# IOS Services Géoscientifiques

# THE MAYOKO COLUMBO-TANTALITE EXPLORATION PROJECT DISTRICT OF NIARI, REPUBLIC OF CONGO NI-43-101-F1

## TECHNICAL REPORT

Presented to

Mr. Dave Gagnon

**RESSOURCES TANTALEX**

By

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Ville de Saguenay

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# ITEM 1: SUMMARY

Tantalum is a strategic metal used in the manufacturing of miniaturized electronic components, for which there is currently no effective substitute. Tantalum is produced in a few locations in the world, either as primary material with some other specialty metals as co-product, as by-product from niobium mines, as co-product of alluvial cassiterite exploitation or from alluvial coltan deposits. The largest known reserves are of the alluvial type and located in the Congo Democratic Republic ("DRC") or the Kivu area of Rwanda, both war-torn countries. Because the revenues are being used to finance local guerrillas, the DRC and Kivu coltan face an international sales ban. Consequently, these large reserves contribute less than a few percent to world production; despite the fact that alluvial coltan mining is known as being even more profitable for local digger than alluvial gold mining. Consequently, developing new sources of "clean" coltan is of strategic importance for developed economies, and is reflected in the current "clean" coltan price on the market. It shall be said that "dirty coltan" is sold with a significant discount (about 50%), dominantly on the Asiatic market.

Coltan, the commercial name of columbo-tantalite, is a tantalum-niobium oxide which is found almost exclusively in sodolithic "LCT-type" pegmatite. It typically grades a maximum of 0.05% $Ta_2O_5$ in these lithium-bearing pegmatites. Such primary tantalum sources are currently exploited in only Greenbushes, Australia, the other known mines being currently closed (Tanco in Manitoba, Canada and Wodgina in Australia). These pegmatites usually occur as dyke swarms in a crystalline basement, in close proximity to migmatitic complexes. Such complexes are typically quite extensive; therefore, lithium and tantalum enriched pegmatite swarms usually occur in large fields or metallogenic provinces, such as the Nemiscau sub-province in Northern Québec. In such operation, columbotantalite is a sub-product or a co-product of spodumene, petalite or other lithium minerals.

Columbo-tantalite is a dense, refractory mineral, which forms large and scattered crystals in the pegmatite. It is not affected by saprolitic alteration, and can thus be preserved as a detrital mineral in wet tropical climates. Therefore, in old crystalline basements, where "LCT" pegmatites can be found, coltan can be released from its silicate matrix and concentrated in residual alluvium where streams erode the laterite. Most coltan produced from these placer deposits is from artisanal exploitation and reported to be highly lucrative compared to other alluvial commodities.

It is important to state that the alluvial Mayoko coltan deposit is located in the "République du Congo", or Republic of the Congo (ROC) (hereafter Congo). This is not

to be confused with the *Democratic Republic of the Congo (DRC).* Congo is the former "République populaire du Congo" informally known as Congo-Brazzaville or French Congo, since it was previously the French colony "Afrique-Équatoriale française". Congo is a sovereign country. It is a relatively stable African democracy and is a *State of Law,* although underdeveloped and poorly organized. Much care will be needed by Tantalex in the marketing of the project as being located in Congo (ROC) and not in the DRC, and into controlling its chain of custody for eventual coltan production.

The Mayoko coltan deposit was discovered around 1956 in the course of alluvial gold exploitation by "La Société Avoine", a French private company, during the colonial regime. Small scale coltan production was carried out in approximately 1963-66 by the same company, the production being sold to Germany for the production of high-temperature resistant alloys. Production ceased in about 1966, when the company was closed due to the death of its leader, Mr. Avoine, about the same period as decolonization of the country. A few exploration reports were handed through time to the government "Bureau minier congolais". During the 1990 civil war, the "Bureau congolais des mines" was set ablaze, and the aforementioned report saved personally by Mr. Simplice Ngami. These reports are the only historical information available about the Mayoko coltan occurrence, with the exception of a simple mention on an old *BRGM*[1] map.

Only limited field work was carried out on the property by SADEM Congo prior to the visit of the author in November 2011. The work included a short sampling program lead by Mr. Bonate Ibouanga, a Congolese geologist, who established contact with local communities and has been able to trace old "Société Avoine" workers to help locate the old mining sites.

In the course of his visit, the author visited 25 alluvial coltan occurrences, where he witnessed the sampling and panning of the alluvium. Coltan in significant abundance was noticed at most sites. Coltan granules can be hand-picked form the alluvium; the author can certify its local origin and that by no means has this coltan been intentionally added. The Mayoko occurrence is a genuine non-*DRC* clean coltan occurrence. Pan concentrates collected in the presence of the author were brought back to Canada for analysis in the author's facilities, and coltan presence is confirmed without question.

Most of the sites visited by the author were former alluvial deposits worked by "Société Avoine". Many of the sites are still currently worked by local gold diggers, and coltan discarded by them. The coltan is found in residual gravels in stream beds, dominantly consisting of quartz pebbles. These gravels come from the erosion of the saprolitic covers, where refractive minerals are accumulated. Considering the dense and small

[1] BRGM: Bureau de la recherche géologique et minière ; Geological survey of France.

scale drainage pattern, a local origin of the coltan is interpreted. The primary source of coltan has not been located.

The Mayoko area is located within the Chaillu Massif, a deeply weathered crystalline basement of likely Archean age, which covers a large span of northwestern Congo and southern Gabon. Very little is known of the geology of this massive; the only geological map available dates from the colonial period. Other than granitoids, the only greenstones are indicated in the Mayoko area, taken from Avoine's report. It is uncertain whether the paucity of supracrustal rocks indicated on this map is due to their absence or to the lack of appropriate mapping.

The Mayoko area geology is composed of a narrow metavolcanic belt dominated by basaltic rocks and flanked by cherty iron stone. Schist and metasediments are associated with the volcanics and ironstones, the extent of which is poorly known. Outside the volcanosedimentary belt, the area is reported as granitoid, but the rocks are not as monotonous as indicated on the map.

Coltan was found in streams which dissect the saprolitized volcanics and schists. Metabasalts and ironstones form ledges in stream beds, suitable for alluvium accumulation. Thus, an apparent association of coltan and ironstone is noted.

The samples collected by the author contained from a few to hundreds of grams of coltan per 5 litres pan, with an average of 10 g. This equates to 2 kg coltan per cubic meter of gravel. This coltan is made up of three size fractions:

- A sandy fraction, less than a millimeter is diameter, accounting for 13% of the total coltan in the sample;

- Most of the coltan is present as a grit fraction, ranging from 1 to 5 mm in diameter, which will require specialized equipment for its recovery, both in laboratory and on a semi-industrial scale. Coltan represents more than 70% of the heavy minerals in this size fraction;

- Coltan pebbles are more than 5 mm across. Abundance of such granule is difficult to assess, the one collected by the author was hand-picked from the gravel and does not represent systematic sampling. The weight contribution of such pebbles was not included in the aforementioned coltan grade.

Tantalum and niobium grades were measured in the heavy mineral concentrates as well as for each individual pebble with a Niton portable XRF analyzer. Although not certified, these provide a reasonable measurement of the tantalum grade, or tantalum to niobium

ratio. Both sand and pebble coltan shows similar grades when collected at same location, although different locations show a bimodal grade distribution, with peaks at 0.35 and 0.55 Ta/Ta+Nb. The 0.35 ratio is quite typical and comparable to DRC coltan, while the 0.55 ratio is to be considered as high grade.

It is too preliminary to assess any CIM guidelines and NI-43-101 compliant resources for these deposits. However, these resources are apparently sufficient to support a semi-industrialized small-scale mining operation. By doing so, Tantalex may generate sufficient revenues to subsidize a systematic exploration program, as well as establish itself as a clean-coltan producer and secure its chain of custody. Off-takes agreement between Tantalex and a tantalum refinery has been signed at a firm price exceeding the actual market price.

# ITEM 2: INTRODUCTION

## MANDATE

Mr. Dave Gagnon, president of Tantalex Resources Inc., instructed the author both verbally on February 2012 and subsequently through a mandate letter dated March 9, 2012, to write a technical report on their Mayoko property, located in the Republic of Congo, which report shall be written according to the NI-43-101 guidelines and requirements. The report was commissioned as a requirement from the Toronto Stock Exchange in order to complete a reverse take-over of Lynnwood Capitals Inc by Tantalex Resources Inc. For this current report, the author relies upon his field visit of the property dated November 12 to 14, 2011. No former NI-43-101 compliant report is available on the Mayoko property.

## SOURCE OF INFORMATION

All information on the Mayoko project was made available to the author by a Tantalex representative, and included copies of the various "Décrets ministériels", the acquisition contract as well as the available historical geological reports. The author did not visit the Congolese department of mines office, where archives were lost during the 1998 civil war. Information about neighboring properties and the coltan market was either obtained from various corporate websites or provided by Tantalex, who collected them from various business contacts.

## FIELD VISIT

*The author completed a field visit of the Mayoko project between November 12 to 14 2011, where he personally sampled the coltan bearing alluviums.*

The author conducted a three day field visit, from November 12 to 14, 2011 (***pictures 1*** and ***2***), during a trip to the Republic of Congo from November 5 to November 18. For the field visit, the author was accompanied by Mr. Jean Bonate Ibouanga and Mr. Micks Ranchard Ngamiye, Congolese geologists on behalf of SADEM Congo, plus about seventeen other staff member and local prospectors. During this trip, the author visited and sampled about 25 coltan-bearing alluvial sites, examined numerous outcrops, and took various notes on local infrastructure. The author considers that what he was allowed to visit provided him with sufficient information to write the present report and organize the subsequent operations. It is to be noted that, at the time of the visit, Tantalex officials had not visited the property yet.

Although this was the author's first experience in the Republic of Congo, the author has extensive experience in mineral exploration for specialty metals as well as with heavy mineral exploration. It is his opinion that this expertise is appropriate to provide the client with suitable recommendations concerning the implementation of the project.

**AUTHORSHIP**

The report was written entirely by the author, who takes responsibility for all items therein. He was assisted by his company's clerical and technical support staff, charged with specific tasks. The report is based mainly on private information made available by Tantalex representatives, which included a few historical assessment reports plus various legal documents, on proprietary information provided by the client, and on the author's personal knowledge.

**INDEPENDENCY**

*The author and the firm he represents are considered independent from Tantalex Corporation and Sadem-Congo s.a.r.l, fulfilling all NI-43-101 requirements regulations on this subject.*

The properties were acquired ("staked") directly by SADEM-Congo s.a.r.l. without any involvement from the author. The author was not involved in the negotiation process between SADEM-Congo and Tantalex Resources. The author and his company are considered to be independent from the client according to the terms of NI-43-101. The author and his company do not own any royalties, grubstake or other benefits in the project nor any participation in the company of the client or its partners and sister-companies. The current mandate is the first to be competed for Tantalex Resources, which therefore represent less than 20% of the author's income. The author and its consulting group is currently in negotiating to carry out other mandates on behalf of Tantalex.

The author has not been involved in the transaction between Tantalex Corporation and Sadem-Congo, and is considered as being at arm's length.


***Picture 1**: View of the SADEM-Congo prospecting crew in front of the Banzoko maki, the author is first on the left in the back row.*

***Picture 2**: View of the SADEM crew panning for coltan in the Imvouala River, in the presence of the author.*

# ITEM 3: RELIANCE UPON OTHER EXPERTS

The author did not rely on other experts to write any section of this report. He alone is liable for any item disclosed in the current report. The author relied solely on the copies of the official documents, which were provided to him, and all interpretations of these are his sole responsibility.

**SOURCE OF INFORMATION**

All information on the Mayoko project was made available to the author by a Tantalex representative, and included copies of the various “Décrets ministériels”, the acquisition contract as well as the available historical geological reports. He consulted the “Journal officiel de la République du Congo” in regard of the validity of the permits as well as various other “Droit-Afrique” web-based documents to obtain copies of the Congolese laws. The author did not visit the Congolese department of mines office, where archives were lost during the 1998 civil war. Information concerning neighboring properties and the coltan market was either obtained from various corporate websites or provided by Tantalex who collected them from various business contacts.

Information on coltan market and the political situation in the Republic of Congo were obtained through web-based research. The Congo mining code was obtained from www.droit-afrique.com. The author’s interpretation of the mining code has not been reviewed by a qualified jurist.

Information on coltan metallurgy was obtained in the course of an industrial visit done by the author to a facility belonging to the corporation with who the off-takes agreement was signed.

# ITEM 4: LOCATION AND PROPERTY DESCRIPTION

## LOCATION OF THE PROJECT

The Mayoko project is composed of four exploration licences located in northwestern Congo, in the Niari district, from the town of Mossendjo in the south, to the Gabon border to the north (***figure 1***). This area is a high lateritic plateau covered by a dense primary jungle forest, sparsely populated, underdeveloped and with limited access.

*Simply finding a mere topographic map for the Mayoko area is challenging.*


***Figure 1****: Location of the project in Africa*

## REPUBLIC OF CONGO MINING CODE

*Mining code of the Republic of Congo has been modernized in 2005. Republic of Congo is a state of law, and is currently a mining friendly jurisdiction.*

The Republic of Congo is a state of law, the civil code of which was inspired by the Napoleonic code of the French Republic. The mining code ("Code minier de la République du Congo, Loi n°3-2005") was modernized, effective April 11, 2005 [2]. Although there is no restriction placed on travelling within the country, any mining and geological operations require specific authorization, permit or licence.

Given that the revised mining code was introduced recently and no mine was operating at that time or put into production since, the code has apparently not yet been seriously tested.

One peculiarity of the code is that specific permits are required for each commodity or metal explored. Permits for different commodities, owned by different groups can be superposed and interference is to be expected.

Obligations and authorizations about manpower, local business development, environmental protection and rehabilitation, health and safety, etc. are embedded in any permit.

Prospection and exploration permits do not include any land ownership or surface rights, with the exception of inhabited areas; these are property of the Congolese government.

Importation of equipment and vehicles used in exploration and mine development are exonerated of customs duty.

There is no restriction on currency exchange or the importation and exportation of currencies. The currency used in the Republic of Congo is the CFA franc ("Francs centre-africains"), while international transactions are usually done in Euros.[3]

[2] The government officer responsible for the revision of the Mining code was Mr. Simplice Ngami, founder of SADEM-Congo and recently approved by Tantalex shareholders as General Manager of SADEM-Congo, a now wholly owned subsidiary.

[3] Exchange rate : CAN$1=0.766 Euro=502.51 CFA (March 12, 2012).

## PROSPECTING AUTHORIZATION

In order to proceed with prospecting, a prospection authorization is required. This authorization does not give the owner the exclusive right to prospect for a specific commodity within its perimeter. Although this authorization is requisite to apply for an exploration permit, it does not give the exclusive right to acquire such exploration permit over the same area. The permit allows the owner to apply for authorization to travel within the concession's limits, collect samples and submit samples for assay. This authorization is valid for one year and can be renewed upon request.

The prospecting authorization places the following obligation on its owner:

- Inform the government officials of the conduct and results of prospecting work.
- Conduct mineral exploration or prospecting work and submit quarterly assessment reports to the Congolese authority.
- Obtain a certificate of origin for any sample submitted for assaying outside Congo.
- Pay a per square kilometre fee[4] to the Ministry of Mines and Geology.

The Ministry Order n$^{o}$ 5907[5], duly signed by Mr. Pierre Oba, Minister of Mines and Geology of the Republic of the Congo, dated April 7$^{th}$ 2011, authorize SADEM-Congo to carry out prospecting for columbo-tantalite (phase 1 work) on the Matsanga-Marala concession, in the Niari department. The authorization encompasses an area of 6000 km$^{2}$ defined by the following geographical limits:

| LIMITS | LONGITUDE | LATITUDE |
|---|---|---|
| A | 12$^{o}$27'14"E | 2$^{o}$19'33"S |
| B | 12$^{o}$27'14"E | 2$^{o}$50'13"S |
| C | 13$^{o}$02'42"E | 2$^{o}$50'13"S |
| D | 13$^{o}$02'42"E | 2$^{o}$19'51"S |
| Boundary | Congo | Gabon |

[4] Fee not indicated in the mining code.

[5] Arrêté N$^{o}$5907/MMG/CAB portant attribution à la Société africaine pour le développement minier d'une autorisation de prospection pour la columbo-tantalite « Matsanga-Marala ».

## EXPLORATION PERMITS

*The six prospecting permits awarded to Sadem Congo were recently converted into four exploration permit, for an area of 4050 km$^2$, valid for a period of 7 years.*

The prospecting permit provides the owner with the right to apply for an exploration permit ("Permis de recherche minière"), which will confer on the owner the exclusive right to carry out exploration work for the specified commodity. This permit is valid for three years and can be renewed for two additional two year periods, for a total of seven (7) years). Upon renewal, the total area of the permit can be subject to a size reduction of maximum 50%. This permit gives the owner the priority[6] for the acquisition of a mining license on the property.

The owner's obligations concerning the permit are:

I. Initiate adequate exploration work within nine (9) months of its issuance.
II. No requirement is indicated about filing assessment reports.

A request to convert the Matsanga-Marala prospection permit into exploration permits has been filed at the Ministry of Mines and Geology by SADEM-Congo on July 26, 2011 and submitted for approbation to the Minister Counsel on November 22, 2011. A field inspection was performed by Congolese government geologists between December 16 and 23, 2011 (Moumpossa et al., 2011), who confirmed that the company had performed the necessary prospecting work on the concession, complied with the permit's requirement and made a favorable recommendation for the conversion of the prospecting permit into an exploration permit. The request has been approved on July 16$^{th}$ 2012, after a long delay due to the Brazzaville explosion on March 4$^{th}$ 2012, which disrupted governmental current affairs for months.

The prospecting permit ("arrêté ministériel n$^{o}$ 5907") has been converted by governmental decrees into a set of four exploration permit of approximately 1000 km$^2$ each on July 16$^{th}$ 2012. Coordinates of these perimeters are indicated below (***table 1***)[7]. The author has not been granted access to the original copies of the permits or *decrêts* due to complicated Congolese business relations, but all the required official information has been published on July 26$^{th}$ 2012 through the "Journal officiel du Secrétariat général de la République du Congo", accessible on-line (http://www.sgg.cg).

