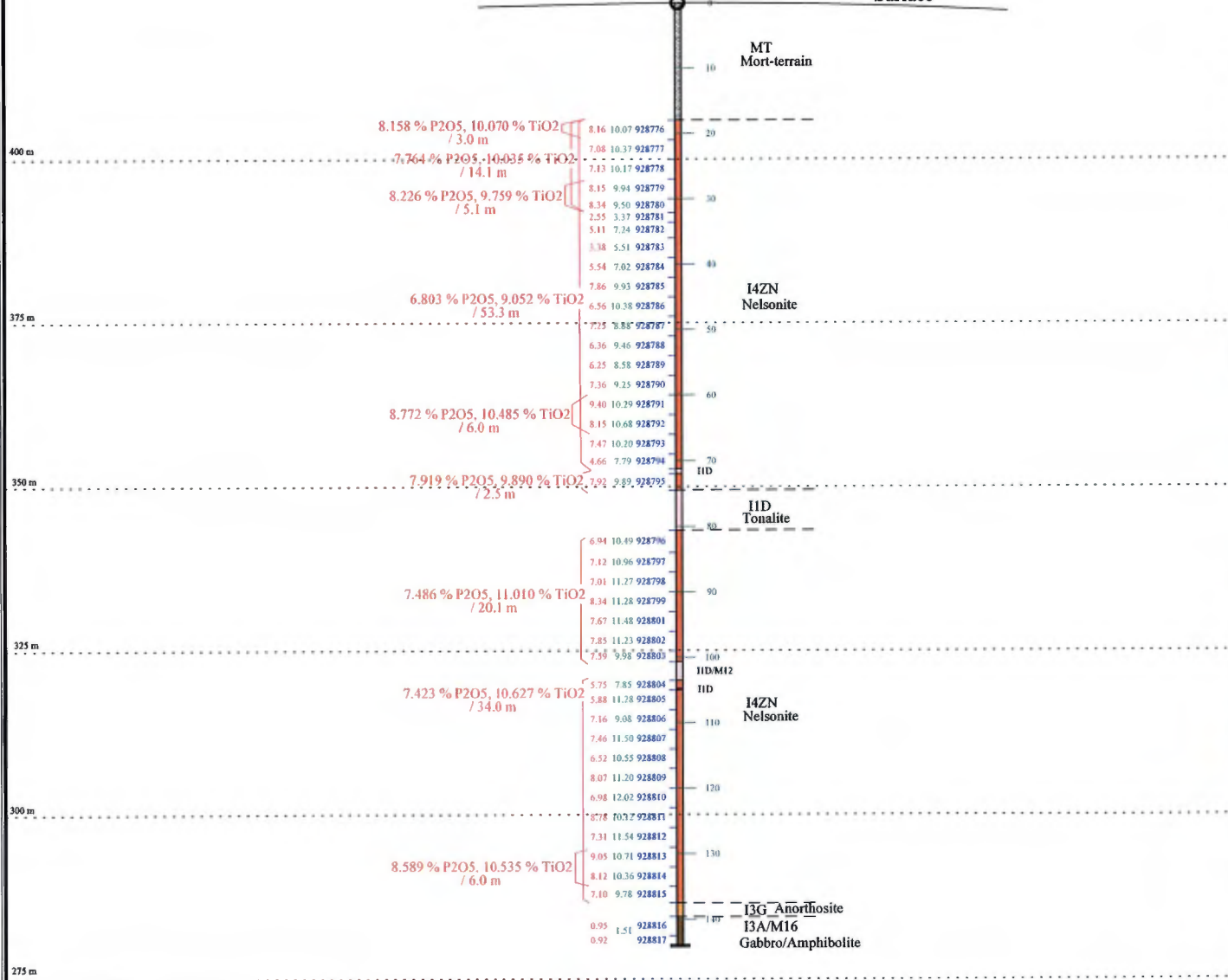
IOS Services Géoscientifiques Inc.

333° ←

→ 153°

UtmX: 381604E
 UtmY: 5527407N
 UtmZ: 424 m
 Azimut (Azimuth): 360°
 Plongée (Dip): -90°
 Profondeur (Depth): 144.0 m
MAN-09-09

Surface



MT	Mort-terrain (Overburden)	I3H	Anorthosite gabbroïque (Gabbroic anorthosite)
I1B	Granite	I3G	Anorthosite
I1G	Pegmatite	I4B	Pyroxénite (Pyroxenite)
I1D	Tonalite	I4I	Périodote (Peridotite)
I2J	Diorite	I4ZN	Nelsonite
I3A	Gabbro	M8	Schiste
I3B	Diabase	M12	Quartzite
I3I	Gabbro anorthositique (Anorthositic gabbro)	M16	Amphibolite

MG: Magnésite (Magnetite)
 1.4: Ap₂O₃ (%)
 1.5: TiO₂ (%)
 74310013 Numéro d'échantillon (Sample number)
 20 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)

0 5 10 15 20 25 m
 Echelle 1 : 1000

RESSOURCES D'ARIANNE INC.