[6] Art. 36: It is stated as "priority" not as "exclusivity".
[7] The coordinates were published in the "Journal official". For an unknown reason, these coordinates differ slightly from the one submitted by Sadem.

| *PERMIT* | *AREA* | *ANNUAL FEE* | ORDRE DE SERVICE |
|---|---|---|---|
| Moupoupa | 1116 km$^2$ | 1 674 000 CFAF | 789/MMG/DGG |
| Doumani-Mounguelé | 944 km$^2$ | 1 416 000 CFAF | 787/MMG/DGG |
| Marala-Lebiha | 1108 km$^2$ | 1 662 000 CFAF | 791/MMG/DGG |
| Matsanga-Moukilingomo | 882 km$^2$ | 1 323 000 CFAF | 785/MMG/DGG |

| **EXPLORATION PERMIT MARALA- LEBIHA DÉCRÊT N$^o$ 2012-742, 16$^{th}$ July 2012** | | |
|---|---|---|
| **LIMITS** | **LONGITUDE** | **LATITUDE** |
| A | 12°30'09"E | 2°22'50"S |
| B | 13°02'47"E | 2°22'50"S |
| C | 13°02'47"E | 2°32'32"S |
| D | 12°30'09"E | 2°32'32"S[8] |

| **EXPLORATION PERMIT MATSANGA-MOUKILINGOMO DÉCRÊT N$^o$ 2012-750, 16$^{th}$ July 2012** | | |
|---|---|---|
| **LIMITS** | **LONGITUDE** | **LATITUDE** |
| A | 12°30'42"E | 2°14'46"S |
| B | 13°01'38"E | 2°14'46"S |
| C | 13°02'47"E | 2°22'50"S |
| D | 13°30'09"E | 2°22'50"S |
| Frontière | Congo-Gabon | |

| **EXPLORATION PERMIT DOUMANI-MOUNGUELÉ DÉCRÊT N$^o$ 2012-749, 16$^{th}$ July 2012** | | |
|---|---|---|
| **LIMITS** | **LONGITUDE** | **LATITUDE** |
| A | 12°36'21"E | 1°52'18"S |
| B | 12°36'21"E | 2°14'41"S |
| C | 12°56'45"E | 2°14'20"S |
| D | 12°56'27"E | 2°09'48"S |

| **EXPLORATION PERMIT MOUPOUPA DÉCRÊT N$^o$ 2012-751, 16$^{th}$ July 2012** | | |
|---|---|---|
| **LIMITS** | **LONGITUDE** | **LATITUDE** |
| A | 12°27'11"E | 2°32'42"S |
| B | 12°43'45"E | 2°32'42"S |
| C | 12°43'45"E | 2°50'13"S |
| D | 12°27'11"E | 2°50'13"S |

***Table 1**: List of exploration permits*

[8] A transcription error is apparently present in the *Journal*. Latitude of corner #4 is indicated at 2°22'50"S, which is incongruent. The correct latitude is likely 2°32'32"S. The *Journal* clearly states that in case of discrepancies, original *decrees* have precedence to the *Journal.*

## MINING LICENSE

No application has been filed yet by SADEM-Congo or Tantalex to acquire a mining licence. Application for such licence requires the project owner to hold an exploration permit and that he has defined an economically viable deposit.

*In the event of a commercial production, a 3% royalty on coltan and 5% royalty on gold is deem payable to the government of the Republic of Congo.*

Although Tantalex plans to mine the alluvia on a small scale, it cannot be regarded as artisanal; therefore an "autorisation d'exploitation artisanale" is not sufficient. A small-scale mining license,[9] "autorisation d'exploitation", will be required which also grants the owner exclusivity to apply subsequently for an exploration permit and a full-scale mining permit ("permis d'exploitation"). The request for a small-scale mining permit requires the submission of an operation plan, an environmental and social evaluation as well as a rehabilitation program. Naturally, such a plan does not have to be as extensive as for a full scale mine and can be done internally by the company. The author understands that Tantalex will need the small-scale mining permit for the exploitation of the alluvial deposit, which may eventually evolve into a full-scale mining permit for pegmatite-hosted tantalum and lithium mining.

A royalty of 3% of the exported ore production and 5% of the gold value is payable to the government, plus a tax of 20% on the net profits for a small-scale mining operation and 30% for a large scale mining operation.

## OTHER PERMITS

No other permits were indicated to the author to be required to conduct exploration work. The exploration and mining permits embed all the environmental obligations. Naturally, work permits and visas are required for expatriate workers. Construction authorization from local authorities is likely required to build the working camp.

## PROPERTY OWNERSHIP

The property is wholly owned by SADEM-Congo s.a.r.l., free of any liens, mortgage, third-party participation, etc, information which has been certified by Tantalex representatives.

SADEM-Congo s.a.r.l. is a private company duly constituted in the Republic of Congo, headquartered in Brazzaville. The company was founded by Congolese investors,

[9] Congo's mining laws make a difference between small-scale and full-scale operations, and different permits are required. However, the difference between these two is not indicated.

including Mr. Damas Simplice Ngami, in January 2011, and was subsequently been acquired by Tantalex Resources.

**TANTALEX-SADEM TRANSACTION**

On October 22, 2011, all share capital of SADEM-Congo were acquired by Sandstone Worldwide Ltd, a corporation registered in the Bahamas and based in Nassau, and a wholly owned subsidiary of Tantalex Corporation, a Canadian based private corporation. SADEM-Congo is therefore considers itself as a wholly-owned Congolese subsidiary of Tantalex, acting as an operating arm in Congo. As part of this transaction, the following obligations were contracted by Tantalex[10]:

*SADEM Congo s.a.r.l. is a private Congolese mineral exploration company, which has been bought by Tantalex Resources and now act as his operating arm in Congo.*

- Nominate Mr. Damas Simple Ngami as Congolese General Manager.
- A payment of US$50 000 per exploration permit due upon issuance of the permits, for a total of US$200 000. Althoug initially expected due on April 2012, this payment has been postponed due to delays in permit issuance by the Congolese authorities.
- A payment of US$50 000 per exploration permit payable upon issuance of an NI-43-101 compliant report disclosing mineral resources, for a total of $200 000, expected due in late 2013.
- A royalty of 10% on the gross production of coltan, to a maximum of US$2 000 000.
- A royalty of 15% on Avoine's 20 tons of coltan stockpile[11].
- No work commitment is indicated, nor is there any obligation to maintain the properties in good standing. No back-in rights are indicated. Salary or other remuneration is not promised to Mr. Ngami for his role as general manager, nor is there any description of his obligations.

[10] Various "African style" complications occurred in the execution of this agreement, which were indicated technically settle at the effective date and to be signed in a meeting scheduled on January 28th 2013.

[11] This clause refers to a stockpile of coltan, indicated as about 20 tons, and reputed to have been abandoned by Avoine in 1966 somewhere near the Banzoko mining site. However, according to the author's discussion with Mr. Téckesse, a former friend of Mr. Avoine and former deputy of the Republic, the stockpile was sold and expedited by Avoine to a German company. The 15% royalty would then be obsolete.

**IRREVOCABILITY**

The mining license being defined by geographic coordinates, claims cannot be challenged on the basis of poor staking. However, the following issues are ambiguous in the mining law, and constant care will be required.

*Revocability of the mining title is always of concern in African countries. One point of concern raised by the author is the interference between permits in regard of various commodities, which may overlap.*

All types of licenses are associated with obligations for the stake holder, which must be diligently completed. The Republic of Congo being ruled by a *Napoleon type* civil code, the text of the laws must be applied regardless of jurisprudences. Rigidity about administrative mistakes is not known to the author. Authorities are generally lenient and overlook minor transgressions, although these can be invoked in a case of malversation.

Numerous ambiguities were noted in the mining code by the author, the most obvious being the interference between the various types of permits and the fact that the same area can be granted to different parties for different commodities. Special care shall be devoted to relations between Tantalex, the iron ore projects (DMC-Congo and Congo Mining) as well as in regard of the gold project (Sino-Congo) and local gold diggers.

**LAND SURVEYING**

Property limits being defined by geographical coordinates, no land surveying is required to officialise these. The licenses encompass “urbanized” areas such as Mayoko, which are likely surveyed and subtracted from the license, but no indication is available. Furthermore, in the event DMC-Congo and Congo-Mining are granted mining leases, these will have to be surveyed and subtracted from the license.

**INFRASTRUCTURE**

The property does not actually host any developed mineral occurrence or any mining infrastructure. The DMC-Congo and Congo Mining iron ore project, located within the perimeter of the Tantalex property, are currently under feasibility study, and infrastructure construction may start in the near future.

The public infrastructures available in the area are very limited, including the N-2 road[12] and the Camilog narrow-gage railway [13]. Mayoko city is currently upgrading its

[12] N2 highway is classified as a national highway, but is merely an unmaintained mud road.
[13] Poorly maintained Cape-gauge medium haulage capacity, expected to be upgraded to match iron-ore expediting.

infrastructure such as water distribution and sewage, with subsidies form the iron-ore companies. No electrical power is available. Water is plentiful. Mobile phone network provides proper coverage.

**RIGHT OF ACCESS**

Right of access to the property is granted by the mining code. No restriction was noted by the author in the course of its visit.

*Large iron mining projects are currently under development in the Mayoko area, and which are expected to bring various infrastructures in the area.*

**TRADITIONAL LAND CLAIMS**

The author is not aware of any traditional land claims issues in the Republic of Congo. Aboriginal ethnic groups are apparently not politically organized. It has been indicated however, that gold digging is considered as a traditional activity, and thus not restricted by the national government. Traditional activities are apparently limited to game hunting and some slash-and-burn manioc agriculture. Gold digging activities were inherited from "Société Avoine"; they are now familiar, although not traditional, to locals.

**ENVIRONMENTAL LIABILITY**

Congo's environmental regulations were not verified by the author, but very little effort appears to be devoted to enforcing them. Most alluvial occurrences visited by the author are located in restricted streams enclosed in deep and steep valleys, and narrow stream beds. These stream beds were exploited for alluvial gold by "Société Avoine" in the 1950s and 60s, who cleared all primary forests from these beds. These are currently regrown as secondary forests: trees up to 50 cm in diameters were noted growing on top of old "Avoine" gravel heaps by the author. Evidence of channel ways and dams are the only visible remnant of the gold mining activity. It is indicated in a report that mercury amalgamation was used by "Avoine", but no such contamination is suspected. Very little scarp equipment was noted.

*Tantalex did not inherit any environmental legacy from previous activities.*

Local gold diggers continue Avoine's activities on a small scale, mainly in streams accessible from villages. These diggers rework the stream gravels, leaving heaps and holes and disturbing the vegetation. However, no contamination or oil spills were noted by the author, except for some littering. It is to be understood that due to the constant reworking of the gravel and low water level, no fish appear to inhabit these streams. No agricultural activity was noted in the vicinity of these workings.

It is the author's opinion that Tantalex does not inherit any important environmental legacy.

## RESTRICTIONS TO EXPLORATION

No restriction to exploration activity, such as nature reserves or parks, was brought to the author's attention. No important public infrastructure, such as buildings or bridges other than the Mayoko urbanized area is present that cannot be displaced at a reasonable cost. No archeological site is indicated. However, primary pristine jungle forests are ubiquitous.

## ADEQUACY OF SIZE

The property is sufficiently large to secure the space required by an eventual mining operation.

# ITEM 5: ACCESSIBILITY AND PHYSIOGRAPHY

## PHYSIOGRAPHY

The project is located within the Chaillu Massif, which is a rugged high plateau carved into rolling hills by ubiquitous deep valleys. The Mayoko area culminates at an altitude of 750 m *asl.*, while the lowest point is the Louesse valley floor at 610 m *asl.* Altitudes outside the Mayoko area are not known to the author, since no topographic maps were available to him.

The project area is drained by a dense network of short streams, collecting into the Louessé River. This river is an affluent of the Niari River, which flows into the Kouilou River and then the Atlantic Ocean north of Pointe-Noire. The dense network of subsidiary stream criss-crosses the area with a typical spacing of a kilometre. Most of these streams are named by the locals and their names are not indicated on the maps.

## VEGETATION

*The Mayoko area is located in the Chaillu massive, covered y a thick primary jungle. Logging activity is currently ravaging part of the area.*

Most of the area is still covered by a thick mature primary jungle forest, near to impenetrable. However, extensive stretches of forests are currently been logged, driven by logging road construction. Small areas near communities are covered by secondary growth forests, resulting from slash-and-burn manioc agriculture. Although primary forests are not accessible by vehicle, trees are widely spaced allowing fairly easy walking. Helicopter landing is hampered by the tick and tall canopy.

Lateritic soil in steep valley sides is typically stabilized by tree roots. Deforestation of such hillsides should be avoided in order to prevent mudslides in stream beds.

Game is apparently not very abundant in the area, probably due to human activity. Roaming big game, such as elephants, is however reported. Care is indicated by the mere presence of snakes and other similar threats.

## ACCESS

Mayoko can be accessed through Gabon or by dirt road (5-6 hours from Dolesie, 3rd largest city of Congo) that can be impassable during the rainy season or after the passage of heavy-haulage logging trucks (***picture 3***). The trip is perilous and 4x4 trucks are required with drivers who have experience on these types of roads. Travelling at

night is not recommended. Bridge capacity is an issue for heavy machinery mobilisation. Travelling from Pointe-Noire or Brazzaville to the property in one day is a challenge; no accommodation is available along the road other than at Dolesie.

*The Mayoko area is accessible only by a dirt road and the old Camilog railway. A private airport is currently under construction by the iron companies.*

Rail service along the former *Cape gauge* Camilog railway is offered once a week by CFCO ("Chemin de Fer Congo-Océan"), the national carrier (***picture 4***). This service is currently not dependable, but can be used to bring containers and heavy machinery, although no facility is available in "Mayoko Gare". Passenger service is not recommended. It is expected that this service may be improved for future iron mines. Standard gauge heavy haulage "Trans-Gabonais" railway is available in Mouanda, Gabon, about 100 km to the north.

The closest public airstrip is located in Mossendjo, about 60 km south of Mayoko. A private strip is apparently under construction near Mayoko by one of the iron mining companies. No heliport is currently available and landing in unprotected areas is not recommended because of the omnipresent kids. No helicopter fuel is currently available in the area.


***Picture 3**: View of N2 national road leading to Mayoko. Notice that the lightest rain renders this mud track extremely slippery and near impassible. The 4x4 pickup in the picture was immobilized by a 1-2% grade hill!*

***Picture 4**: A view of the Camilog "Cape Gauge" narrow gauge railway. Note the steel sleepers dating from 1976 and the approximately 70 lb/yard rails, inadequate for the anticipated transport of iron ore.*

**SERVICES**

Next to no services are available in Mayoko. The services are limited to an ENI Foundation dispensary, a small police station, a few small shops and a market (***picture 5*** and ***6***). The only heavy machinery available is owned and operated by other mining or logging corporations. Cell phone and internet service is accessible. No fuel dealer was noted, the closest one available appears to be in Mossendjo.

*Near to no services are available in the Mayoko area, else than a good cellular phone network. No electrical power, drinkable water or waste management is available.*

Various services required for mining operations are available in the capital city of Brazzaville, or in the port city of Pointe-Noire. These include western-standard hospital, international airport, European groceries and restaurants, as well as a multitude of shops and dealers.


***Picture 5**: The Mayoko police station (Congolese army), the only ostensible sign of government presence in the area.*

***Picture 6**: A view of Mayoko-Gare village. The Congo Mining camp is visible to the left.*

**CLIMATE**

The climate is tropical humid, with little contrasting “rain” (November to February) and “dry” season. Due to its altitude, the Mayoko climate is comfortable, with warm days and cool nights. Rain is common, and is of a concern for flash-floods in river gullies and for vehicle travel.

# ITEM 6: HISTORY

## ASSESSMENT AND GOVERNMENTAL REPORTS

*There is practically no geological report available for the area. The Congolese department of mine has been destroyed in 1998, with most of the geological and assessment reports.*

Obtaining access to government files in an African country can be an act of patience, and the author did not visit the office of the "Bureau minier congolais" in Brazzaville. The author was informed that all historical records of the Congolese government, including the archives from the "Direction des mines et de la géologie de l'Afrique-Équatoriale française" about mining activities prior to 1998 were destroyed during the civil war[14]. No historical assessment files are available officially. Some reports may be available concerning recent exploration activity, but no attempt was made by the author or Tantalex to acquire them. It is not clear if these reports can be publically accessed. No geological report prepared by the Congolese government appears to be available, none is posted on the internet, nor are there any regional aeromagnetic maps or regional geochemical surveys.

## BRGM REPORTS

The geological reconnaissance of Congo was carried in the late-colonial period by the French BRGM[15]. The last work published or available work dates back to the 1960s and no recent update seems available. The BRGM map indicates the "Massif du Chaillu" as being an Archean basement consists almost entirely of undifferentiated granitoids, with the only supracrustal unit being in the Mayoko area, likely derived from "Société Avoine's" work. The only mineral occurrences indicated are the gold, tantalum and iron from "Société Avoine". It is unlikely that other relevant data is available in BRGM the undisclosed archives of the BRGM.

[14] At the time of the 1998 civil war, the head of the "Direction générale de la géologie du ministère des Mines et de la Géologie" was Mr N'Gami, who founded SADEM-Congo. Mr N'Gami apparently managed to save a few of the reports, including the two from "Société Avoine", hereafter discussed below.

[15] BRGM: "Bureau de la recherche géologique et minière" is the approximate French equivalent of the Geological Survey of Canada. However, this organism was not in charge of maintaining colonies' mining activity records.

## SOCIÉTÉ AVOINE

*La Société Avoine has been exploiting alluvial gold in the Mayoko area in the 1950' and 1960'. Evidences of their work are still visible in streams where exploitation took place.*

Alluvial gold was discovered and exploited in the 1950s by a French group, "Société Avoine". The company left its mark that is still very visible in Mayoko. Most colonial buildings in the area were built by this group. Avoine exploited most rivers in the area with systematic but artisanal methods; evidence of its work is ubiquitous in the streams. The amount of gold extracted is not known, but legends tell of a single site on the Bamboma River, north of Moupapa, that produced more than one ton of gold.

In the course of their gold exploitation, "Société Avoine" noticed the abundance of coltan in the alluvium. This company proceeded with a systematic evaluation of the heavy minerals of part of the area, including estimating coltan abundance, as described in two preserved reports (Boineau, 1956; Bureau minier congolais, 1964). However, no official record of the coltan production is available.

*Two geological reports produced on behalf of La Société Avoine, written in 1956 and 1964, are the only geological information available. There reports deal with heavy mineral exploration and coltan abundance.*

The purpose of the first report (Boineau, 1956) was to place the alluvial coltan into a geological context and to validate its link to various pegmatites in the area. It also mentions prospecting carried out in other areas without providing any results or localities. The report gives the most accurate description of the bedrock geology available. It describes the sinking of an unknown number of pits, some into a substratum rich in tantalum. Of the dozen or so pegmatites indicated as evaluated, two were mineralized. Grades of more than 1 kilogram of coltan per cubic meter were reported.

The second report (Bureau minier congolais, 1964) is a preliminary report describing the various sites evaluated for their coltan potential, nearly 10 years into their operation. Thirteen sites are described and are accompanied by detailed maps. The digging of 214 pits (sampling sites?), the analysis of 192 heavy mineral concentrate samples and the presence of 66 m of galleries (!) are mentioned. A number of pegmatite occurrences were evaluated without success. The work relied essentially on the known tantaliferous streams identified during alluvial gold extraction.

Although brief, these reports contain a lot of relevant information, which need to be compiled and carefully plotted on a map. It is clear that Avoine Mining produced a number of other reports which are not available at the present time.

The author had the opportunity to discuss the matter with Mr. Pierre Téckesse, former deputy-minister representing Mayoko district in the Congolese government from 1961 to 1971. Mr. Téckesse was a school teacher in the time of "Société Avoine" and described himself as one of Mr. Avoine's personal friends. He told us that in the beginning of the 1960s, the company entered into a commercial agreement to sell its coltan to a German firm for the manufacture of high temperature alloys to be used in airplane turbines. Several tonnes of coltan were sent to this company before the end of operations in 1962.

As indicated in the SADEM-Tantalex agreement, Mr. N'Gami reported the existence of an estimated 20 tonnes of coltan reserves accumulated by *Société Avoine* and left in place when they abandoned operations. We met one of the company's former foremen[16] in Banzoko who told us that the coltan[17] stockpile was buried under a layer of mud not far from the village. This layer of mud could not be located by SADEM during its operations. According to Mr. Téckesse, the 20 tonnes of coltan stockpile mentioned above was sold by Avoine.

"Société Avoine" ended its operation in 1962, after the accidental death of Mr. Avoine. This was shortly after the inauguration of the Camilog railway, and represented the end of the mining development in the area until recently. Local gold diggers perpetuate the Avoine activity on an artisanal scale (***picture 7***).

It is to be mentioned that the Lékoumou iron deposit is indicated on "Société Avoine" reports, without further details.

[16] The man presented himself as a "capita", which means he was in charge of supervising a small group of worker.
[17] "coultan" or "cooltan" in the local dialect.

***Picture 7**: Views of the artisanal gold mining operations using sluice boxes operated by children. The method is identical to the one used by Avoine Mining, but without bypass channels and dam. The last picture shows gold concentrate being traded at the village maki.*

## WORK CARRIED OUT BY SADEM-CONGO

*Prior to the author visit, SADEM-Congo conducted a single field program, were they sampled various stream for coltan, based on Avoine's reported occurrence.*

SADEM-Congo conducted a prospecting program on the Matsanga-Marala permit from February 02 to March 9, 2011 (Ibouanga (?) 2011). The program was conducted by Mr. Jean Bonate Ibouanga, a Congolese geologist, and is briefly described in his report. No reliable analysis is provided, with the exception of two XRD analyses that confirm the presence of coltan. Coltan proportion as indicated is only a visual estimate: coltan may be confused with any other black mineral in the concentrates, such as ilmenite. The report indicates the presence of other valuable minerals such as cassiterite, wolframite, chalcopyrite[18] and

[18] A picture provided in the report shows large chunks of alluvial chalcopyrite, the provenance of which is not indicated!

various gems, the identification of which can be dubious[19]. Some outcrops, identified as granitoids or metavolcanics, were reported with coordinates, but without descriptions[20].

**AUTHOR'S VISIT**

At the request of Tantalex, the author visited the Mayoko project for a period of three (3) days, from November 12 to November 14 2011, plus traveling time. The author was accompanied by Mr. Ibouaga for this visit, who introduced him to the main coltan occurrences near Mayoko. A series of 25 stream sediments were collected by the crew under the direct supervision of the author, which were carried back to Canada for assaying. Currently, these samples provide the only reliable set of assays in the project area.

[19] Numerous such mineral misidentifications were noticed by the author during discussions with Mr. Ibouanga. For example, garnet and pyroxene were identified as ruby and emerald. Furthermore, the report does not provide locations for these mineral occurrences. !

[20] Samples and sampling sites are not described. However, a set of pictures are provided with no indication of localisation, but showing that trench pits were dug, outcrops were visited, alluvial gold and coltan were obtained, and that even coltan-bearing (?) quartz veins (?) were found.

# ITEM 7: GEOLOGICAL SETTING AND MINERALIZATION

## REGIONAL GEOLOGY

Very little is known of the regional geology, the last geological map was produced by the BRGM map in 1965 (***figure 2***). Even the recently published geological map of Africa by the Commission for the Geological Map of the World (http://ccgm.free.fr/cartes_afrique_gb.html) does not add any more detail compared to the UNESCO 1964 map.

*The Mayoko area is located within the Massif du Chaillu, which is a crystalline basement, part of the Kasai-Congo craton, archean in age, dominated by granitoid, Its geology is poorly known.*

The overall area is underlain by the Kasai-Congo craton, Archean in age. The craton is mostly covered by Cenozoic sediments; its geology is largely unknown. In western Congo, the Congo craton is present as the Chaillu massif, which connects with the Ivindo Complexe through Gabon. For most of eastern Congo, the massif is covered by the Bateke Plateaux, a part of the Congo Basin. This sedimentary sequence is transgressive eastward from Cretaceous to Pliocene in age. To the south and to the west, the Chaillu massive is bordered by the West Congo mobile belt. The mobile belt is Proterozoic in age, also known as the Mayombe series, and belongs to the Pan-African orogeny.

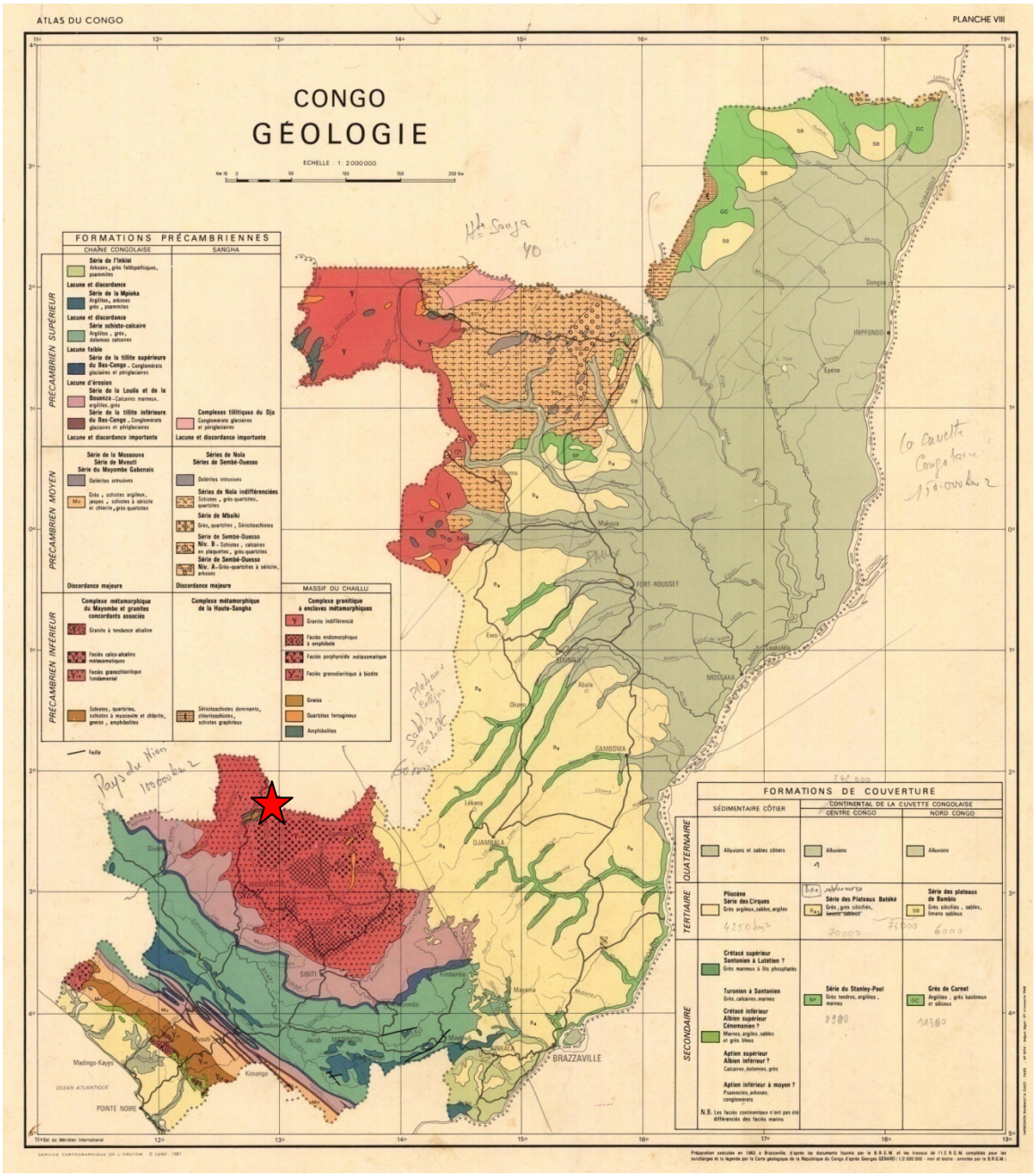



***Figure 2**: Geological map of the Republic of Congo, originally produced by the French BRGM. The star marks the project location in the in the Archean Chaillu Massif (red background). Note the small green band indicating the only mention of volcanics in the massif. The information on these volcanic is likely taken from Société Avoine's report.*

The geology of the Chaillu massif is poorly know, due to restricted accessibility, thick forest cover and deep saprolitic alteration. Mapping conducted by Mr. Boineau[21] in the 1950s is the only information available, as stated in a recent Ngouabi University[22] publication (Watha-Ndoudy and Djama, 2004) (***figure 3***).

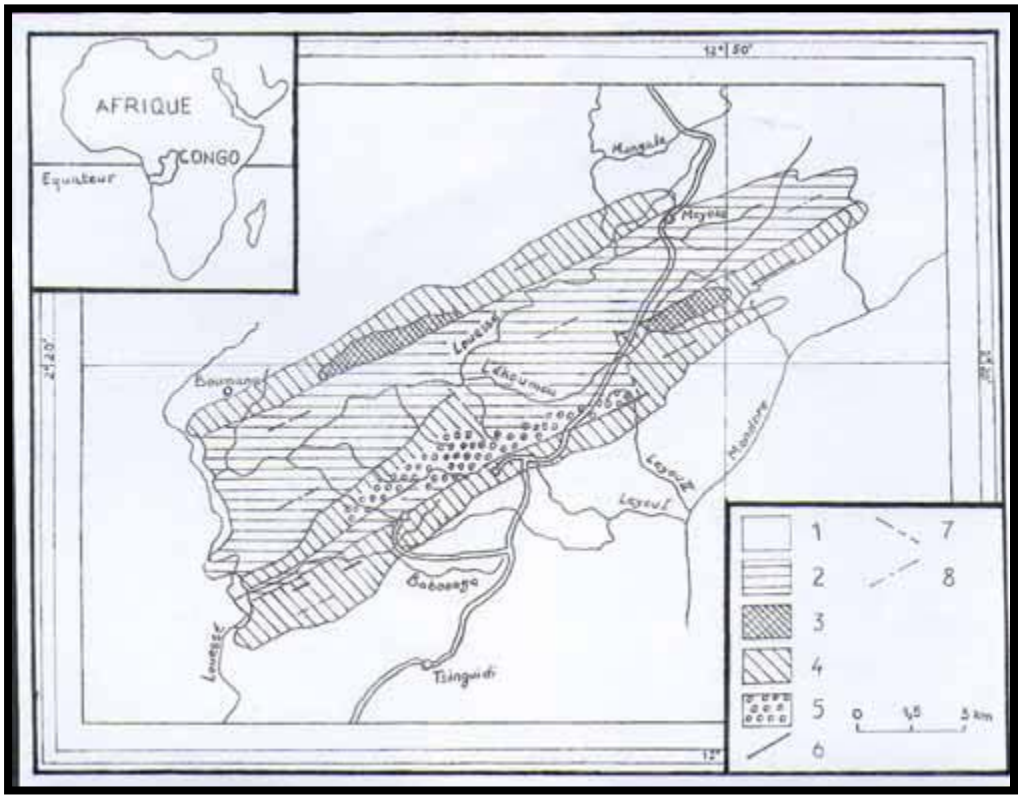



***Figure 3****: Geological map of the Mayoko supracrustal belt as extracted from a BRGM report (Boineau, 1956, cited in Watha-Ndoudy and Djama, 2004). 1: Heterogeneous syn-cinematic granites, 2: Biotite gneiss, 3: Iron-bearing quartzite (Magnetite-BIF), 4: Amphibolite, 5: Conglomerates. 6: Pegmatite. 7: Interpreted fault. 8: Foliation with vertical dip.*

The Chaillu massif is reportedly dominated by porphyroid granites, with local granodiorites, diorites and gneisses. Supracrustal rocks are limited to the Mayoko volcanic belt and the Zanaga iron formation. The Mayoko volcanic belt is composed of amphibolite schists, magnetite-hematite (Algoma type) iron

*The Mayoko area is the only supracrustal sequence known in the area. It is composed of basaltic amphibolites, oxide facies iron formation, and schistosed metasediments.*

[21] Apparently the same person who worked for *Société Avoine*.
[22] *Département de géologie, Université Marien Ngouabi, Brazzaville.*

formation[23] and various biotite gneisses and associated quartzofelspathic facies. It is likely that these "biotite gneisses" are metatexites and paragneisses, and some of them are of felsic volcanic origin. The author examined various outcrops and found the geology to be more complex than indicated on Boineau's published map (1956) or in his handwritten annotations found on the topographic **map** [24]. Pegmatites are indicated here and there.

The quartzofeldspathic rocks are deeply weathered into a saprolitic blanket, tens of metres in thickness. The author noted that amphibolites and iron formations are much less affected by such weathering, and are typically preserved as outcrops forming blocks and ledges (***picture 8***). Streams eroded gullies through this clay-rich material, exposing the only available outcrops of the area. This suggests that topographic differences in such steep "V" shaped gullies represent the approximate thickness of the weathering. The laterite is disturbed by biological activity to a depth of a few meters, representing the soil. Below the disturbance, the original rock structures are preserved and the protolith can be discerned by trained eyes (***picture 9***).

Thick vegetation allows stabilization of such soils and prevents flash-flooding in gullies, therefore preventing coarse sediment from being washed away. Refractory heavy mineral accumulation in stream beds is thus facilitated.

[23] Described as "quartzite ferrugineux".
[24] Given to the author as part of the "Société Avoine" reports.

***Picture 8**: Outcrops of a partially laterized biotite schist, (upper left), an amphibolite schist (upper right) and an iron formation forming a sill in the stream in the Makengui deposit (lower left), and the Lekoumou iron deposit (lower right).*


***Picture 9**: A view of a road cut along the Pointe-Noire - Brazzaville N-1 highway through the Mayombe mountain range. The bedrock is a completely laterized schist or gneiss. Note the 1-2 m thick zone of bioturbation at the surface (ochre layer) and the underlying laterite, where the mud has preserved the ghost structures of the original rock (foliation dips to the right).*

## GEOPHYSICS

The only geophysics available for the area is the aeromagnetic survey published by companies (details provided in ***item 23***) exploring for iron (***figure 4***). This map is of little use, not having access to original data.

*No geophysics or geochemistry is available for the area, else than what is published on website of the society developing the iron deposits.*

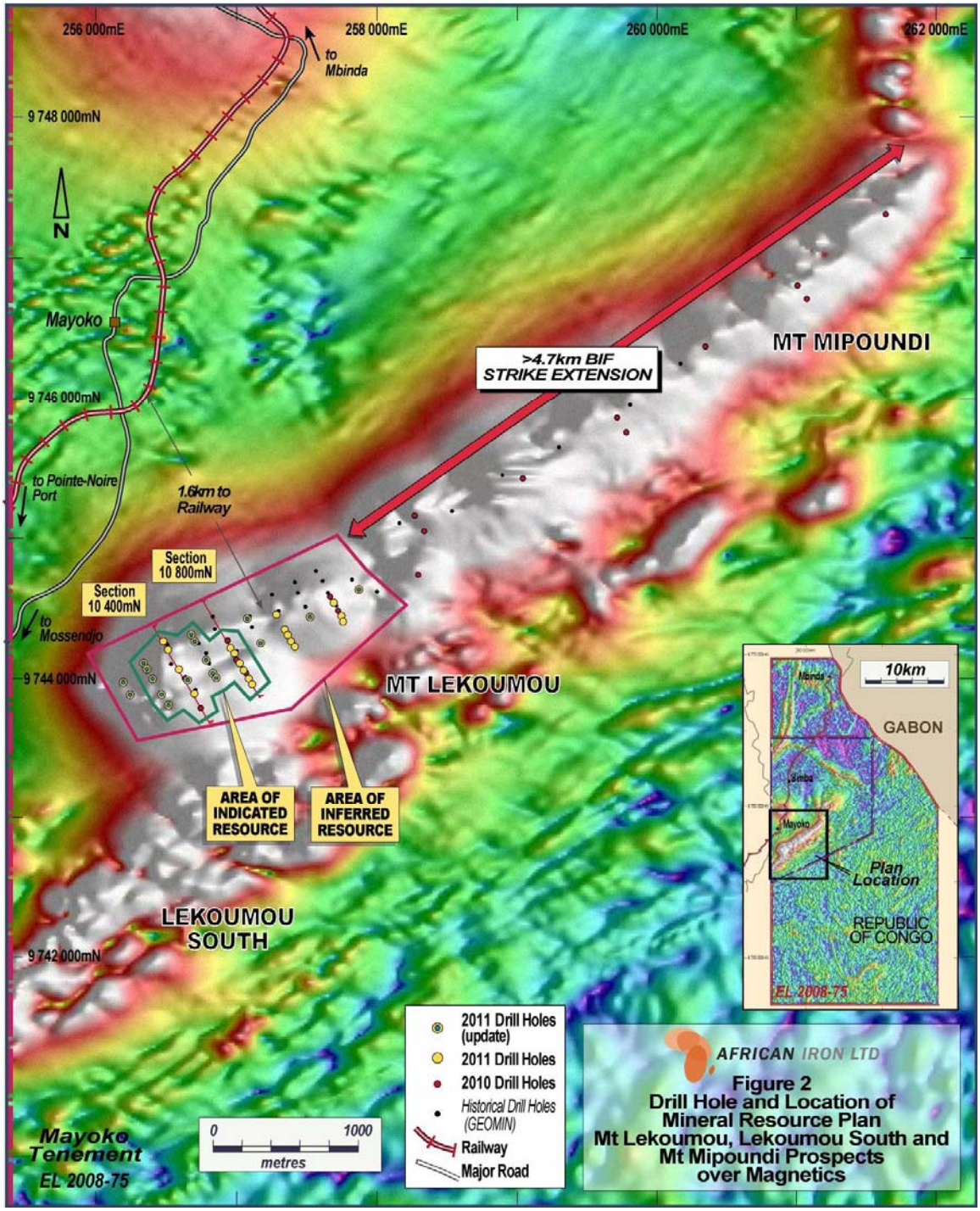



***Figure 4**: Aeromagnetic map of the Lekoumou area, directly south of Mayoko, and encompassing the main coltan occurrence, publically available on the African Iron Ore website.*

## GEOCHEMISTRY

The only “geochemistry” surveys available, restricted to the Mayoko area, are the two heavy mineral surveys carried out by the “Société Avoine”. The purpose of these surveys was to detect the presence of coltan. They give a visual estimate of various heavy minerals in stream sediments (Boineau, 1956) and laterite pits (Bureau minier congolais, 1964). The survey includes the area where “Société Avoine” carried out its gold mining activities and was likely limited by accessibility. Coltan abundance is reported, including rutile, chromite, zircon, monazite and about twelve other common minerals. This information was compiled in a database, and a map of coltan abundance shown in ***figure 5***.