197

Projet (Project): **Lac à Paul**
 Grille (Grid): **Manouane**

Section L3+00E: **MAN-09-09**

SNRC (NTS): 22E15
 UTM, Zone 19, Nad83

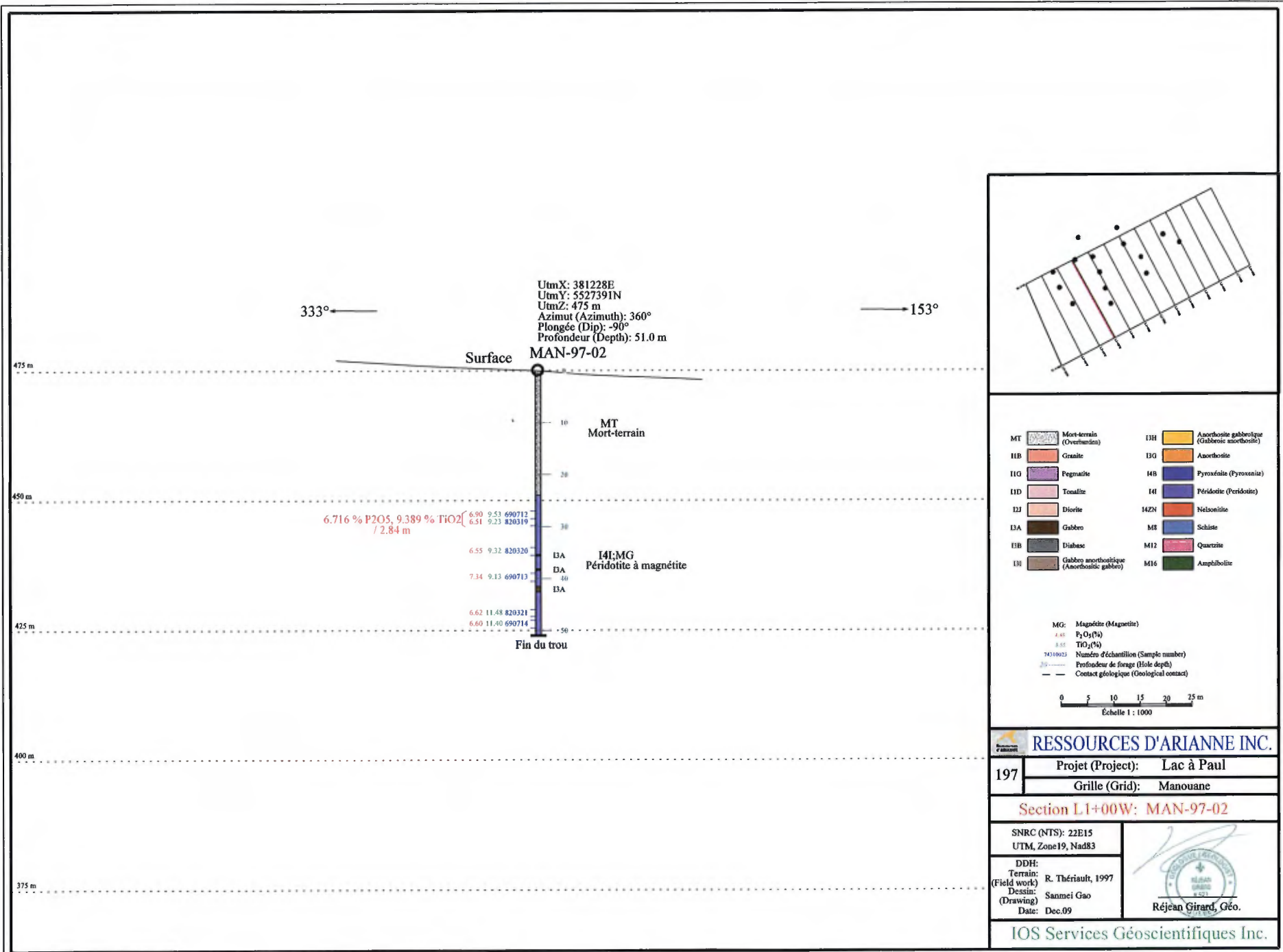
DDH: Forage Dami-Or
 Terrain: D. Boulianne, 2009
 (Field work)
 Dessin: Sanmei Gao
 (Drawing)
 Date: Dec.09

Réjean Girard, Géo.

IOS Services Géoscientifiques Inc.