## MINERALIZATION

*Coltan is found as detrital minerals in stream beds. Coltan is a refractory mineral which resist to lateritic weathering, and concentrate as residuum in quartz pebble conglomerate deposited in active streams carved in the lateritic clays.*

Coltan, the commercial name of columbo-tantalite, is found as detrital minerals in alluvium throughout the Mayoko area (***picture 10***). It is a black, very dense, semi-metallic mineral, typically occurring as single crystals or fragmented grains. It is a very refractory mineral that resists lateritic weathering and consequently concentrates as residuum when a stream washes over the muddy laterite. It may have a slight iron oxide coating. It can be rather difficult to distinguish coltan from other non-magnetic black oxides, such as ilmenite just by visual examination. Untrained eyes may also confuse coltan with tourmaline or hornblende, locally abundant minerals. Therefore, visual estimation of its abundance done by untrained geologist can be misleading.

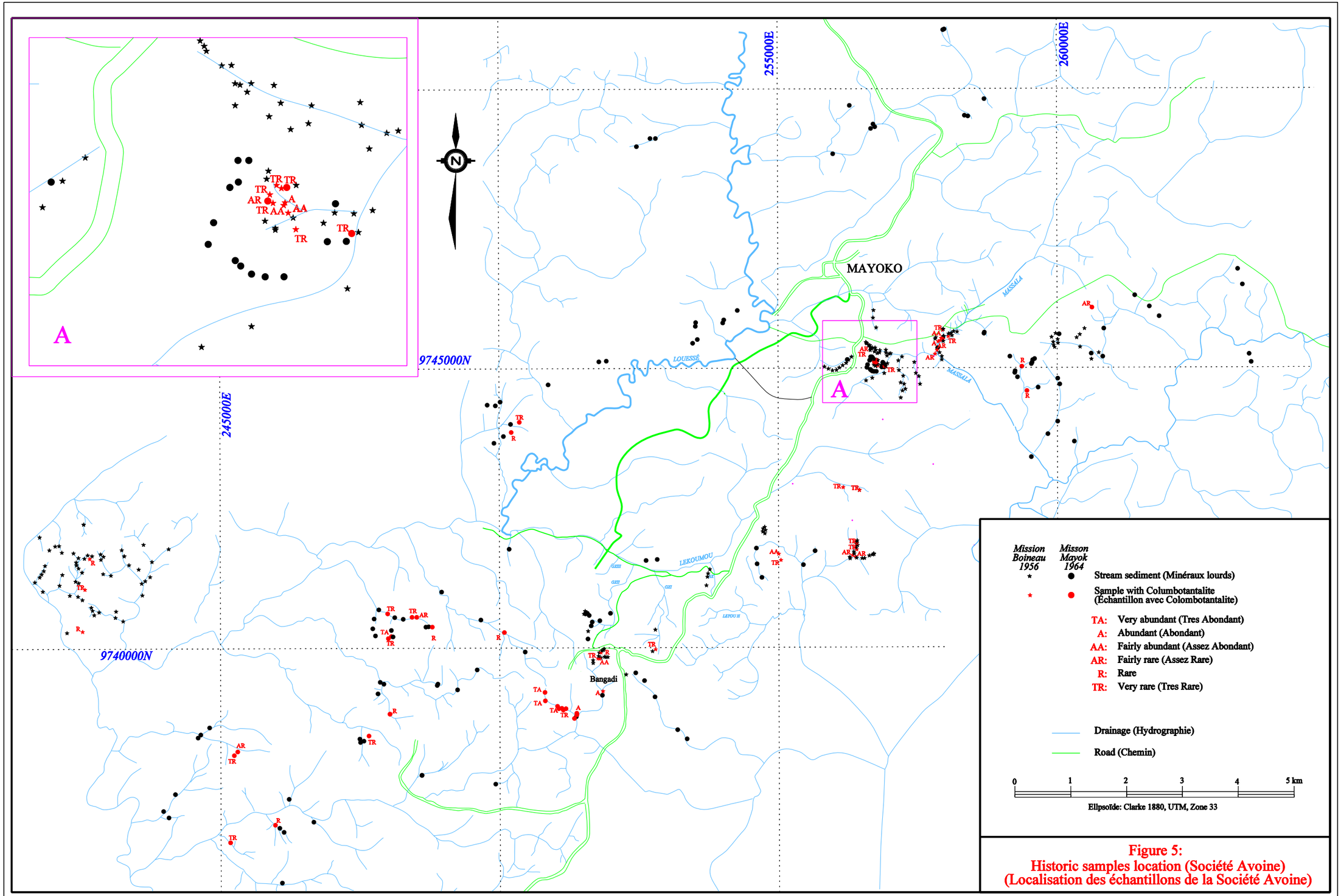



**Figure 5:**
**Historic samples location (Société Avoine)**
**(Localisation des échantillons de la Société Avoine)**

***Picture 10**: A very clean coltan concentrate obtained by Mr. Tsoumbo (alias "Diesel"), a local gold digger. At the author's request, the origin of the concentrate was not revealed. Although the whole concentrate was offered, only a 239.5 g, or 5.5 cm x 3.7cm x 2.0 cm, fragment worth $60 was accepted by the author. The estimated total weight of the concentrate is more than 5 kg valued at around $400, or the equivalent of the six month earning of a Congolese geologist.*

Coltan is mainly found as granules or even as single crystal pebbles, peppering quartz pebble gravels. Boineau (1956) reports that pebbles the size of a grapefruit were found by "Société Avoine". The author found up to 50 g grains just by hand picking in the gravel heaps (***pictures 11*** and ***12***).

***Picture 11**: Coltan pebbles collected at site 88040008 and pan concentrates collected at site 88040001. Note that the pebbles were subsequently assayed in laboratory with a portable XRF analyser by the author and confirmed as coltan.*

***Picture 12**: A view of the unperturbated gravel from site 88040019, showing quartz and schist pebbles dotted with black coltan and tourmaline grains up to a few millimetres in size. Notice the undisturbed small plants and seedlings growing in the gravel, witnessing the genuine coltan presence. Pen cap provides the scale.*

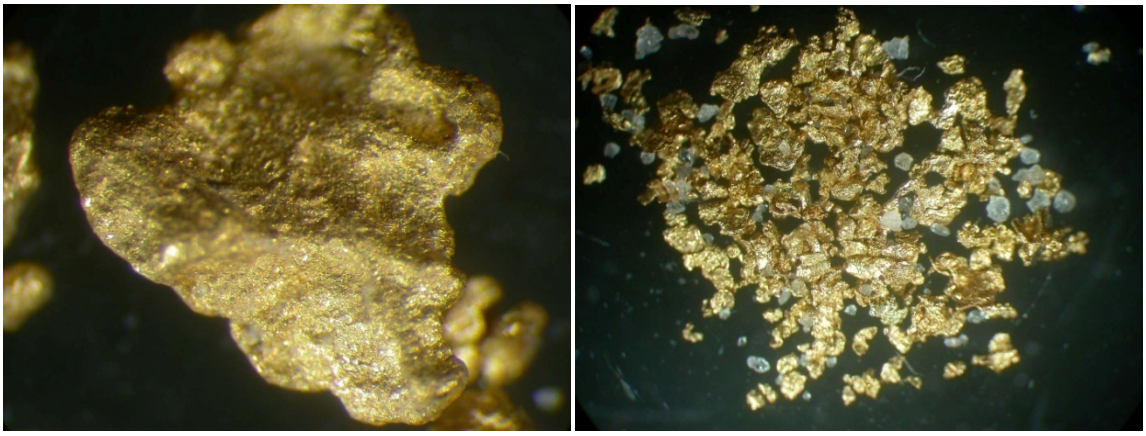
## OTHER METALS AND COMMODITIES

Iron ore deposits were reported in the Mayoko area as early as 1912 (Watha-Ndoudy and Djama, 2004), and tonnage was suggested on the Boineau (1956) map. Although located within the Matsanga-Marala permit, these deposits belong to other companies and Tantalex does not have any rights to them. However, a relationship between iron ore outcrops in stream beds and coltan concentration was observed. It is interpreted to be caused by the presence of ledges that creates traps for the hydraulic accumulation of heavy minerals.

*Gold has been mined by La Société Avoine for years, and is still extracted by local digger. Gold is expected to be recovered as co-product from the coltan mining.*

Gold (***picture 13***) was exploited by Société Avoine and continues to be done so by local gold diggers. Although placer gold would be collected along with coltan in the course of alluvial mining, Tantalex does not own the rights for gold exploration.

The presence of a few pyropes, a purple garnet typically originating from kimberlite, was noted in a few samples, suggesting a potential for diamond exploration. The presence of kimberlite is realistic in the area, which is a basement of Archean age.



***Picture 13**: Picture taken with a low-magnification microscope of a large (2 mm) gold nugget from sample 88040013a (40x), and of a gold grain concentrate from sample 88040004 (16x).*

# ITEM 8: DEPOSIT TYPE

## ALLUVIAL COLTAN

Coltan in the Mayoko area is currently known only as detrital grains in alluvium. Although there are some mentions of coltan in pegmatites or laterite in historical reports, these are not considered to be reliable for the moment.

Alluvial coltan comes from the erosion and elutriation of the clay-rich laterite where it occurs as a refractory mineral. The streams where it has been accumulating are enclosed in narrow valleys, but are slow flowing due to the dense vegetation invading the stream bed. Coltan and other refractory heavy minerals accumulate in the gravel layer blanketing the stream bed. This gravel is largely dominated by quartz pebbles derived from the erosion of quartz veins resistant to lateritic alteration. As most of the streams visited are small with limited flow, minimal transport distances are expected. Deposits from each of the streams are thus expected to be small but enriched, not suitable for large scale dredging. Larger streams and rivers, such as the Louessé, were not visited, and their potential for coltan placer is not known.

## SOURCE ROCKS OF THE COLTAN MINERALIZATION

*Columbotantalite is known to be formed in significant abundance only in lithium-bearing pegmatite. Such pegmatites are typically associated with metasediments which underwent anatexis.*

Only a few geological contexts can produce coltan mineralization, in particular the formation of the large crystals seen during the visit and so strongly enriched in tantalum with respect to niobium. Only LCT [25] type peraluminous sodium-lithium or sodolithic pegmatites are known to the author (Černý and Ercit, 2005). However, other contexts may contain coltan, or at least tantalum-bearing oxides, such as nepheline peralkaline pegmatites (Crevier deposit, Québec, Canada), carbonatites or possibly certain exotic types of mineralization associated with IOCG deposits. Obtaining enrichment of tantalum over niobium requires unusual geochemical conditions, since these two metals have near identical chemical behavior, and niobium being 10 times more abundant than tantalum in most alkaline rocks as well as in cosmic abundance. The reason for tantalum enrichment over niobium in LCT pegmatites is not well understood.

LCT sodolithic pegmatites are coarse-grained, sodium-rich (alaskitic) granitic rocks formed by the melting of a paragneiss. They are characterised by an assemblage of

[25] LCT Pegmatite: Lithium-Ceasium-Tantalum bearing peraluminous pegmatite.

quartz, albite (cleavelandite), muscovite and various lithium aluminosilicates such as spodumene and petalite. The columbo-tantalite content of these pegmatites is typically relatively low, around 0.05% or 500 ppm. This grade of tantalum is or has been exploited at different sites such as at Tanco in Manitoba, which is the main world source of tantalum. Note that the tantalum content of these rocks is significantly lower than the tantalum content of the alluvial deposits visited in Mayoko. The alluvial deposits have a residual origin, where refractory minerals preserved during the lateritization of crystalline rocks become concentrated in the superficial alluvium. The typical tantalum content of tantaliferous alluvium is not well documented, but shows an enrichment of up to an order of magnitude (0.5-5%) compared to the source rocks. Coltan, like gold, is very resistant to weathering, so they both get concentrated as heavy minerals with alluvial quartz pebbles.

Based on the author's experience, sodolithic pegmatite veins usually occur in swarms up to hundreds of metres in extent. In addition, dyke swarms are usually interspersed with a wide range of lithodemic assemblages, such as migmatite complexes. A number of swarms can be dispersed on a regional scale, scattered throughout the territory over several hundreds of kilometres. This is the basis of the argument suggesting that the alluvial coltan deposits in Mayoko may have a much larger regional extent than known at the present time.

*Columbotantaline bearing sodolithic pegmatites are not yet reported in the Mayoko area, although granitic pegmatites are reported here and there. Exploration for such has been conducted by Société Avoine, in the 1960'.*

It is currently impossible to confirm an association of the Mayoko coltan with the presence of a pegmatite. A few pegmatite outcrops were seen by the author (***picture 14***) or reported by the geologists from "Société Avoine" as well. Mentions of pegmatites are also made in Ibouanga (2011), but will require verification. But there are no reports of spodumene in these pregmatite at this time and the pegmatite's sodolithic nature is unconfirmed. Note that pegmatites are relatively common rocks in crystalline basement and only one type is coltan bearing. For a pegmatite swarm to be of interest for coltan exploitation, it must be on the order of kilometres in size: the size of the current spacing between the various stream in the drainage pattern.

***Picture 14**: Left: Flakes of muscovite scattered in gravel at site 84040008, suggesting erosion of a nearby peraluminous pegmatite. Right: View of a quartzofelspathic pegmatite outcrop in a stream.*

Exploration for LCT type sodolithic pegmatites for their lithium content is relatively active around the world at the present time. Such pegmatites typically contain 1.5% $Li_2O$, or 20-30% spodumene. Spodumene is an industrial mineral currently worth over $800 a tonne, assuming suitable quality. It is used in the manufacture of glass and ceramics, and developments are currently carried for its use in the production of lithium carbonate for electrical storage batteries. The lithium content of these pegmatites is the main source of income from their exploitation, leaving coltan as a by-product or as a co-product at best. It is estimated that the in-situ value of a spodumene bearing pegmatite is on the order of $200 a tonne, versus production costs that could be well below $100 a tonne.

There is currently no known LCT pegmatite in Chaillu massive. However, numerous pegmatite occurrences, many of which are per-aluminous or tourmaline bearing, were reported by *Société Avoine.*

*Sodolithic pegmatites are mined around the world for lithium as well as columbotantalite. Such pegmatite usually occurs in large swarm, over metallogenic province.*

While visiting the alluvium in the Banabari Creek area, near the MDC iron deposits, Mr. Ranchard N'Gamye, a young geologist working for SADEM-Congo, mentioned having collected a lateritic clay sample in a road cut which, when washed, yielded coltan. This sample was not duplicated by the author, but this type of material could be an example of the weathered source rock.

# ITEM 9: EXPLORATION

## PREVIOUS EXPLORATION WORK

Due to the lack of detailed and reliable information, all previous exploration work is disregarded by the author, other than for being the trigger behind the project.

## AUTHOR'S FIELD VISIT

The author's visit was guided by Mr. Bonate Ibouanga, who selected the sites to be visited based on his experience obtained during previous campaigns (***appendix 2***). Significant amounts of coltan could be found at each location.

*In the course of his visit, the author sampled xxx sites from various stream. Coltan was collected from most of these sites. In many locations, coltan granules can be picked directly from gravel piles.*

The selected sites were artisanal gold mining places in the various streams of the area. "Société Avoine" reported coltan in these streams; the reports were relatively accurate. It should be noted that the local miners do not recover the coltan at this time because they do not have a market for selling it.

Typically, the samples collected were the heavy fraction of four (4) pans of material, 5 litres each. The samples were washed by the local prospectors (***picture 15***). Sampling sites were usually selected by Mr. Ibouanga, even though the prospectors were free to collect material where they wished within the designated area (***figure 6***). The material was washed under the author's supervision. The typical material collected was from the quartz pebble gravel in a lateritic mud matrix.

Typically, a few grams of sand sized heavy mineral concentrate were recovered from each pan and stored in little sealable plastic bags. The material was retained by the author and brought back to Canada for subsequent analysis.

In parallel with the panning, an examination of the gravels allowed the recovery of coltan pebbles (1-100 g) at several locations, both by the local diggers and by the author himself[26]. These pebbles were retained by the author for subsequent analysis and brought back to Canada in his personal luggage. In addition, a number of coltan pebbles weighing up to 250 g were handed over by some of the local miners, in particular by Mr. Jean Firmin Tsoumbo.

[26] Due to the neighboring DRC coltan production, extreme care was taken by the author to certify the authenticity and detect any attempt at on-site salting.

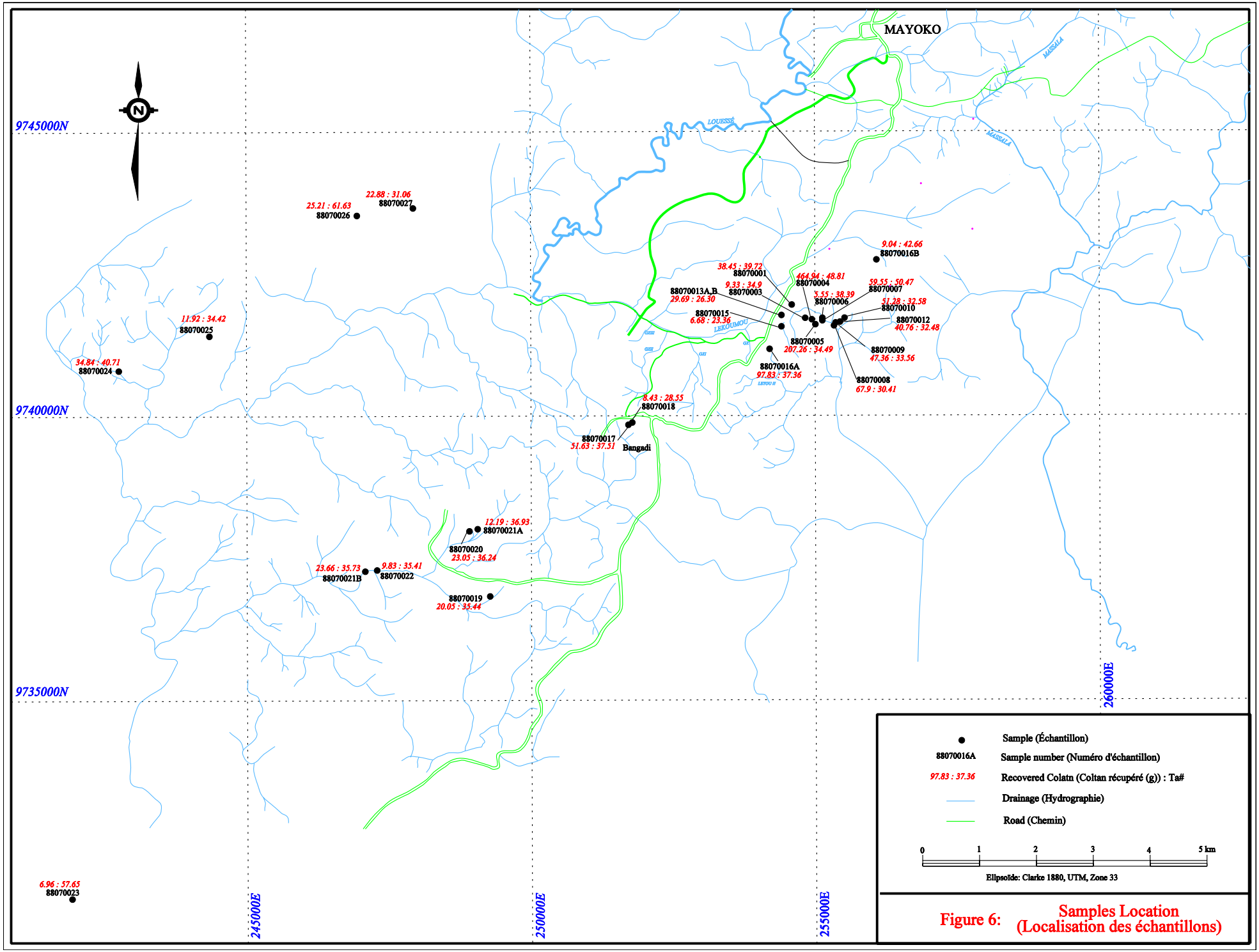



**Figure 6:** Samples Location (Localisation des échantillons)

It must be emphasised that the visit of the author and the sampling he carried strictly aimed at confirming the presence of the coltan on the property. It does not constitute a structured exploration program and is not carried according to systematic and rigorous procedures.

***Picture 15**: SADEM-Congo crew at work, panning for coltan under the author's supervision.*

# ITEM 10: DRILLING

No drilling has ever been carried out on the project.

# ITEM 11: SAMPLE PREPARATION, ANALYSIS AND SECURITY

## SAMPLE DESCRIPTION

Twenty-nine (29) samples were collected by the author in total. The samples are either heavy mineral pre-concentrates or coltan grains. In addition, nine (9) panned pre-concentrates and two (2) small bags of coltan grains labelled X01 to X11 were supplied by Mr. Ibouanga. The provenance of these last samples was not given to the author other than they were collected in the Mayoko area by a local SADEM worker during the author's visit. All samples were analysed using the same procedures, including the samples provided by Mr. Ibouanga.

*Pan concentrate collected by the author were processed in his mineralogy facility in Saguenay, Canada, to measure accurately the coltan abundance and tantalum content of these concentrates.*

## SAMPLE PREPARATION AND COLTAN SEPARATION

Samples collected in the course of the visit were brought to the IOS facilities in Saguenay, Canada, for processing, a facility owned by the author, but independent from Tantalex. Samples were processed using the following procedure:

### Sandy fraction <1 mm

- Drying and weighting
- Washing in bleach to sterilise the samples
- Washing in oxalic acid to remove any ferruginous encrustation. This step had to be vigorous and repeated several times because of the persistence of the encrustation, suggesting that it is hematite and not goethite. The cleanliness of the pre-concentrate is vital for the subsequent treatment with heavy liquids; any trace of ferruginous salts being harmful to the process.
- Separating using LST heavy liquids with a density of 3.2 g/cc.
- Separating magnetite using a hand magnet and Frantz field barrier magnetic separator.
- Examining the non-magnetic heavy mineral concentrate using a binocular microscope and evaluating the mineral proportion.
- Gold grains were extracted and stored separately.
- Analysing the non-magnetic heavy mineral component using a portable X-ray fluorescence analyzer, with Hf-Ta mode. This analysis gives the percentage of tantalum, niobium and major transition metals.

**Granule fraction 1-5 mm**

Analysis of the grit fraction, between 1 and 5 mm, presented some difficulties. The material is too coarse to obtain a homogeneous material for portable XRF analysis, but too small to analyze individual grains.

*Tantalum analyses were carried using a Niton XLT portable XRF analyzer, using the Nb-Ta mode, operated by a certified chemist.*

The grit fraction, overwhelmingly composed of heavy oxides, was sorted by hand using a binocular microscope and weighted. The coltan proportion was measured, but its composition cannot be known without pulverizing the material, which we decided not to do.

**Pebble fraction >5 mm**

Individual coltan pebbles and granules were numbered based on to their place of origin and underwent the following analytical procedure:

- weighing
- washing in bleach and then in oxalic acid
- most grains larger than 5 mm were analysed using a portable X-ray fluorescence analyser. Unlike the analyses of the concentrates, the samples are not contaminated by other minerals and represent the real tantalum and niobium values for these crystals.

**CHAIN OF CUSTODY**

Samples were collected by SADEM crew members under the author's supervision. Pan concentrates were put in small bags and kept by the author, who brought them to Canada in his personal luggage. Samples were prepared and assayed in IOS facilities, under supervision of a certified chemist[27].

IOS is not a certified laboratory, but has 20 years of experience in heavy mineral processing.

**QUALITY CONTROL AND QUALITY ANALYSIS**

Quality control of the sample preparation and heavy mineral concentration used various methods such as mass balance and the insertion of tracer minerals.

[27] Mme Karen Gagné, registered member of the *Ordre des chimistes du Québec*, n° 2003-137.

Quality of the coltan analysis with the portable XRF spectrometer has not been rigorously monitored. Multiple measurements of 120 seconds were made for each analysis, discrepant results were discarded and the average of the three first consistent results used. Since the analysis is non-destructive, all the material and pebbles were preserved and archived, and can be used for re-assay with a different method.

Considering the simple prospecting nature of the program, the author is confident that the analysis are of sufficient quality to support the conclusion of the report.

**OBSERVATIONS DERIVED FROM THE COLLECTED SAMPLES**

1. The cleaned pre-concentrates brought back to Canada by the author consist of silt, sand and grit sized particles. All material smaller than 100 microns appear to have been lost through panning, which was to be expected.

2. The minerals retained after treatment are clean and ready to be examined.

3. The following minerals are observed in the heavy mineral concentrates:

    - Columbo-tantalite $(Fe,Mn)(Nb,Ta)_2O_6$ is the main mineral of interest. Grains of this mineral are a metallic greyish-black and usually euhedral. It tends to keep its crystalline form, but can also be found as cleaved fragments. It is relatively abundant, but on visual examination can be confused with ilmenite or specular hematite. Assuming that the entire niobium and tantalite content of the concentrate is in the coltan, XRF analysis of the concentrate should allow the calculation of coltan abundance. The columbite to tantalite ratio of the concentrate should represent that of coltan.

    - Ilmenite ($FeTiO_3$) appears to be the dominant mineral of numerous concentrates. It is metallic black in colour, very similar to coltan and it is easy to confuse the two. It is clear to the author that the panning done by the prospectors does not take into account the presence of ilmenite in their concentrate; therefore, the weights obtained are overvalued. Ilmenite is the only titanium mineral noted, rutile and leucoxene are both absent. The proportion of ilmenite can thus be calculated from the chemical analysis, assuming its stoichiometric nature. Ilmenite is a common constituent of crystalline rocks, so its source rock cannot be uniquely identified. The author is never-the-

*Ilmenite is abundant in the coltan concentrate from some area, and can be difficult to distinguish or separate.*

less surprised that it shows no evidence of lateritic alteration or conversion to leucoxene or pseudorutile. Ilmenite is currently selling at $90 a metric tonne, too low to consider its exploitation.

- Garnet ($(Fe\text{-}Mg\text{-}Ca)_3Al_2Si_4O_{12}$) is present in relatively variable proportions from one sample to the next. Garnet is a common constituent in paraschists, an abundant lithofacies in the area. Contrary to the author's expectations, the garnet shows no sign of lateritic corrosion. Garnet has practically no commercial value.

- Zircon ($ZrSiO_4$) or xenotime ($YPO_4$) is a ubiquitous in crystalline rocks and extremely resistant to any weathering. The mineral is present in low amounts in all the concentrates. It is pale pinkish in colour and easily mistaken for quartz or feldspar on visual examination. It is not sufficiently abundant to have a commercial value.

- Apatite and quartz can be seen in small quantities in some of the samples, due to a separating problem with heavy liquids.

*181 coltan pebble, either collected by the author or provided by local gold digger were analyzed. The average $Ta_2O_5$ content is 35.9%, but some pebble being as rich as 64%.*

In total, 181 pebbles from the various sites thought to be coltan were analyzed with the use of a portable X-Ray fluorescence analyser (***table 2***). Of these, 165 (91.2%) were coltan, with an average[28] tantalum oxide content of 35.9% $Ta_2O_5$, ranging between 6.14% and 64.21%. Class distribution of tantalum grade in coltan grades is provided in ***figure 7***. The analyses are near to stoichiometric [29] $(Nb\text{-}Ta)_2(Fe\text{-}Mn)O_6$, with traces of titanium (0.5-1.5 $TiO_2$), calcium (0.1-3% CaO, likely from the inclusion of perovskite molecules), and abundant manganese (1-11% MnO, typically one third of iron). Traces of other metals were detected, below 1%, but it is uncertain if they are in solid solution within the coltan, a superficial alteration or a mere analytical discrepancy[30].

[28] Not weighted for the weight of the individual grains

[29] Stoichiometric calculation is slightly divergent from the theoretical stoichiometry, due to niobium grade errors inherent to the analytical method, varying by 0.4% to 10% of the measured value.

[30] Matrix corrections with Rousseau's fundamental algorithm are quite severe for material rich in heavy metals such as tantalum and may exceed the capability of the software used for the analysis. Rigorous calibration was not preformed.

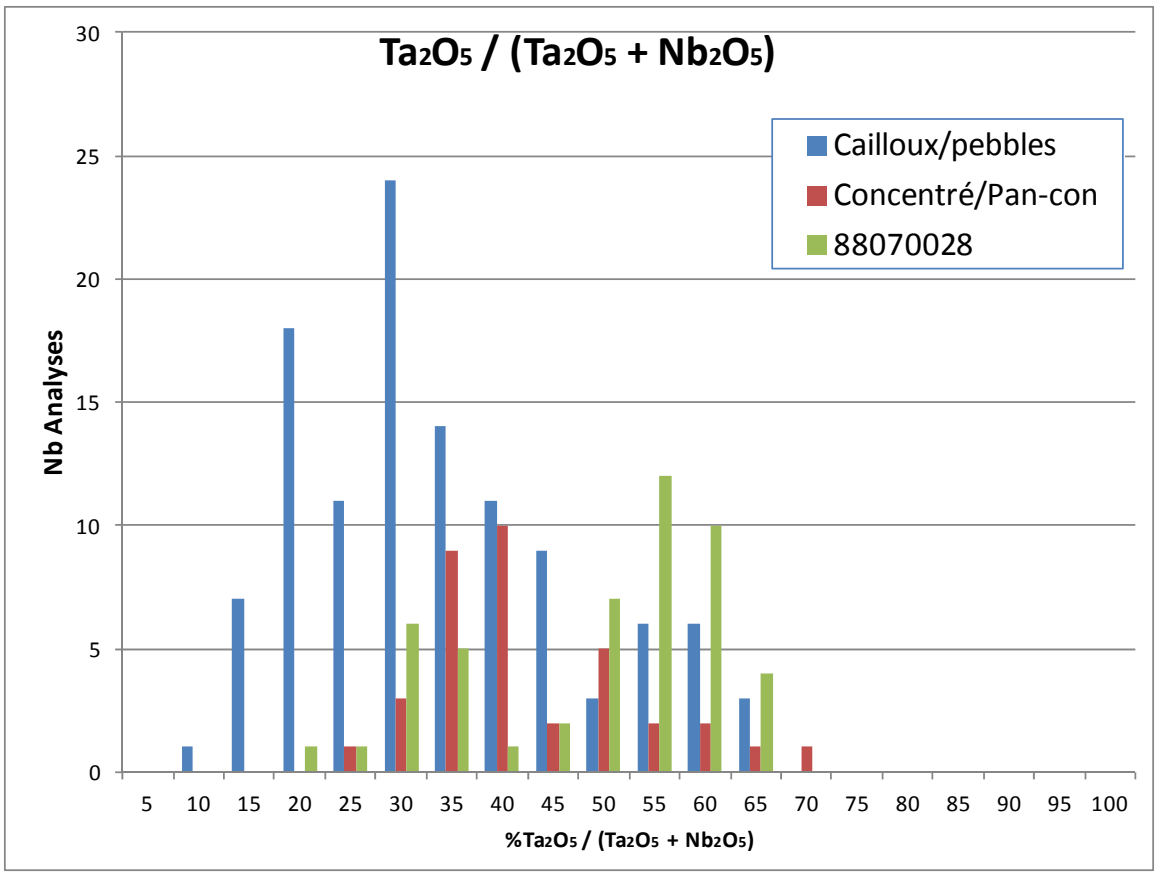



***Figure 7**: Class distribution of tantalum grade.*

Tantalum content of the pebbles varies based on their provenance. However, the small numbers of available analyses per site render statistical evaluation not very robust.

| Site[31] | Nb | Avg %$Ta_2O_5$ |
|---|---|---|
| 88070001 | 6 | 25.4% |
| 88070004 | 7 | 28.7% |
| 88070005 | 5 | 29.0% |
| 88070007 | 4 | 38.0% |
| 88070007 | 5 | 33,7% |
| 88070009 | 8 | 40.9% |
| 88070010 | 3 | 43.4% |
| 88070012 | 5 | 19.1% |
| 88070016 | 5 | 26.8% |
| 88070017 | 5 | 34.1% |
| 88070020 | 3 | 30.2% |
| 88070021 | 3 | 21.7% |
| 88070023 | 3 | 32.2% |
| 88070024 | 5 | 37.2% |
| 88070026 | 3 | 32.5% |
| 88070027 | 4 | 30.6% |
| 88070028[32] | 49 | 46.4% |
| 88070100[33] | 29 | 30.4% |

***Table 2***: Average tantalum grade in pebbles.

Other than coltan, pebbles included crystalline iron oxide (magnetite, maghemite or hematite), ilmenite and tourmaline (?). These, especially ilmenite, can be tricky to distinguish visually from coltan. Also, three large grains of the pyrochlore-microlite series $(Na,Ca)_2(Nb\text{-}Ta)_2O_6(OH,F)$ with 30% to 40% $(Nb\text{-}Ta)_2O_5$ were detected. Finally, two black oxides returned no detected metal with the XRF analyzer, meaning they are made of metals for which the analyser is not programmed. These are likely rare-earth oxides, such as euxenite or betafite.

*The abundance of coltan pebble in gravel is near to impossible to evaluate accurately. The beneficiation process will have to enable recovery of these.*

[31] Only sites with more than 3 grains are indicated

[32] 88070028: collection of grains provided by Mr. N'Gamie, with a few exceptions. Exact provenance was not disclosed and might not even been known to Mr. N'Gamie. He informed us that the SADEM crew collected them in the Mayoko district. Tantalum grade in these pebbles is significantly higher than the ones collected in the presence of the author. As it is impossible to visually distinguish tantalum-rich from tantalum-poor coltan and no simple analytical test were available to Mr. N'Gamie, it is difficult to imagine that a selection bias was introduced by him. The provenance of these pebbles must be different from the ones collected by the author, likely from a different stream.

[33] 88070100: Samples provided by Mr. Ibouanga and collected by unsupervised prospectors during the author's visit. Provenance was not disclosed to the author. They show tantalum grades similar to the ones collected in presence of the author: they likely come from the same system.

The abundance of coltan pebbles in the gravel is near to impossible to estimate accurately. Pebbles were collected one by one mainly by a visual search within the quartz gravel. Their contribution to the mass balance is erratic, a bit like the gold nugget effect. However, their contribution to potential revenues can be significant. In the Avoine report, there is mention of a coltan pebble the size of a grapefruit, which could weigh more than 10 kg and have a value in excess of $600. The mining process will have to be able to recover these erratic large pebbles.

**Pan concentrate analyses**

Local prospectors prepared the pan concentrates using their usual methods for gold panning: they concentrated the heavies until they obtained the cleanest concentrates they could achieve. The concentrates contain a certain proportion of grit dominated by coltan and were sieved in the laboratory to exclude material smaller than 0.1 mm or larger than 1mm. The sieved sandy material is composed of a salt-and-pepper mixture of dark heavy minerals such as coltan and light minerals such as quartz in various proportions. Coltan was then separated from the concentrate in the IOS laboratory. Light minerals were removed using heavy liquids, leaving heavy concentrates representing an average of 34% of the pan concentrates. Magnetite, separated with a hand magnet, represents an average of 8% of the concentrate. However, samples collected near iron formation ledges in the stream may contain up to 68% magnetite. Magnetite and coltan can easily be confused by local prospectors if not tested with a magnet. The paramagnetic heavy concentrate is then analyzed with the XRF analyser. Since only coltan contains significant amounts of tantalum and niobium, the grade of these metals can be used to estimate the coltan abundance as well as its tantalum-niobium ratio. A mass balance and recovery is then back-calculated.