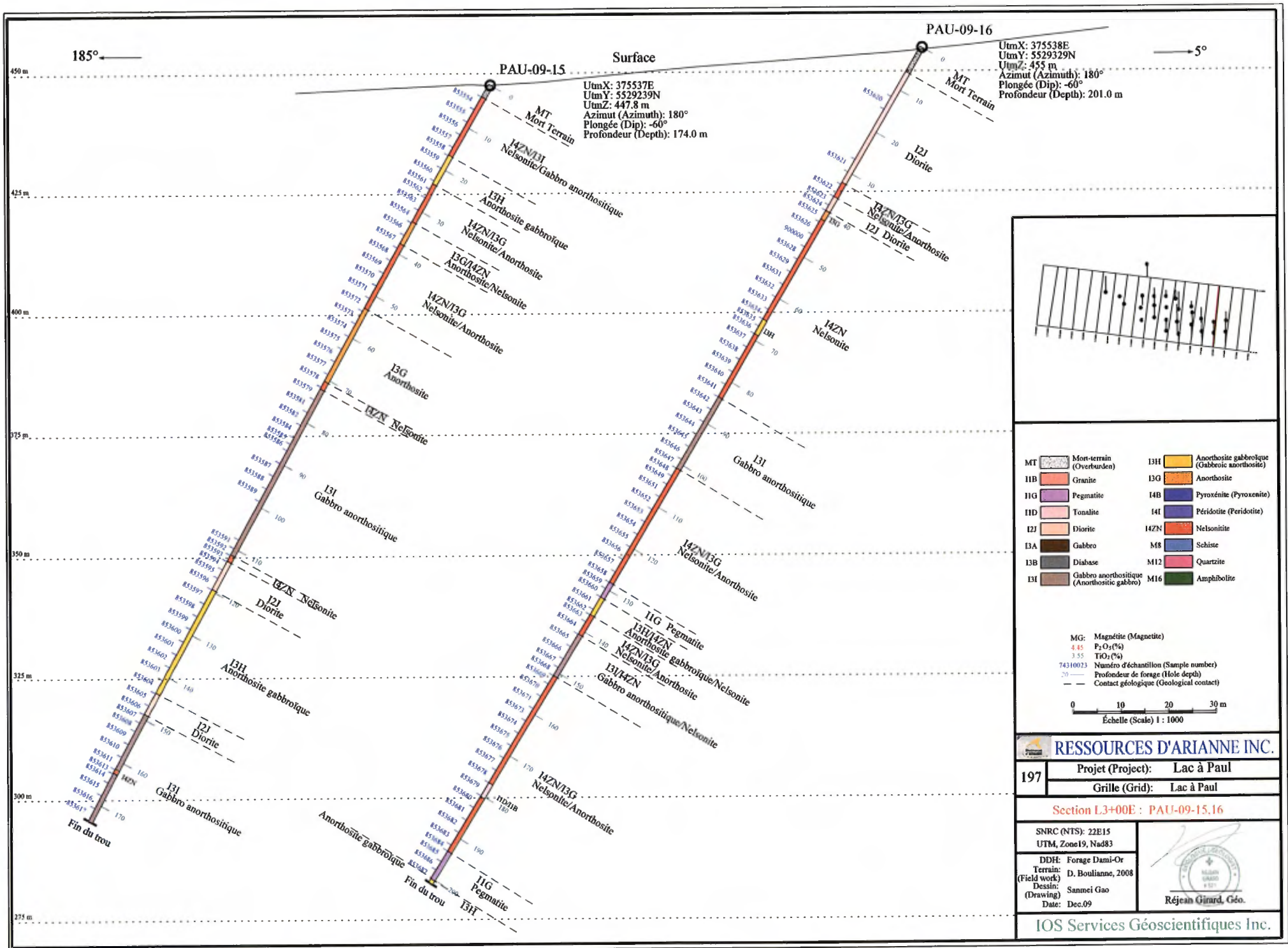
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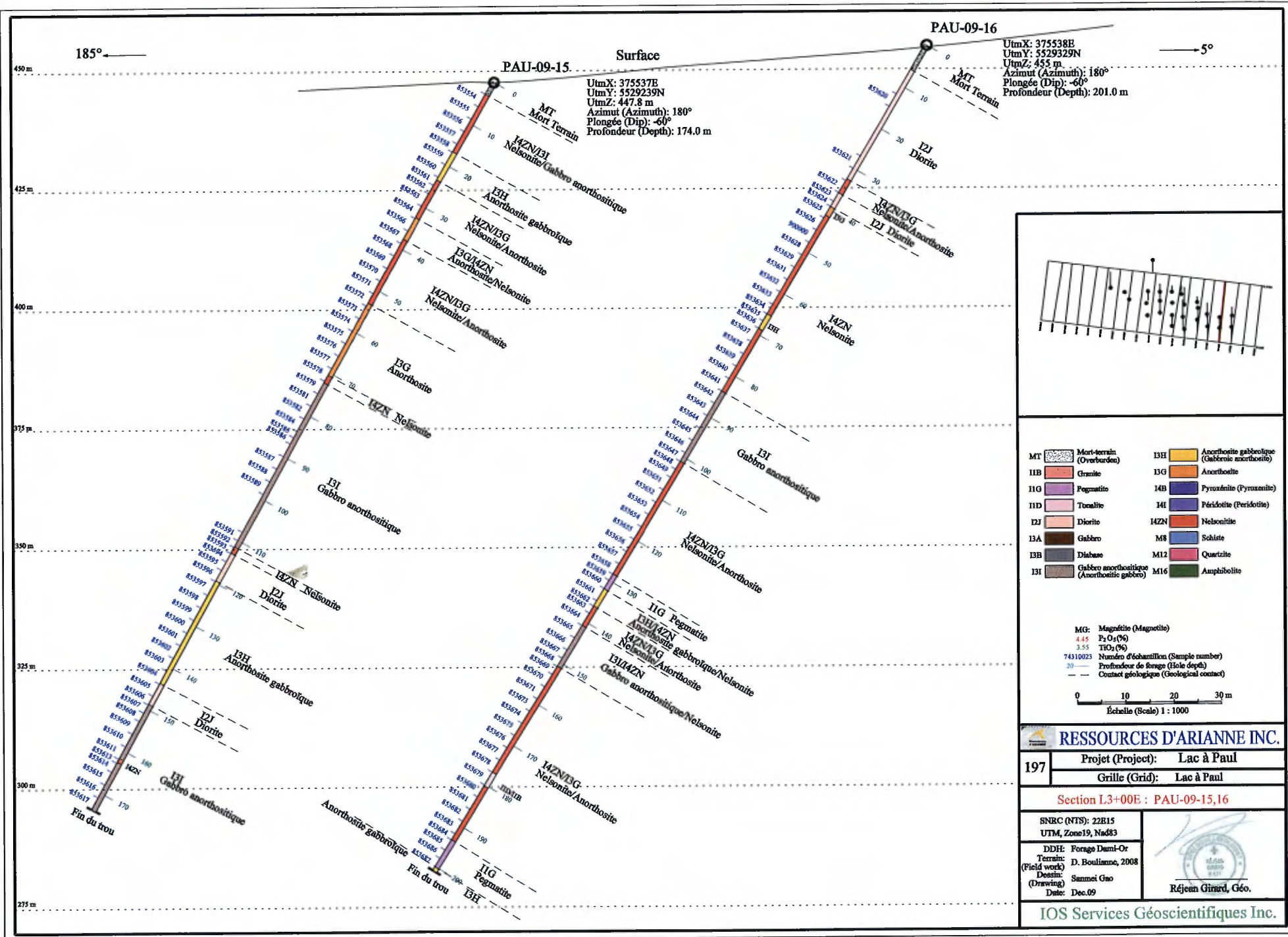
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RESSOURCES D'ARIANNE INC.

197

Projet (Project): Lac à Paul
 Grille (Grid): Lac à Paul

Section L3+00E : PAU-09-15,16

SNRC (NTS): 22B15
 UTM, Zone19, Nad83

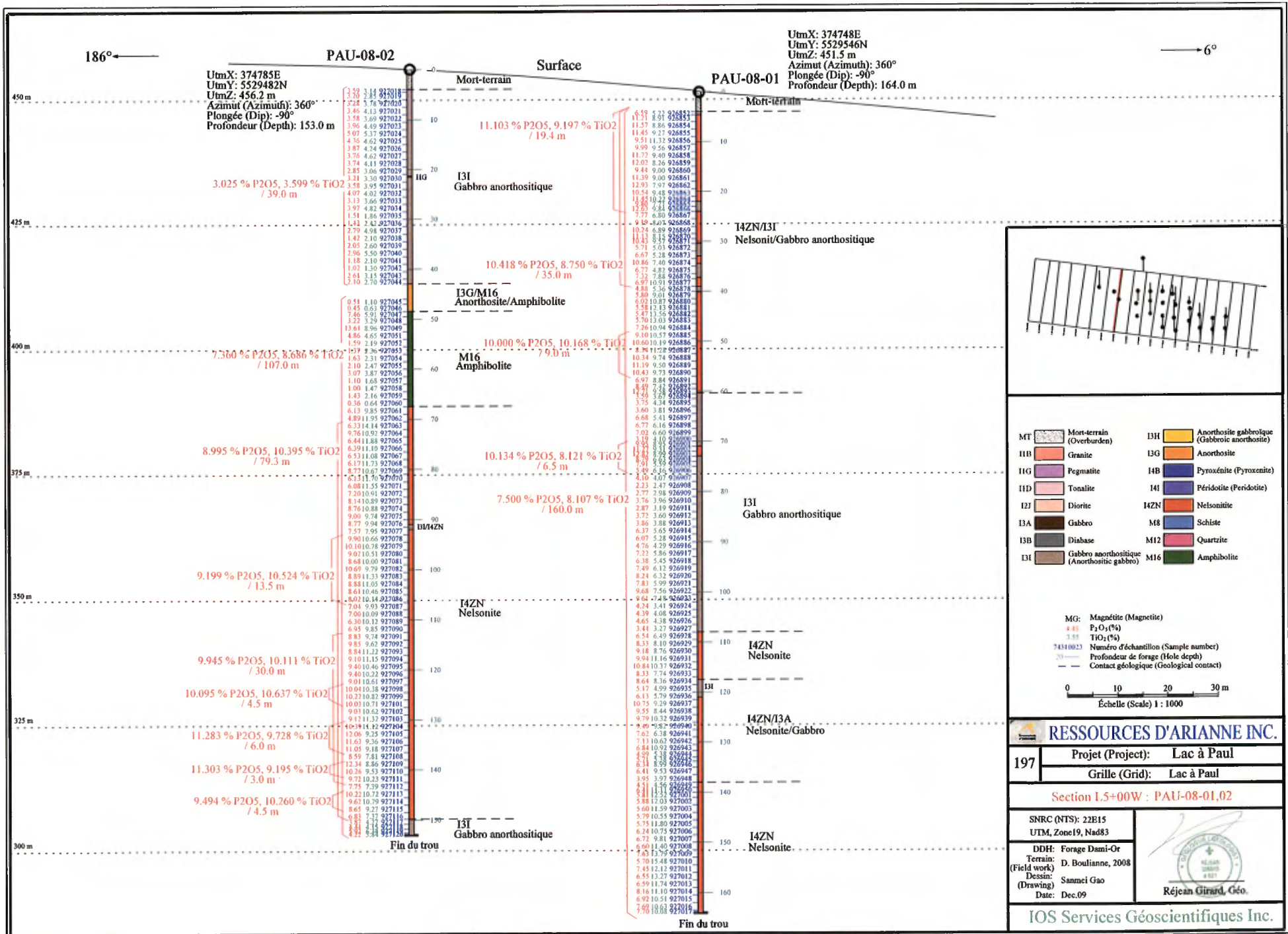
DDH: Forage Demi-Or
 Terrain: D. Boullanne, 2008
 (Field work)
 Dessin: Sammi Gno
 (Drawing)
 Date: Dec.09

Réjean Girard, Géo.

IOS Services Géoscientifiques Inc.

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RESSOURCES D'ARIANNE INC.