*Pan concentrates smaller than 1 mm collected by the author yielded an average of 6 grams of coltan per 20 liters of gravel. $Ta_2O_5$ grade varies with location, between 38% and 50%.*

The amount of coltan recovered in the sandy fraction is modest, for an average of 20.8 grams per site. This average is biased by sample 88040004, with 526 g of coltan. If excluded, the average coltan per sample drops to 6.0 grams. Only seven (7) samples produced in excess of 10 g coltan, all from the Imvouala tributary, Lekoumou area. The tantalum versus niobium ratio of the coltan is calculated at an average of 38.3%. It is noted that samples from the Lekoumou area show a lower tantalum content (about 30%) than those of the Makengui area, which grade at about 50% tantalum. Class distribution of tantalum ratio is provided in ***figure 7***, compared to the pebble grades.

**Grit analyses**

Grit (1-5 mm in diameter) is dominated by coltan. The exact proportion is however hard to measure accurately, since coltan and ilmenite can be tricky to discriminate visually. Accurate assaying would require pulverisation of the material, which can be difficult for such small samples of a hard mineral. Visual examination under microscope indicate that silicates account for less than 1% of the grit, and coltan represent between 35% and 95% of the concentrate weight. It is noted that the proportion of coltan grit in the samples collected by unsupervised prospectors is significantly lower, typically 30%.

The grit fraction recovered by panning represent between 5 and 204 g for 5 pans, thus an average of 35.1 g per sample, or 41% of the pan concentrate. The grit is dominantly coltan and represents a significant proportion of the mineral budget. The recovery process for eventual mining will have to consider recovering this size fraction, which will require a different process than the sandy fraction. The tantalum oxide grade of this coltan cannot be measured, and can only be assumed to be similar to the one measured in the sandy fraction.

*Although difficult to evaluate, the bulk of the coltan is contain in the grits (> 1 mm) fraction. The beneficiation circuit will require recovering efficiently this fraction.*

**Gold**

The *Société Avoine* exploited the alluvial gold in the Mayoko district for almost 30 years. These exploitations used quite primitive equipment typical of the epoch. A fair amount of gold is still present in these gravels and artisanal exploitation is continued by local gold diggers. Gold is recovered along with coltan in pan concentrates. Up to 361 gold grains were recovered per sample, with a typical count of 20-30 grains. The gold grains were not weighed. The concentrate was not assayed for gold. The amount of gold is not sufficient to sustain gold mining by itself, but should be considered as a valuable by-product and a significant revenue source.

**Diamond**

Some kimberlitic indicator minerals such as pyrope were suspected in the concentrates. These minerals were extracted and will be analysed using an electron microprobe to evaluate the diamond potential.

# ITEM 12: DATA VERIFICATION

The project being in its infancy, next to no data is available. The information contained in Ibouanga (2011) will require a complete field revision and cannot be used as presented. The historical data from “Société Avoine” is incomplete and difficult to reconciliate, and shall be used with circumspection. Avoine’s work has been compiled to the best of our capability, but misallocation of the samples remains an issue.

# ITEM 13: MINERAL PROCESSING AND METALLURGICAL TESTING

Coltan has effectively been mined and commercially produced by “Société Avoine”, with the use of quite primitive means. Although no production rates or recoveries are available, this activity testifies to the mining feasibility of this mineral.

A 20 kg pan pre-concentrate of heavy mineral, collected by Mr. Ibouanga and local gold diggers is currently being processed at the author’s facilities in Saguenay, Canada. Results from this procedure are to be used in addressing the principal issues that shall be considered for an eventual semi-industrialized operation.

The author did visit, in April 2012, a tantalum refinery, where he has been familiarized with the process. This will be discussed in ***item 24***.

# ITEM 14: MINING RESOURCES AND RESERVES

No CIM-guideline compliant mining resources or reserves have been defined within the Matsanga-Marala permit. However, the mere visual estimation of the site may suggest the potential sustainability of a semi-industrialized operation.

# ITEM 15 TO 22: ADDITIONAL REQUIREMENTS FOR ADVANCED PROPERTY

The Mayoko project is a very early exploration project: ***item 15*** to ***22*** are not applicable. Some aspect of these will be briefly discussed in ***item 24***.

# ITEM 23: ADJACENT PROPERTIES

Mayoko district is currently very busy with mineral exploration, mostly with iron mine development. The detailed information on these projects is not available to the author, and verifications were limited to web-based publically disclosed information, without further verification. The author did witness the evidences of their activities in the course of its visit.

**DMC Iron Mining**

DMC Iron Congo [34] (***figure 8***), an Australian company, is currently evaluating the Lekoumou iron ore deposit in the Mayoko area, reporting a reserve of 2.6 billion tonnes. The project, acquired in 2007, is located in an area south of Mayoko and south of the Banabari River. The mineralization is apparently an Algoma type magnetite banded iron formation. It outcrops in some stream beds (visited by the author) and is mentionned in the reports produced by Avoine (Boineau, 1956). Mentions dating as early as 1912 were found (Watha-Ndoudy and Djama, 2004).

*DMC Iron Mining is currently developing the Lekoumou iron ore deposit, located just south of Mayoko. Development of this project is expected to bring various infrastructure, as well as completion for local resources between mining companies.*

DMC Iron Ore was a congolese corportation, of which about 92% of the capital was acquired last year by the Autralian-based African Iron Company Limited[35]. This company was subsequently acquired by Exarro Resources, a South-African corporation. The African Iron Company Limited, an Australian corporation, issued various press releases about its Lekoumou property, indicating a resource of 144 million tonnes at 46% DSO type iron (press release of October 17, 2011). The property is located between the Lekoumou and Mipoundi Mountains and stated as possible to be put into production quickly. The maps used, including the aeromagnetic base and drill site maps, are the same as those published by DMC Iron Congo.

A possible land-use conflict with Sadem must also be mentioned, since alluvial coltan occurrences are found overlying the above mentioned iron deposits. DMC established its site facilities in the village of Mayoko.

[34] Formerly DMC Iron Ore S.A.R.L.

[35] Press releases and internet-based information about these corporations and transaction are quite confusing, and not considered relevant enough to be researched by the author.

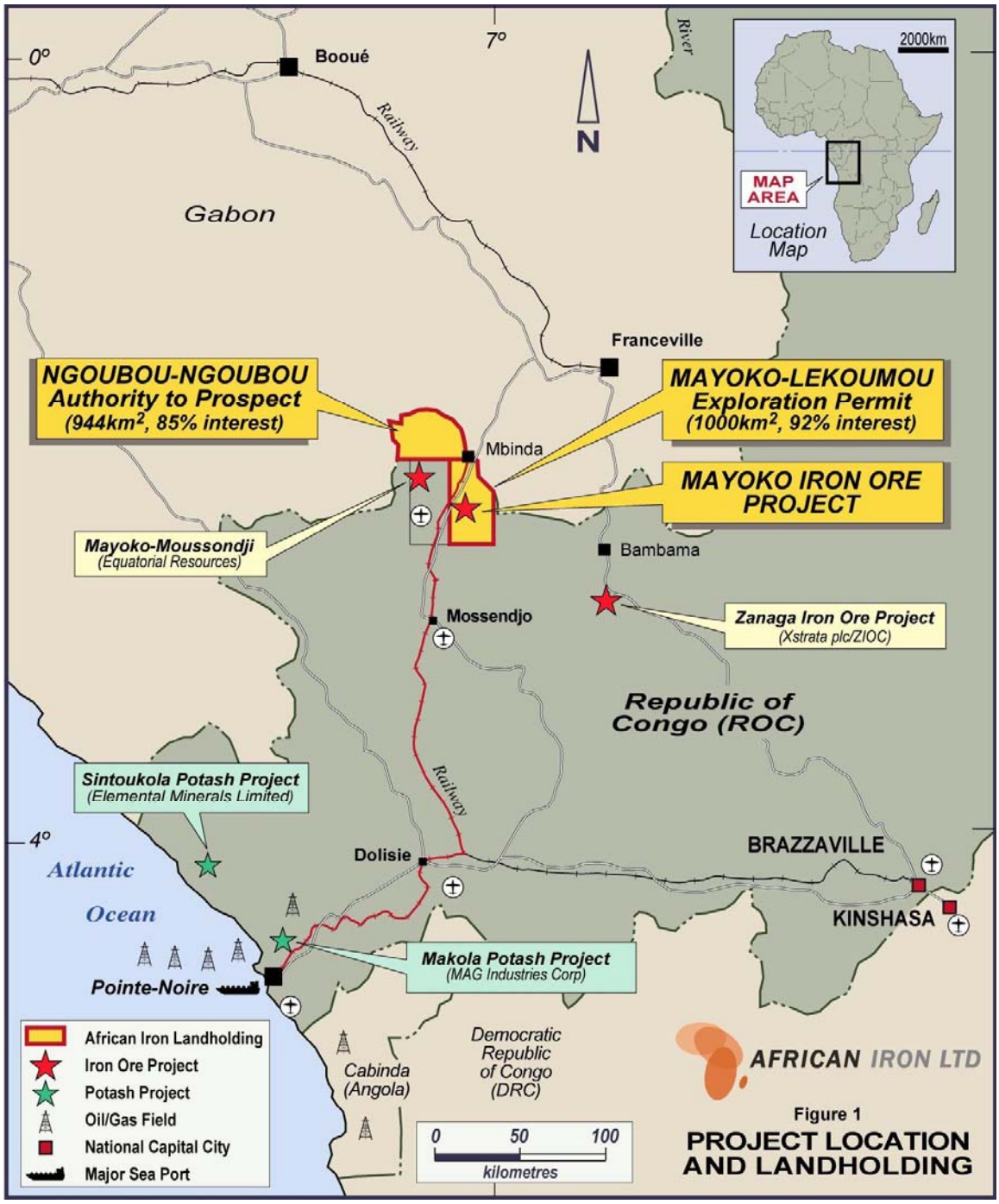



***Figure 8**: Regional map of the MDC iron-ore project, which provides an overview of south-western Congo.*

**Congo Mining**

Congo Mining is currently the most active mining company in the area. It is actively developing an iron ore deposit in the area to the north-west of the Louessée River, expected to be in production in 2014. Site facilities are established in the village of Mayoko-Gare. Various pieces of heavy mining equipment have been shipped for the work, including reverse circulation drilling platforms, excavators, bulldozers, etc.

Based on maps published by African Iron Ore, the area worked by Congo-Mining is indicated as the "Mayoko-Moussondji" project and is belonging to Equatorial Resources, an Australian company. On their website, Equatorial mentions the "Makengui" deposit and the drill sites visited by the author (***picture 16***). Please note that, in 2011, Equatorial owns close to 20% of the African Iron Ore shares in circulation and therefore they have a share in all the iron projects of the region.

*A second large iron project is under development by Congo Mining. This project is located north-west of Louesse River. Coltan alluviums were discovered in the same area.*


***Picture 16**: Concrete slab sealing off DMC's (African Iron Ore) reverse circulation drill hole, and Congo Mining's (Equatorial Resources) drill site with samples. Both operations are located close to a stream containing coltan.*

**Sino-Congo**

Sino-Congo is a mining exploration company owned by Chinese interests (government?). The link between Sino-Congo and Sino-Congolese Mines operating in the DRC[36] is not known to the author. Sino-Congo holds gold exploration permits in a part of the region. Evidence of their exploration work was seen here and there by the author (***picture 17***). Their site facilities are located a small distance to the south of Mayoko.

***Picture 17****: A series of small exploration pits dug for gold by Sino-Congo near a former Société Avoine exploitation (site 88040021).*

[36] DRC: République démocratique du Congo, informally known as Congo-Kinshasa, previously known as Zaïre and Belgian Congo. Not to be confused with the République Populaire du Congo, where the current project is located, also known as Congo-Brazzaville, previously known as French Congo or Afrique-Équatoriale française.

**Other companies**

The following exploration companies were reported in the area; however, no sign of their activity could be seen.

- MDC, a subsidiary of Canadian Mexivada, is inactive at the moment. They hold gold claims in the area.
- MPD Congo, a subsidiary of X-Strata PLC, holding claims and the 3.3 billion tonne Zanaga iron ore deposit approximately 100 km to the south-east of Mayoko. Their presence was not observed in the Mayoko area.
- Cantoon (?) Congo was reported active in gold exploration a few years ago.
- Socorem ("Société congolaise de recherche en exploration minière") also seemed to have worked in the region.
- Soneco S.A. recently acquired an exploration permit for iron to the east of Mayoko, which partly encompasses the eastern limit of Tantalex permit.

It should be mentioned that both Congo Mining and MDC Iron Ore tried to include columbo-tantalite as a commodity in their permits. In addition, at least four other companies submitted permit applications for columbo-tantalite exploration or prospecting to the "ministère des Mines du Congo".

Usually, the presence of these mining companies near the claim under study, particularly those intending in developing iron mines, allows the anticipation of a general improvement in the infrastructure in the medium and long term. A point to note, African Iron Ore says it expects to ship 5 million tonnes of ore per year by the Camilog railway. Congo Mining also forecasts 5 million tonnes per year, while DMC estimates shipping an additional 11 million tonnes. This represents a total of 21 million tonnes; 10 times the quantity shipped by Comilog[37], the company the railway was built for. Such an annual traffic is simply unrealistic on a narrow gauge railway designed to accept 17 tonnes axle loads. In addition, this traffic will be added to normal the CFCO traffic on the Dolisie - Pointe-Noire stretch (1 million tonnes per year crossing the Mayonge Mountains).

[37] Camilog: Compagnie minière de l'Ogooué, the world's largest manganese producer with the Moanda mine in neighbouring Gabon, a subsidiary of Eramet.

# ITEM 24: OTHER RELEVANT INFORMATION

## TANTALUM METALLURGY

The extractive metallurgy of tantalum is not complex, although the conversion from tantalum chemical into commercial goods is highly specialized. Tantalum is a heavy transition metal of group $V_B$, sixth period ([Xe] $4f^{14}$ $5d^3$ $6s^2$), usually pentavalent ($Ta^{+5}$). Its electronic configuration on the outer shells is identical to niobium (or columbium), group $V_B$ but fifth period. Therefore, these two metals are nearly always associated in nature, with a near constant abundance ratio of 1 tantalum for 10 niobium, similar to their cosmic abundance ratio. This indicates the difficulties in partitioning these two metals. The LCT peraluminous pegmatite is one of the only rock types known to the author where this ratio is not preserved.

*Tantalum and niobium are always associated in nature, having similar chemical properties. Separating them requires hydrometallugical process, known as "de Marignac" process.*

The great difficulty in partitioning tantalum and niobium is reflected in the extractive metallurgy. The aluminothermic process of tantalum-depleted pyrochlore produces most of the niobium used by the steel industry. In this process, the niobium oxide mineral is mixed with magnetite (iron oxide) and aluminum powder, ignited into an exothermic reaction that produces ferroniobium and alumina slag. A very similar process is used for most ferroalloys, such as ferrochromium, ferrovanadium, etc. This process doesn't discriminate tantalum, and hence tantalum cannot be separated from niobium by the use of pyrometallurgical processes. Tantalum poor pyrochlor, such as the one recovered from carbonatite, is preferred for this process. This explains why most niobium operations do not have tantalum as a by-product: tantalum is simply lost as contaminant in ferroniobium.

Separating niobium and tantalum require wet chemistry or hydrometallurgy. For these processes, the metals need to be put into an aqueous solution. The second difficulty is the refractory nature of these metals. Their pentavalent state and small nuclear diameter give them a high ionic ratio. Niobium and tantalum metals or oxides do not react readily with an acid or a base. Digestion proceeds in concentrated hydrofluoric acid (70% HF) at room temperature and pressure[38]. This enables solubilisation of the metal into complex fluoride salts, such as di-potassic heptafluorotantalate and di-potassic pentafluoroniobate, a process known as "de Marignac". Both salts can then be separated efficiently by either a solvent extraction process (usually Methyl-isobutyl-

[38] Manipulating hydrofluoric acid is extremely hazardous (polite word for "nasty") and should be attempted only under the strictest safety protocols both for transportation, storage and manipulation. For this reason alone, attempting tantalum refining in Congo would be socially irresponsible.

ketone or MIBK) or ion-exchange resins. Di-potassium heptafluorotantalate can then be precipitated into potassium tantalum heptafluoride $K_2TaF_7$ (commercially called KTaF) or precipitated as tantalum pentoxide ($Ta_2O_5$) by a reaction with ammonia.

*The "de Marignac" process use coltan concentrate as feedstock, and is sufficiently selective to by quite robust to the various contaminant in the concentrate.*

The *"de Marignac"* process is quite robust. The feedstock can be simple unclean heavy mineral concentrate, such as those obtained by artisanal mining methods. Coltan and a few other minerals are put into solutions in hydrofluoric acid, while most other common heavy minerals remain as a sludge, which can be separated by filter press. The pregnant liquor is brought into contact of MIBK[39], which is extremely selective in separating tantalum from niobium and other metals. The niobium sluge is not purified by this process, and is sold to other niobium refiner or aluminothermic converter. The author has been informed that the only contaminant of concern in heavy mineral concentrates is antimony (for an unknown reason) and silica which consume hydrofluoric acid.

*The marketable tantalum end product is a soluble salt $K_2TaF_7$, known as KTaF.*

KTaF recovered from *"de Marignac"* process is sold to be converted it into tantalum metal powder. This metallic powder is the commodity used for the manufacturing of electronic components and is produced by direct reduction of KTaF by sodium metal. Pentoxide can be reduced to ferrotantalum by an aluminothermic process to be used as an alloy component. Readers can appreciate the elevated cost of conversion: tantalum metal powder is sold at over $5000 per kilogram. The author has not been able to obtain reliable KTaF prices. However, the current market price paid by refiner for the coltan concentrate is about $60 per kilogram of contained $Ta_2O_5$[40]

**COLTAN MARKET**

Coltan is the main primary source of tantalum, either from alluvial or hard rock deposits. Other primary sources are as by-products of niobium (as pyrochlore), tin (cassiterite) or titanium (rutile) production. A significant proportion, estimated at 30%, of the tantalum comes from recycling and as a by-product of tin smelting. World production currently stands between 1500 and 2000 tons per year, with a current marketed price of 70$/lb[41].

[39] MIBK: Methyl-iso-buthyl-ketone, or raspberry flavor.

[40] Contained $Ta_2O_5$: Weight of the coltan concentrate multiplied by the $Ta_2O_5$ grade of the concentrate. Pricing of coltan is confusing in the literature, as this contained $Ta_2O_5$ price is usually referred as the coltan price, which is obviously not. Raw coltan price is approximately one third of the usually published $Ta_2O_5$ price!

[41] Prices are reported up to $150 per pound of $Ta_2O_5$ content, which is not sustainable and likely caused by

However, the tantalum market is known to be highly volatile, this commodity is sold by lots between producers and processors, with or without metal brokers, on a strictly private basis. No spot price is available, the commodity not being traded on the metal markets. No vertical integration of the market has been achieved yet. The volatility of the market is apparent by looking at the 2008 bankruptcy of *Sons of Gwallia*, then the largest producers in the world, operating the Wodgina and Greenbushes mines in Australia, their recent reopening, the intermittent operation of the Tanco Mine in Manitoba, and the recent consolidation of the industry by Cabot.