197 **Projet (Project): Lac à Paul**
 Grille (Grid): Lac à Paul

Section L5+00W : PAU-08-01,02

SNRC (NTS): 22B15
 UTM, Zone 19, Nad83

DDH: Forage Dami-Or
 Terrain: D. Boulianne, 2008
 Dessin: Samel Gao
 Date: Dec.09

Réjean Girard, Géo.

IOS Services Géoscientifiques Inc.

185°

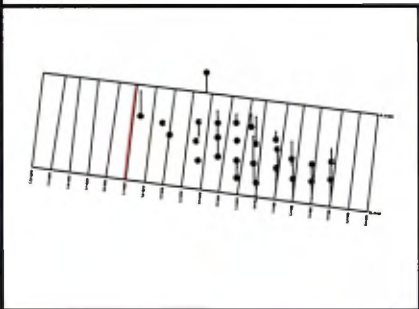
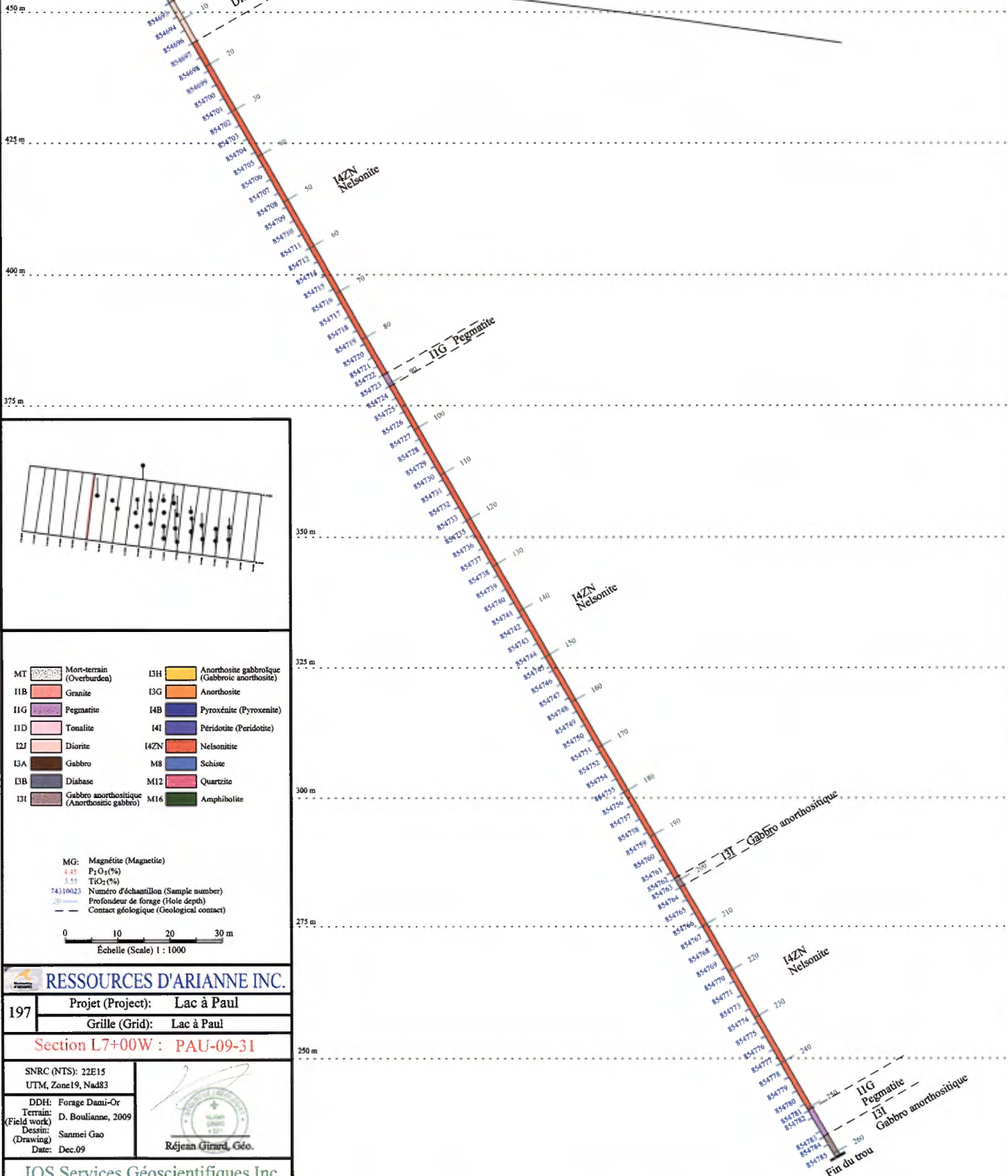
5°

UtmX: 374632E
UtmY: 5529582N
UtmZ: 457 m
Azimut (Azimuth): 360°
Plongée (Dip): -60°
Profondeur (Depth): 261.0 m

PAU-09-31

MT Mort-terrain

Surface



MT	Mort-terrain (Overburden)	I3H	Anorthosite gabbroïque (Gabbroic anorthosite)
I1B	Granite	I3G	Anorthosite
I1G	Pegmatite	I4B	Pyroxénite (Pyroxenite)
I1D	Tonalite	I4I	Péridotite (Peridotite)
I2J	Diorite	I4ZN	Nelsonite
I3A	Gabbro	M8	Schiste
E3B	Diabase	M12	Quartzite
I3I	Gabbro anorthositique (Anorthositic gabbro)	M16	Amphibolite

MG: Magnétite (Magnetite)
 4-25 P₂O₅(%)
 3-55 TiO₂(%)
 74310023 Numéro d'échantillon (Sample number)
 20 Profondeur de forage (Hole depth)
 --- Contact géologique (Geological contact)

0 10 20 30 m
 Échelle (Scale) 1 : 1000

RESSOURCES D'ARIANNE INC.