*About 2 000 tons of coltan is produced yearly, at an average price of $70 per pound of contained $Ta_2O_5$. The tantalum market is plagued by volatility induced by speculation from metal brokers.*

About 80% of the tantalum is used in manufacturing electronic capacitors, ubiquitous in computers and communication devices. Tantalum cannot be replaced in such application, and is therefore highly strategic to our high-tech society. Tantalum is also used for specialty alloys, such as turbine-grade high-temperature steel or surgery-grade low-corrosion alloys. It is a paradox to see such a strategic commodity being affected by such market volatility and disorganized production. Fluctuations in the market were caused by economic doldrums (post-IT Bubble in 2000, post-2008 crash, etc), selling of strategic stockpiles (2008 by US government), illegal production, waxing and waning of producers, metal broker speculation, etc. Coltan prices are therefore volatile, swinging from $60 to almost $200 per pound over a few years.

Current leading producers are Talison lithium, a Canadian corporation operating in Australia (Wodgina and Greenbushes accounting for about 600 tons per year), Cabot from Tanco in Manitoba, and various African states such as Mozambique producing alluvial coltan. Forecasted new producers are Abu Dabbab in Egypt for 325 tons per year and Crevier Mineral from Québec with 220 tons per year.

*Tantalex succeeded in signing an off-take agreement with a leading tantalum refiner at a non-discounted market price. Such off-takes are of strategic importance in the industrial mineral business.*

**SUPPLY AGREEMENT**

Tantalex Resources signed, on May 15th 2012, a supply agreement ("off-take" agreement) with one of the leading tantalum refiner[42] based in an occidental country. According to this agreement, the refiner agree to buy from 5000 pounds to 20 000 pounds per month

fortuitous shortage or speculation. Although mentioned by various promoters, such price shall not be considered as sustainable, and therefore not used for any economic assessment.

[42] Name of the refiner and details of the agreement are to be kept confidential for strategic reasons.

of $Ta_2O_5$ from the Mayoko project at either the average market price or a fixed non-discounted price depending on the production rates. This represents about 60 to 120 tons per year, or 6-8% of the world production. The signature of such supply agreement is of strategic importance to Tantalex.

## DIFFERENCES BETWEEN THE REPUBLIC OF THE CONGO AND THE DEMOCRATIC REPUBLIC OF CONGO

It is of the utmost importance to state the differences between the "République du Congo" and the "République Démocratique du Congo", since these two distinct countries are very often confused by foreigners. The "République Démocratique du Congo", or DRC, former "Congo Belge", ex-Zaïre, usually referred to as Congo-Kinshasa, borders the Republic du Congo to the south, with the Congo River acting as the border. The two capital cities, Brazzaville and Kinshasa, are facing each-other across this river. DRC is far larger and densely populated (53 million inhabitants) than "République du Congo", and well known for its mineral endowment.

The DRC is a war-torn country, currently stabilized by UN troops (MONUSCO). Tribal wars are endemic and 50% of the population is threatened by hunger. Although endowed with tremendous mineral wealth, mining activity (1.3% of the non-domestic investment of Canadian mining corporations) is at risk due to the lack of governance and safety. By comparison, "République du Congo" is a rather stable country, quite safe for occidentals. However, DRC's reputation overshadows the "République du Congo". A large proportion of mining activity is illicit in the DRC, including coltan mining; revenues are used to finance warlords.

## DRC COLTAN ISSUE

About 60% to 80% of the world's known coltan resources are located in the DRC. However, DRC currently accounts for less than 10% of the world production because DRC coltan has been vigorously banned by the industry. DRC coltan is produced essentially artisanally, sold at "*comptoirs*" controlled by various tribal warlords, the DRC army or the Rwandan army. Revenues from coltan sales are thus funnelled into guerilla warfare. The DRC "grey gold" has therefore been targeted by various international non-profit organizations, in a manner similar to Sierra Leone's "blood diamonds".

*The largest coltan resources are located in Democratic Republic of Congo, and neighboring Ruanda's Kivu. This coltan is currently heavily discounted, being banned due to the use of its revenues to finance warlords and guerilla.*

The main user of tantalum-based products are the 40 largest leading electronic manufacturers, such as Intel, Apple, Samsung, etc. They voluntarily joined the *Global e-Sustainability Initiative* or GeSI, and therefore subscribe to the *Electronic Industry Citizenship Coalition* or EICC[43]. This group insists on a strict code of social conduct that bans the use of tantalum products derived from DRC Coltan. Clean coltan production is currently attempted in the DRC by Canadian corporations like Shamika Resources, but stringent policies will have to be implemented.

The Belgium based "Centre d'Etude international sur le niobium et le tantale", discourages buyers from trading DRC coltan, in spite of the close economic ties between the DRC and its former colonial power, Belgium. Furthermore, the American government recently adopted the *Wall Street Reform and Consumer Protection Act*, which includes restrictions on using metals form war-torn states, among them tantalum from the DRC, in the manufacturing of consumer goods for the American market. The bulk of illegal coltan is sold in China for domestic consumption.

Due to the EICC and other's bans, DRC coltan is heavily discounted on the market, typically sold between $35 and $70 per kilogram (50% of the price of clean coltan). Commodity brokers, typically based in developing economy such as Costa Rica, regularly advertise such DRC coltan on the internet. Since the Republic of Congo is the neighboring state of the DRC and is often confused with it; special attention will be required from Tantalex in marketing and implementing a chain of custody. Concerns are expressed about the Republic of Congo acting as an outlet for DRC coltan, similar to Rwanda, Uganda and Burundi.

*A rigorous chain of custody will be required to export coltan from Republic of Congo, compliant to UN and GeSI protocols. Tantalex has been invited to join the EICC.*

Tantalex has been invited to attend the last EICC meeting in Capetown, SA., in May 2012, and currently work in implementing the indicated chain of custody.

The author does not have access to a reliable database of analyses for coltan from the DRC or Rwanda. It is not possible, for the moment, to say if the coltan from the Mayoko project is chemically distinctive.

[43] Documents from the EICC were made available to the author by Tantalex representatives. The EICC is an association of electronic manufacturer, including Dell computer, Apple, Intel, Samsung, etc, which agreed on a code of ethic in regard of their supply chain, banning any commodity which might be financing War Lord and guerrillas. Coltan is the main commodity concerned, and DRC the main source targeted.

## TANTALUM SUPPLY CHAIN TRANSPARENCY

In order to sell its coltan to one of the primary processors or smelters[44], a certification of origin must be provided by the coltan producer. Leading electronic manufacturers will buy tantalum products only from EICC-GeSI certified processors or smelters. In order to be certified, the processor or smelter has to be audited by the EICC-GeSI. Because the Republic of Congo shares a border with the DRC, it is considered as a "*Level 2"* country. Producers from a level 2 country must implement a tracking mechanism and a chain of custody to secure its production delivery to the processor or smelter. They must provide, among other things, a government certificate of origin, an export license, all the accounting and ledgers from the mine, a bill of lading, etc. Acceptance of not-compliant coltan source by a processor may lead to its certification being revoked, an issue taken very seriously by the industry. This issue must be considered very serious by Tantalex and a rigorously robust chain of custody has to be implemented. The author has been informed that Tantalex negotiating with an internationally reputed firm of material inspection to implement such control protocol.

## POLITICAL STABILITY

The Republic of Congo gained its independence from France in 1960. The country was politically instable until 1979, when the army general, Mr. Denis Sassou-Nguesso took over. After 1979, political stability was maintained, although the regime was not democratic. In 1991, following a general election, Sassou was replaced by Lissouba. In 1997 a civil war ravaged the country and put Sassou back in power. Since 2002, the Republic of Congo is officially a democracy, with Sassou as elected president.

Congo is considered as a *Heavily Indebted Poor Country*, in spite of its oil revenues. Poor organization and underinvestment are endemic.

## ETHNIC ISSUES AND LOCAL POPULATION

It is difficult to estimate the size of the population living in the project area. The only published values estimate the population of Mayoko to be about 15 000. Most of the people belong to the Mbéré Nzambi ethnic group, different from the dominant Teké (or Kongo) peoples. The district of Niari is the stronghold of former president, Mr. Pascal Lissouba, who was opposed by the current president, Mr. Denis Sassou-Nguesso during the 1997-1999 civil war.

*Republic of Congo is a rather stable country, although considered as a Heavily Indebted Poor Country. No severe ethnic tensions were noticed.*

[44] Certified processors are currently Cabot, Ningxia, HC Starck, Niotan, F&X, Duoloshan, Plansee, Ulba, Mitsui, Jiujiang Tambre and Zhuzhou.

Although peace has returned to Congo, tensions remain between the Nzabi and the Bantu ethnic groups. Tensions were observed on several occasions by the author, especially between different members of the project from Pointe-Noire and Mr. Bonate. This residual tension is often sited to explain the under investment in the region by the government. These unpredictable sensitivities have to be taken into account when conducting field work.

The local Mbéré-Nzabi population lives together with the Pygmy population. Relations appear cordial, but some discrimination can be seen against the Pigmies by other Congolese. For example, the village of Banzoko consists of two adjacent settlements, one Nzambi and the other Pygmy and is managed by two chiefs and two elders. It can be difficult for westerners to detect these subtleties and thereby cause difficulties. But the easy-going nature of the Congolese makes sure these problems are easily straightened out.

Each village has its own political structure, usually including a village chief and an elder. It is essential that diplomatic relations between SADEM and local officials be amicable and respectful of unwritten rules. The village chief must be met at each visit and consulted about each decision, even though he has to defer to the doyen. Small gifts are expected to maintain good relations.

The local population lives in absolute poverty. All SADEM involvement in a community should, as far as possible, be accompanied by various investments and services in the community, such as providing drinking water or electricity. There are no regulations governing these investments. The approval of the local residents is not required for project development, but one must be aware of the local expectations in this regard.

**SOCIO-ECONOMIC INVESTMENT**

Traditionally, the local population has certain expectations concerning some social involvement from any company that wishes to set up in the area. Since the majority of the miners attracted to the project live in the village of Banzoko, it is recommended that Tantalex focus its efforts there. Also, the more populous community of Mayoko is currently benefiting from investments being made by MDC, Congo Mining and the ENI Foundation.

*Tantalex shall consider doing some socio-economic investments if it wishes to operate on the long term in the Mayoko area. Simple needs such as schools and clean water access are out crying.*

Examples of realistic investments can be:

1. Installing a drinking water tap and a community laundry facility.
2. Providing a power generator.
3. Improving the school or providing the salary of a school teacher.
4. Establishing weekly visits from a nurse and a small dispensary.
5. Constructing a landfill facility.
6. Building a soccer field.
7. Donating the timber harvested during operations and installing a small sawmill.

The exploitation of the alluvial deposits necessitates the clearing of the plains and the disruption of thalwegs. Deforestation has to be carried out in a clean and organized manner. It should include the recovery of the tree trunks for making lumber for community needs, the recovery of logs or planks of valuable woods for sale, the recovery of fire wood or charcoal manufacture and the management of the remaining woody materials for eventual site reclamation.

Initially, the cleared gravel and other alluviums could be used for aggregate and manufacturing concrete. There is currently a real shortage of this commodity in the area, a need that will disappear once the iron mines are in production.

Washing sediment into streams will cause suspended sediments and clays. It is therefore essential that remedial measures are put in place to contain the sedimentation and to avoid sediment influx into rivers such as the Louesse. The influx of fine particulate matter would be devastating to the halieutic fauna in the rivers. Facilities needed for the project (dams, etc.) should be designed in a way to allow land reclamation or its conversion to agriculture.

# ITEM 25: INTERPRETATION AND CONCLUSION

## CONCEPTUAL EXTENT OF THE DEPOSITS

The alluvial coltan containing deposits are limited to the residual gravel in the valley bottoms. Since these correspond to the active steam beds, no paleoplacer deposits are expected. The gravel rests on non-eroded lateritic clays. Its thickness varies between 0.5 and 1 m. It is difficult to evaluate the average thickness because of the extensive reworking of these gravels by the gold diggers. A thin layer of gravel covers virtually all the streambeds and is limited to them. The author examined some of the clay banks: they were undisturbed laterites devoid of gravel. A typical streambed is about 10 m or so wide. The various branches visited represent a minimal length of 1 km each. An examination of the topographic map suggests the existence of approximately a kilometre of stream per square kilometre. The author found coltan over the extent of the area visited, which appears to be 10 km long by a few kilometres wide. Please note that this figure covers only the visited area and the potential of the remaining property will be discussed below.

*It is estimated that about 5000-10000 cubic meters of gravel are available per kilometer of stream. However, the extent of the coltan bearing drainage system is not known.*

Therefore, we estimate that there is approximately 5 to 10 $m^3$ of gravel per linear metre of stream, that is to say 5000-10 000 $m^3$ per kilometre. As the study area covers approximately 20 $km^2$, the volume of ore-containing gravel is estimated to be 100 000 to 200 000 $m^3$ in the known area.

The amount of coltan in the gravel is difficult to estimate, due to its coarse habit and erratic distribution. The preliminary laboratory evaluation suggests approximately 10 g per pan (1116 g for 24 samples of 5 pans, weight corrected for the proportions of coltan in the concentrate, including the sandy and grit fractions but not the pebbles), or 2 g per litre, or 2 kg per cubic metre. It is therefore likely that there may be more than 100 tonnes of coltan available in the streams within the 20 $km^2$ area visited. This figure is a rough estimate and very imprecise. **By no means does it constitute a resource** estimate based on the standards set out by CIM Best Practices Guidelines and required by National Instrument 43-101. Obviously, a CIM compliant resource calculation will require systematic sampling and cubage measurements, which need to be carried out in the next exploration program.

Using a market value of about $35 per pound before refining, a value which could be higher depending on the quality of the ore and the state of the market, the inferred extent of the streams could easily represent an in-situ value of more than 7 million dollars based on the 20 $km^2$ parcel studied during our visit.

## POTENTIAL SIZE OF THE ALLUVIAL DEPOSITS

The extent of the currently known deposits was shown by the working of the gold bearing alluvium by “Société Avoine” in the 1950s and the 1960s. Little information remains about the work carried out by this company. The only information available about their gold mining operations comes from a few sources: the few surviving former employees we could meet and the few indications found on topographic maps or in place names dating from that time.

At the present time, we do not have any information whether the streams beyond the area described above had been explored by Société Avoine, whether they are gold bearing or whether they were judged to be too inaccessible at the time. The company stopped working suddenly in 1962 with the accidental death of Mr. Avoine, and the state of the then resource is unknown.

Coltan was found and reported by “Société Avoine” geologists. However, except during the last few years of its operations, coltan was not of interest for them. It was discarded with the gravels after sluicing. Since only the streams that had been previously worked for gold were evaluated for coltan, the extent of the coltan bearing tributaries is not actually known. A regional exploration campaign is needed to assess the area of dispersion, which more than likely extends beyond the known area. Note that the concession granted to SADEM covers more than 6000 $km^2$, or 30 times the area covered by “Société Avoine”. Gold and coltan does not necessarily accompany each other.

# ITEM 26: RECOMMENDATIONS AND BUDGET

**WORK RECOMMENDATION**

Following this visit, the company would be justified in carrying out further exploration work, in estimating its resource and in preparing for a semi-mechanized extraction of alluvial coltan.

Exploration will have to proceed with systematic heavy mineral survey to measure coltan abundance in every single stream present within the permits. The samples should be pre-washed, sieved and preconcentrated on the site, but using a much more rigorous procedure than manual panning. A small laboratory needs to be created at the site facility. The use of a Falcon concentrator will probably be the preferred method.

*Tantalex shall be capable to initiate small-scale mining within a year. However, this will require an aggressive program of resource definition and exploration sampling.*

A three phase sampling program is needed:

A. ***Alluvial exploration:*** A regional sampling program, with samples spaced every 300 m along all streams accessible across the property. About 500 samples are planned at first, which will represent about 750 to 100 days/crew of work. These samples can be taken from the superficial gravel in active stream-beds.

B. ***Resource assessment:*** A detailed sampling program with 50 m spacing along the best stream, and 20 m across stream when possible. These samples must be taken from pits on a very regular gird, along with DGPS surveying of the stream bed. These will be used to evaluate the resources of the coltan bearing streams. We estimate about 850 samples to evaluate about a 20 km length of stream. This sampling can and must be initiated very quickly on already known occurrences. Primary targets shall be the known occurrences coinciding with iron deposits, such as Makengui and Lekoumou streams.

C. ***Bedrock exploration:*** Using the results from the sampling program mentioned above, a sampling program of the laterite should be initiated near the apex of the in stream dispersion trend. The stream alluvium originates from the erosion of the lateritic overburden. Since it is highly unlikely that the sodolithic pegmatites resisted lateritization, their coltan content was probably released into the laterite with very little displacement and the streams eroded

the lateritic residues of these pegmatites. The sampling of the laterite below the bioturbated zone should detect the presence of coltan and its accompanying refractory minerals (tourmaline, garnet, beryl, triphyllite, etc.) from the pegmatites near the apexes of the main alluvial dispersion trains. Large, 1 cubic metre samples will be required to be processed, taken from pits or auger drill holes reaching below the bioturbated horizon. These samples should be taken as fences along the stream, with sample spacing every 10 m at the most, for 20 samples per target. A total of 400 samples can be anticipated.

Exploration work should always be led by an experienced geologist and will require the hiring of many local workers. The laboratory located at the site facility would allow the preparation of heavy mineral concentrates, but their examination should be entrusted to qualified skilled workers, probably in Canada.[45].

**ORGANISATION OF THE SITE FACILITIES**

A suitable site facility should be established in the Mayoko region for carrying out field work. Several alternatives were discussed and the option chosen was to rehabilitate the old Mingananga school building. The settlement of Mingananga is located on a plateau along the main road to Gabon, a few kilometres to the north of Mayoko. There are a few colonial houses, including the one used by the team during field work last November, the house of Mr. Téckesse, the Episcopal Church with its dependencies and the old school house along with a few traditional houses such as the house of the pastor. There is no water, electricity or sanitation in the village at this time.

The production facilities should include a small laboratory for heavy mineral processing, which shall be located in Pointe-Noire. This laboratory will require the purchase of various pieces of equipment, which will be determined based on the metallurgical testing currently being carried.