197

Projet (Project): Lac à Paul
 Grille (Grid): Lac à Paul

Section L7+00W : PAU-09-31

SNRC (NTS): 22E15
 UTM, Zone19, Nad83

DDH: Forage Dami-Or
 Terrain: D. Boulianne, 2009
 (Field work)
 Dessin: Sanmei Gao
 (Drawing)
 Date: Dec.09

Réjean Girard, Géo.

IOS Services Géoscientifiques Inc.

ESTIMATED YEARLY CASH-FLOWS

Available tonnage	99315000	Pre-tax DNPV	304 398 575 \$						
Mining rate	11704682	Pre-Tax IRR	19,84%						
Mine life (no ramping up)	8,5								
Apatite content	20,10%	Post-tax DNPV	247 153 932 \$						
Recovery rate	85%	Post-Tax IRR	17,54%						
Selling price FOB Dolbeau	118 \$								
Cummulative Inflation	0%	Post-mining tax DNPV	276 587 476 \$	1	1	1	1	1	1
Discount rate	3%	Post-mining Tax IRR	18,86%						
NSR	1%								
Year		2012	2013	2014	2015	2016	2017	2018	
Project year		1	2	3	4	5	6	7	
Mining year				1	2	3	4	5	
Investment		66 619 934 \$	248 674 266 \$	- \$	- \$	- \$	- \$	- \$	
Depreciated value, 1st January		66 619 934 \$	315 294 200 \$	315 294 200 \$	295 881 967 \$	236 779 829 \$	162 555 650 \$	78 885 646 \$	
Depreciated value, 31 December		66 619 934 \$	315 294 200 \$	295 881 967 \$	236 779 829 \$	162 555 650 \$	78 885 646 \$	- \$	
Operating capital		- \$	- \$	20 949 274 \$	33 518 838 \$	37 708 693 \$	41 898 547 \$	41 898 547 \$	
Mined ore, year				5852340,936	9363745,498	10534213,69	11704681,87	11704681,87	
Mined ore, total				5852340,936	15216086,43	25750300,12	37454981,99	49159663,87	
Residual resources				93462659,06	84098913,57	73564699,88	61860018,01	50155336,13	
Pit-Ratio	Optimal = 3:1			0	0	0	0	0	
Waste, year				0	0	0	0	0	
Waste, total				0	0	0	0	0	
Mined/removed total				5852340,936	15216086,43	25750300,12	37454981,99	49159663,87	
Apatite produced			16970132	1000000	1600000	1800000	2000000	2000000	
Ilmenite produced				771573	1234516	1388831	1543145	1543145	
Profit per ton of apatite				47 \$					
OPEX Mine				24 501 746 \$	39 202 793 \$	44 103 142 \$	49 003 491 \$	49 003 491 \$	
OPEX Mill				31 723 897 \$	50 758 236 \$	57 103 015 \$	63 447 795 \$	63 447 795 \$	
OPEX Transport				13 605 269 \$	21 768 431 \$	24 489 484 \$	27 210 538 \$	27 210 538 \$	
Total OPEX no-inflation				69 830 912 \$	111 729 460 \$	125 695 642 \$	139 661 824 \$	139 661 824 \$	
Total OPEX with inflation				69 830 912 \$	111 729 460 \$	125 695 642 \$	139 661 824 \$	139 661 824 \$	
Revenus (post-NSR, no-inflation)				117 060 042 \$	187 296 066 \$	210 708 075 \$	234 120 083 \$	234 120 083 \$	
Revenus (post-NSR, with-inflation)				117 060 042 \$	187 296 066 \$	210 708 075 \$	234 120 083 \$	234 120 083 \$	
Net revenues			(302 076 464) \$	47 229 129 \$	75 566 607 \$	85 012 433 \$	94 458 259 \$	94 458 259 \$	
Processing tax allocation				10 788 254 \$	10 788 254 \$	10 788 254 \$	10 788 254 \$	10 788 254 \$	
Depreciation tax allocation				19 412 233 \$	59 102 139 \$	74 224 178 \$	83 670 004 \$	78 885 646 \$	
Profits required for OPEX				17 028 642 \$	5 676 214 \$	5 676 214 \$	- \$	19 916 273 \$	
Residual equipment value				166 740 756 \$	141 729 642 \$	120 470 196 \$	102 399 666 \$	87 039 717 \$	
Taxable revenues				17 028 642 \$	5 676 214 \$	- \$	- \$	4 784 358 \$	
Mining taxes	12%	Total	35 799 429 \$	2 043 437 \$	681 146 \$	- \$	- \$	574 123 \$	
Provincial income taxes	8%	Total	21 002 332 \$	1 198 816 \$	399 605 \$	- \$	- \$	336 819 \$	
Federal income taxes	12%	Total	35 799 429 \$	2 043 437 \$	681 146 \$	- \$	- \$	574 123 \$	
Net profits		Investissement de départ	(302 076 464) \$	41 943 439 \$	73 804 710 \$	85 012 433 \$	94 458 259 \$	92 973 194 \$	
Cumulative net profits				41 943 439 \$	115 748 149 \$	200 760 582 \$	295 218 840 \$	388 192 034 \$	
Cumulative profits after mining taxes		Total	(302 076 464) \$	45 185 692 \$	74 885 461 \$	85 012 433 \$	94 458 259 \$	93 884 136 \$	

ESTIMATED YEARLY CASH-FLOWS

Available tonnage	99315000							
Mining rate	11704682							
Mine life (no ramping up)	8.5							
Apatite content	20,10%							
Recovery rate	85%							
Selling price FOB Dolbeau	118 \$							
Cumulative Inflation	0%	1	1	1	1	1	1	1
Discount rate	3%							
NSR	1%							
Year		2019	2020	2021	2022	2023	2024	2025
Project year		8	9	10	11	12	13	14
Mining year		6	7	8	9	10	11	12
Investment		4 726 866 \$	- \$	- \$	- \$	- \$	- \$	- \$
Depreciated value, 1st January		4 726 866 \$	- \$	- \$	- \$	- \$	- \$	- \$
Depreciated value, 31 December		- \$	- \$	- \$	- \$	- \$	- \$	- \$
Operating capital		56 599 595 \$	47 916 699 \$	47 916 699 \$	47 916 699 \$	13 659 429 \$	- \$	- \$
Mined ore, year		11704681,87	11704681,87	11704681,87	11704681,87	3336608,643	0	0
Mined ore, total		60864345,74	72569027,61	84273709,48	95978391,36	99315000	99315000	99315000
Residual resources		38450654,26	26745972,39	15041290,52	3336608,643	0	0	0
Pit-Ratio	Optimal = 3:1	1	1	1	1	1	1	1
Waste, year		11704681,87	11704681,87	11704681,87	11704681,87	3336608,643	0	0
Waste, total		11704681,87	23409363,75	35114045,62	46818727,49	50155336,13	50155336,13	50155336,13
Mined/removed total		72569027,61	95978391,36	119387755,1	142797118,8	149470336,1	149470336,1	149470336,1
Apatite produced		2000000	2000000	2000000	2000000	570132	0	0
Ilmenite produced		1543145	1543145	1543145	1543145	439898	0	0
Profit per ton of apatite								
OPEX Mine		98 006 983 \$	69 063 997 \$	69 063 997 \$	69 063 997 \$	19 687 808 \$	- \$	- \$
OPEX Mill		63 447 795 \$	63 447 795 \$	63 447 795 \$	63 447 795 \$	18 086 819 \$	- \$	- \$
OPEX Transport		27 210 538 \$	27 210 538 \$	27 210 538 \$	27 210 538 \$	7 756 803 \$	- \$	- \$
Total OPEX no-inflation		188 665 316 \$	159 722 330 \$	159 722 330 \$	159 722 330 \$	45 531 430 \$	- \$	- \$
Total OPEX with inflation		188 665 316 \$	159 722 330 \$	159 722 330 \$	159 722 330 \$	45 531 430 \$	- \$	- \$
Revenus (post-NSR, no-inflation)		234 120 083 \$	234 120 083 \$	234 120 083 \$	234 120 083 \$	66 739 712 \$	- \$	- \$
Revenus (post-NSR, with-inflation)		234 120 083 \$	234 120 083 \$	234 120 083 \$	234 120 083 \$	66 739 712 \$	- \$	- \$
Net revenues		45 454 767 \$	74 397 753 \$	74 397 753 \$	74 397 753 \$	21 208 281 \$	34 924 323 \$	- \$
Processing tax allocation		10 788 254 \$	10 788 254 \$	10 788 254 \$	10 788 254 \$	10 788 254 \$	- \$	- \$
Depreciation tax allocation		- \$	- \$	- \$	- \$	- \$	- \$	- \$
Profits required for OPEX		(11 763 170) \$	- \$	- \$	(46 410 105) \$	(18 505 139) \$	- \$	- \$
Residual equipment value		78 710 625 \$	66 904 031 \$	56 868 427 \$	48 338 163 \$	41 087 438 \$	34 924 323 \$	- \$
Taxable revenues		34 666 513 \$	63 609 499 \$	63 609 499 \$	63 609 499 \$	10 420 027 \$	34 924 323 \$	- \$
Mining taxes	12%	4 159 982 \$	7 633 140 \$	7 633 140 \$	7 633 140 \$	1 250 403 \$	4 190 919 \$	- \$
Provincial income taxes	8%	2 440 523 \$	4 478 109 \$	4 478 109 \$	4 478 109 \$	733 570 \$	2 458 672 \$	- \$
Federal income taxes	12%	4 159 982 \$	7 633 140 \$	7 633 140 \$	7 633 140 \$	1 250 403 \$	4 190 919 \$	- \$
Net profits		34 694 282 \$	54 653 365 \$	54 653 365 \$	54 653 365 \$	17 973 905 \$	45 033 086 \$	- \$
Cumulative net profits		422 886 315 \$	477 539 680 \$	532 193 045 \$	586 846 409 \$	604 820 314 \$	649 853 401 \$	649 853 401 \$
Cumulative profits after mining taxes		41 294 786 \$	66 764 613 \$	66 764 613 \$	66 764 613 \$	19 957 878 \$	30 733 404 \$	- \$

Feuille	Rangée/Bloc	Colonne/Lot	Type de titre	No titre	Statut du titre	Date d'inscription	Date d'expiration	Superficie (Ha)	Crédits	Détenteur(s) (Nom, Numéro et Pourcentage)
SNRC 22E15	14	56	CDC	1004635	Actif	2001-03-21 00:00	2011-03-20 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	55	CDC	1004636	Actif	2001-03-21 00:00	2011-03-20 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	56	CDC	1004637	Actif	2001-03-21 00:00	2011-03-20 23:59	55,5	15516,37	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	10	40	CDC	1024230	Actif	2001-09-04 00:00	2011-09-23 23:59	55,55	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	10	41	CDC	1024231	Actif	2001-09-04 00:00	2011-09-23 23:59	55,55	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	10	42	CDC	1024232	Actif	2001-09-04 00:00	2011-09-23 23:59	55,55	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	11	40	CDC	1024233	Actif	2001-09-04 00:00	2011-09-23 23:59	55,54	627,85	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	11	41	CDC	1024234	Actif	2001-09-04 00:00	2011-09-23 23:59	55,54	1007,52	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	11	42	CDC	1024235	Actif	2001-09-04 00:00	2011-09-23 23:59	55,54	1675,97	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	11	43	CDC	1024236	Actif	2001-09-04 00:00	2011-09-23 23:59	55,54	1248,87	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	12	41	CDC	1024237	Actif	2001-09-04 00:00	2011-09-23 23:59	55,53	828,05	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	12	42	CDC	1024238	Actif	2001-09-04 00:00	2011-09-23 23:59	55,53	1219,34	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	12	43	CDC	1024239	Actif	2001-09-04 00:00	2011-09-23 23:59	55,53	1067,47	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	5	19	CDC	1025896	Actif	2001-11-02 00:00	2011-09-23 23:59	55,6	130113,24	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	5	20	CDC	1025897	Actif	2001-11-02 00:00	2011-09-23 23:59	55,6	8074,82	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	4	18	CDC	1038320	Actif	2002-01-24 00:00	2011-03-25 23:59	55,61	33856,14	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	4	19	CDC	1038321	Actif	2002-01-24 00:00	2011-03-25 23:59	55,61	41812,23	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	5	18	CDC	1038322	Actif	2002-01-24 00:00	2011-03-25 23:59	55,6	2508,08	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	42	CDC	2121340	Actif	2007-09-13 00:00	2011-09-12 23:59	55,48	187580,61	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	43	CDC	2121341	Actif	2007-09-13 00:00	2011-09-12 23:59	55,48	138335,44	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	12	40	CDC	2125492	Actif	2007-10-02 00:00	2011-10-01 23:59	55,53	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	13	40	CDC	2125493	Actif	2007-10-02 00:00	2011-10-01 23:59	55,52	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	13	41	CDC	2125494	Actif	2007-10-02 00:00	2011-10-01 23:59	55,52	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	13	42	CDC	2125495	Actif	2007-10-02 00:00	2011-10-01 23:59	55,52	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	13	43	CDC	2125496	Actif	2007-10-02 00:00	2011-10-01 23:59	55,52	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	14	40	CDC	2125497	Actif	2007-10-02 00:00	2011-10-01 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	14	41	CDC	2125498	Actif	2007-10-02 00:00	2011-10-01 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	14	42	CDC	2125499	Actif	2007-10-02 00:00	2011-10-01 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	14	43	CDC	2125500	Actif	2007-10-02 00:00	2011-10-01 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	14	44	CDC	2125501	Actif	2007-10-02 00:00	2011-10-01 23:59	55,51	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	40	CDC	2125502	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	41	CDC	2125503	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	42	CDC	2125504	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	43	CDC	2125505	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	44	CDC	2125506	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	15	45	CDC	2125507	Actif	2007-10-02 00:00	2011-10-01 23:59	55,5	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	40	CDC	2125508	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	41	CDC	2125509	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	42	CDC	2125510	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	43	CDC	2125511	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	44	CDC	2125512	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	16	45	CDC	2125513	Actif	2007-10-02 00:00	2011-10-01 23:59	55,49	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	40	CDC	2125514	Actif	2007-10-02 00:00	2011-10-01 23:59	55,48	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	41	CDC	2125515	Actif	2007-10-02 00:00	2011-10-01 23:59	55,48	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	44	CDC	2125516	Actif	2007-10-02 00:00	2011-10-01 23:59	55,48	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	17	45	CDC	2125517	Actif	2007-10-02 00:00	2011-10-01 23:59	55,48	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	40	CDC	2125518	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	41	CDC	2125519	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	42	CDC	2125520	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	43	CDC	2125521	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	44	CDC	2125522	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	18	45	CDC	2125523	Actif	2007-10-02 00:00	2011-10-01 23:59	55,47	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	19	31	CDC	2129818	Actif	2007-10-16 00:00	2011-10-15 23:59	55,47	60458,17	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E15	19	32	CDC	2129819	Actif	2007-10-16 00:00	2011-10-15 23:59	55,47	229331,09	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E10	27	35	CDC	2165596	Actif	2008-07-11 00:00	2010-07-10 23:59	55,67	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E10	27	36	CDC	2165597	Actif	2008-07-11 00:00	2010-07-10 23:59	55,67	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E10	27	37	CDC	2165598	Actif	2008-07-11 00:00	2010-07-10 23:59	55,67	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E10	27	38	CDC	2165599	Actif	2008-07-11 00:00	2010-07-10 23:59	55,67	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)
SNRC 22E10	27	39	CDC	2165600	Actif	2008-07-11 00:00	2010-07-10 23:59	55,67	0	Ressources D'Arianne Inc.. (Les) (16503) 100 % (responsable)