**ORGANISATION OF MECHANIZED EXTRACTION**

Tantalex Resources intend to proceed with mechanized alluvial mining at the earliest opportunity. A site evaluation by an experienced contractor shall be organized at the earliest date. A decision about equipment and labour requirements will be made following this evaluation. Budget and requirement to initiate such production are not indicated in the current report, which concerns only the exploration program.

[45] The training of a mineralogist to carry out this task usually requires more than one year, and the use of sophisticated and fragile analytical equipment.

**BUDGET**

Tantalex did indicate a minimum and maximum anticipated financing of $200 000 and $500 000. As the logistical platform and staff used to start semi-mechanized alluvial mining will contribute to the program, no infrastructure cost is included hereafter. Minimum financing will allow carrying the regional exploration program (item A), while the maximum financing will allow carrying both the regional exploration plus the systematic resource evaluation (item A&B) of the area already known to have coltan. The budget here proposed covers item A of the aforementioned work program, and thus includes only conducting the regional stream sampling in order to assess the regional mineral endowment. All figures are stated in Canadian dollars.

***MINIMUM FINANCING***

| | | | |
|---|---|---|---|
| **Preparation** | 20 men/day | $600 per day | $12 000 |
| **Capital cost** | (vehicles, camps material, equipments) | | $0 |
| **Camp and vehicle** | 100 men/day | $100 per day per man | $20 000 |
| **Sampling** | 500 samples | $200 samples | $100 000 |
| **Assaying** | 500 samples | $120 samples | $ 60 000 |
| **Reporting, consulting, administration** | | | $8 000 |
| **TOTAL (minimum)** | $200 000 | | |

***MAXIMUM FINANCING***

| | | | |
|---|---|---|---|
| **Preparation** | 20 men/day | $600 per day | $12 000 |
| **Capital cost** | (vehicles, camps material, equipments) | | $0 |
| **Camp and vehicle** | 200 men/day | $100 per day per man | $40 000 |
| **Sampling** | 1350 samples | $200 samples | $270 000 |
| **Assaying** | 1350 samples | $120 samples | $162 000 |
| **Reporting, consulting, administration** | | $16 000 | |
| **TOTAL (Minimum)** | $500 000 | | |

According to the author's experience, the budgets and targets presented here are realistic and legitimate. If properly managed, the project shall have reasonable chances of leading to sufficient resources defined to initiate a mechanized alluvial mining operation, notwithstanding the risk associated with any exploration project.

Signed in Saguenay, Canada on October 09, 2013.

Effective date of the report: January 9, 2013.


Réjean Girard
Professional Geologist (OGQ 521)

# ITEM 27: REFERENCES

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# ITEM 28: CERTIFICATE OF QUALIFICATION

**RÉJEAN GIRARD, PROFESSIONNAL GEOLOGIST**

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

I am currently employed as a professional geologist by:

IOS Services Géoscientifiques inc.
1319, Boul. St-Paul
Saguenay (Québec)  G7J 3Y2

1. I graduated with a degree in geology from the Université Laval in Ste-Foy, Québec in 1985. In addition, I completed 5 years of graduate studies in mineral resources at the Université du Québec à Chicoutimi.
2. I am a member of the Ordre des géologues du Québec.
3. I have worked as a geologist for a total of 27 years since my graduation from university.
4. I have read the definition of a "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 purposes of NI 43-101.
5. I am responsible for the preparation of the technical report entitled *The Mayoko columbo-tantalite exploration project, Niari district, Republic of Congo"*, effective on January 09, 2013, relating to the Mayoko project. I did visit the property from November 5 to November 8, 2011.
6. Since 1995, I have been personally involved as project geologist as well as qualified person in a number of industrial metal projects, including involvement in the feasibility study of the Crevier niobium-tantalum project as well as various lithium exploration projects in Québec.
7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that, at the effective date of the technical report, to the best of the qualified person’s knowledge, information and belief, the technical report, or part that the qualified person is responsible for, contains all scientific and technical information that is required to make the technical report not misleading.
8. I am independent of the issuer as well as the property owner applying all of the tests in section 1.5 of National Instrument 43-101.

10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them, including electronic publication of the Technical Report in the public company files on their website accessible to the public.

Dated October 09, 2013.


Réjean Girard
Professional Geologist (OGQ n°521)

# APPENDIX 1

PROSPECTING LICENSE AND RESEARCH (EXPLORATION) LICENSES

PRESIDENCE DE LA REPUBLIQUE

SECRETARIAT GENERAL
DU GOUVERNEMENT

REPUBLIQUE DU CONGO
Unité*Travail*Progrès

**Décret n° 2012 - 749 du 16 juillet 2012**
**portant attribution à la société africaine pour le développement minier d'un permis de recherches minières pour la colombo-tantalite dit « permis Doumani-Mounguelé » dans le département du Niari**

LE PRESIDENT DE LA REPUBLIQUE,

Vu la Constitution ;
Vu la loi n° 50-84 du 7 septembre 1984 fixant les taux et les règles de perception des droits sur les titres miniers telle que modifiée par les lois n°s 18-88 du 17 septembre 1988 et 24-2010 du 30 septembre 2010 ;
Vu la loi n° 4-2005 du 11 avril 2005 portant code minier ;
Vu le décret n° 2005-313 du 29 juillet 2005 portant attributions et organisation de la direction générale des mines ;
Vu le décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative ;
Vu le décret n° 2009-395 du 13 octobre 2009 relatif aux attributions du ministre des mines et de la géologie ;
Vu le décret n° 2009-471 du 24 décembre 2009 portant organisation du ministère des mines et de la géologie ;
Vu le décret n° 2011-558 du 17 août 2011 portant nomination de nouveaux ministres et fixant la composition du Gouvernement ;
Vu le décret n° 2011-737 du 12 décembre 2011 modifiant la composition du Gouvernement ;
Vu la demande de permis de recherches minières formulée par la société africaine pour le développement minier en date du 4 juin 2011.

Sur rapport du ministre chargé des mines.

En Conseil des ministres,

DECRETE :

**Article premier** : Il est attribué à la société africaine pour le développement minier, domiciliée : 12, rue du poisson salé, Mpila, B.P. : 587, Brazzaville, République du Congo, et dans les conditions prévues par le présent décret, un permis de recherches dit « permis Doumani-Mounguelé » valable pour la colombo-tantalite, dans le département du Niari.

**Article 2** : La superficie du permis de recherches, réputée égale à 944 $km^2$, est définie par les limites géographiques suivantes :

| SOMMETS | LONGITUDES | LATITUDES |
|---|---|---|
| A | 12°36'21" E | 1°52'18"S |
| B | 12°36'21" E | 2°14'41"S |
| C | 12°56'45" E | 2°14'20"S |
| D | 12°56'27" E | 2°09'48"S |
| Frontière | Congo | Gabon |

**Article 3** : Le permis de recherches visé à l'article premier du présent décret est accordé pour une durée de trois ans. Il peut faire l'objet de deux renouvellements d'une durée de deux ans chacun dans les conditions prévues par le code minier.

**Article 4** : Le programme des travaux à exécuter dans le cadre de ce permis de recherches est défini à l'annexe du présent décret.

La société africaine pour le développement minier est tenue de faire parvenir à la direction générale de la géologie, chaque fin de trimestre, les rapports des travaux.

**Article 5** : La société africaine pour le développement minier doit associer, à chaque étape des travaux de recherches, les cadres et techniciens de la direction générale de la géologie.

**Articles 6** : Les échantillons prélevés au cours des travaux, destinés à des analyses ou des tests à l'extérieur du territoire congolais, doivent faire l'objet d'un certificat d'origine délivré par le directeur général de la géologie.

**Article 7** : Conformément aux dispositions des articles 149, 150 et 151 de la loi n° 4-2005 du 11 avril 2005 portant code minier, la société africaine pour le développement minier bénéficie de l'exonération de tous droits et taxes à l'importation et de toutes taxes intérieures sur les matériels et matériaux nécessaires à l'exécution des travaux de recherches minières.

Toutefois, la société africaine pour le développement minier doit s'acquitter d'une redevance minière à taux fixe sur les produits principaux et les éléments en traces valorisés.

**Article 8** : Conformément aux articles 36, 91 et 92 de la loi n° 4-2005 du 11 avril 2005 portant code minier, le permis de recherches minières visé par le présent décret peut, en cas de non-exécution ou d'arrêt des travaux pendant neuf mois consécutifs sans raison valable, faire l'objet d'une suspension ou d'un retrait.

**Article 9** : En cas de découverte d'un ou de plusieurs gisements exploitables dans la superficie visée à l'article 2 du présent décret, il sera attribué de droit un permis d'exploitation, pour chaque gisement, à la société africaine pour le développement minier.

**Article 10** : Conformément aux dispositions des articles 98 et 99 de la loi n° 4-2005 du 11 avril 2005 portant code minier, une convention d'établissement doit être signée entre la société africaine pour le développement minier et l'Etat congolais.

Cette convention définit les conditions dans lesquelles la société africaine pour le développement minier doit exercer les activités minières, les droits et obligations de chaque partie, ainsi que les modalités de suivi et de contrôle de celles-ci par l'Etat.

**Article 11** : Le ministre des mines et le ministre des finances sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera enregistré et publié au Journal officiel de la République du Congo./-

2012 - 749

Fait à Brazzaville, le 16 juillet 2012

Denis SASSOU-N'GUESSO.-

Par le Président de la République,

Le ministre des mines et de la géologie,

Pierre OBA.-

Le ministre des finances, du budget et du portefeuille public,

Gilbert ONDONGO.-

DEPARTEMENT DU NIARI ATTRIBUE A LA SOCIETE SAGE MOUNGO

Coordonnées géographiques

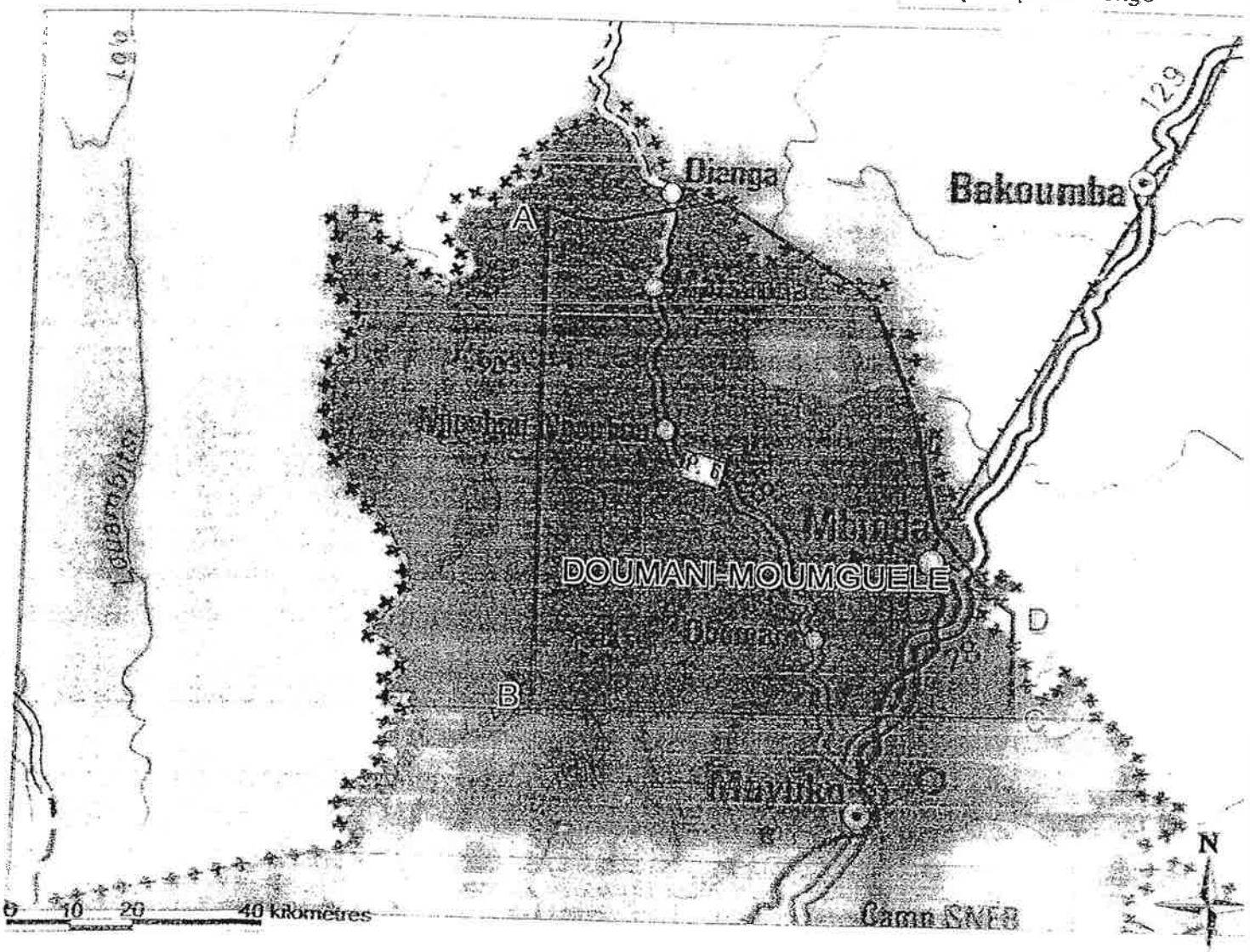
| Sommets | Longitude | Latitude |
|---|---|---|
| A | 12°36'21" E | 1°52'18" S |
| B | 12°36'21" E | 2°14'41" S |
| C | 12°56'45" E | 2°14'20" S |
| D | 12°56'27" E | 2°09'48" S |

Frontière: Congo-Gabon

Superficie: 944 km2

Zone de recherches

République du Congo



PRESIDENCE DE LA REPUBLIQUE

SECRETARIAT GENERAL
DU GOUVERNEMENT

REPUBLIQUE DU CONGO
Unité*Travail*Progrès

Décret n° 2012 - 751 du 16 juillet 2012
portant attribution à la société africaine pour le développement minier d'un permis de recherches minières pour la colombo-tantalite dit « permis Moupoupa » dans le département du Niari

LE PRESIDENT DE LA REPUBLIQUE,

Vu la Constitution ;
Vu la loi n° 50-84 du 7 septembre 1984 fixant les taux et les règles de perception des droits sur les titres miniers telle que modifiée par les lois n$^{os}$ 18-88 du 17 septembre 1988 et 24-2010 du 30 septembre 2010 ;
Vu la loi n° 4-2005 du 11 avril 2005 portant code minier ;
Vu le décret n° 2005-313 du 29 juillet 2005 portant attributions et organisation de la direction générale des mines ;
Vu le décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative ;
Vu le décret n° 2009-395 du 13 octobre 2009 relatif aux attributions du ministre des mines et de la géologie ;
Vu le décret n° 2009-471 du 24 décembre 2009 portant organisation du ministère des mines et de la géologie ;
Vu le décret n° 2011-558 du 17 août 2011 portant nomination de nouveaux ministres et fixant la composition du Gouvernement ;
Vu le décret n° 2011-737 du 12 décembre 2011 modifiant la composition du Gouvernement ;
Vu la demande de permis de recherches minières formulée par la société africaine pour le développement minier en date du 4 juin 2011.

Sur rapport du ministre chargé des mines.

En Conseil des ministres,

DECRETE :

**Article premier** : Il est attribué à la société africaine pour le développement minier, domiciliée : 12, rue du poisson salé, Mpila, B.P. : 587, Brazzaville, République du Congo, et dans les conditions prévues par le présent décret, un permis de recherches dit « permis Moupoupa » valable pour la colombo-tantalite, dans le département du Niari.

**Article 2** : La superficie du permis de recherches, réputée égale à 1.116 $km^2$, est définie par les limites géographiques suivantes :

| SOMMETS | LONGITUDES | LATITUDES |
|---|---|---|
| A | 12°27'11" E | 2°32'42"S |
| B | 12°43'45" E | 2°32'42"S |
| C | 12°43'45" E | 2°50'13"S |
| D | 12°27'11" E | 2°50'13"S |

**Article 3** : Le permis de recherches visé à l'article premier du présent décret est accordé pour une durée de trois ans. Il peut faire l'objet de deux renouvellements d'une durée de deux ans chacun, dans les conditions prévues par le code minier.

**Article 4** : Le programme des travaux à exécuter dans le cadre de ce permis de recherches est défini à l'annexe du présent décret.

La société africaine pour le développement minier est tenue de faire parvenir à la direction générale de la géologie, chaque fin de trimestre, les rapports des travaux.

**Article 5** : La société africaine pour le développement minier doit associer, à chaque étape des travaux de recherches, les cadres et techniciens de la direction générale de la géologie.

**Articles 6** : Les échantillons prélevés au cours des travaux, destinés à des analyses ou des tests à l'extérieur du territoire congolais, doivent faire l'objet d'un certificat d'origine délivré par le directeur général de la géologie.

**Article 7** : Conformément aux dispositions des articles 149, 150 et 151 de la loi n° 4-2005 du 11 avril 2005 portant code minier, la Société africaine pour le développement minier bénéficie de l'exonération de tous droits et taxes à l'importation et de toutes taxes intérieures sur les matériels et matériaux nécessaires à l'exécution des travaux de recherches minières.

Toutefois, la Société africaine pour le développement minier doit s'acquitter d'une redevance minière à taux fixe sur les produits principaux et les éléments en traces valorisés.

**Article 8** : Conformément aux articles 36, 91 et 92 de la loi n° 4-2005 du 11 avril 2005 portant code minier, le permis de recherches minières visé par le présent décret peut, en cas de non-exécution ou d'arrêt des travaux pendant neuf mois consécutifs sans raison valable, faire l'objet d'une suspension ou d'un retrait.

**Article 9** : En cas de découverte d'un ou de plusieurs gisements exploitables dans la superficie visée à l'article 2 du présent décret, il sera attribué de droit, un permis d'exploitation, pour chaque gisement, à la société africaine pour le développement minier.

**Article 10** : Conformément aux dispositions des articles 98 et 99 de la loi n° 4-2005 du 11 avril 2005 portant code minier, une convention d'établissement doit être signée entre la société africaine pour le développement minier et l'Etat congolais.

Cette convention définit les conditions dans lesquelles la société africaine pour le développement minier doit exercer les activités minières, les droits et obligations de chaque partie, ainsi que les modalités de suivi et de contrôle de celles-ci par l'Etat.

**Article 11** : Le ministre des mines et le ministre des finances sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera enregistré et publié au Journal officiel de la République du Congo./-

2012 - 751

Fait à Brazzaville, le 16 juillet 2012

Denis SASSOU-N'GUESSO.-

Par le Président de la République,

Le ministre des mines et de la géologie,

Pierre OBA.-

Le ministre des finances, du budget et du portefeuille public,

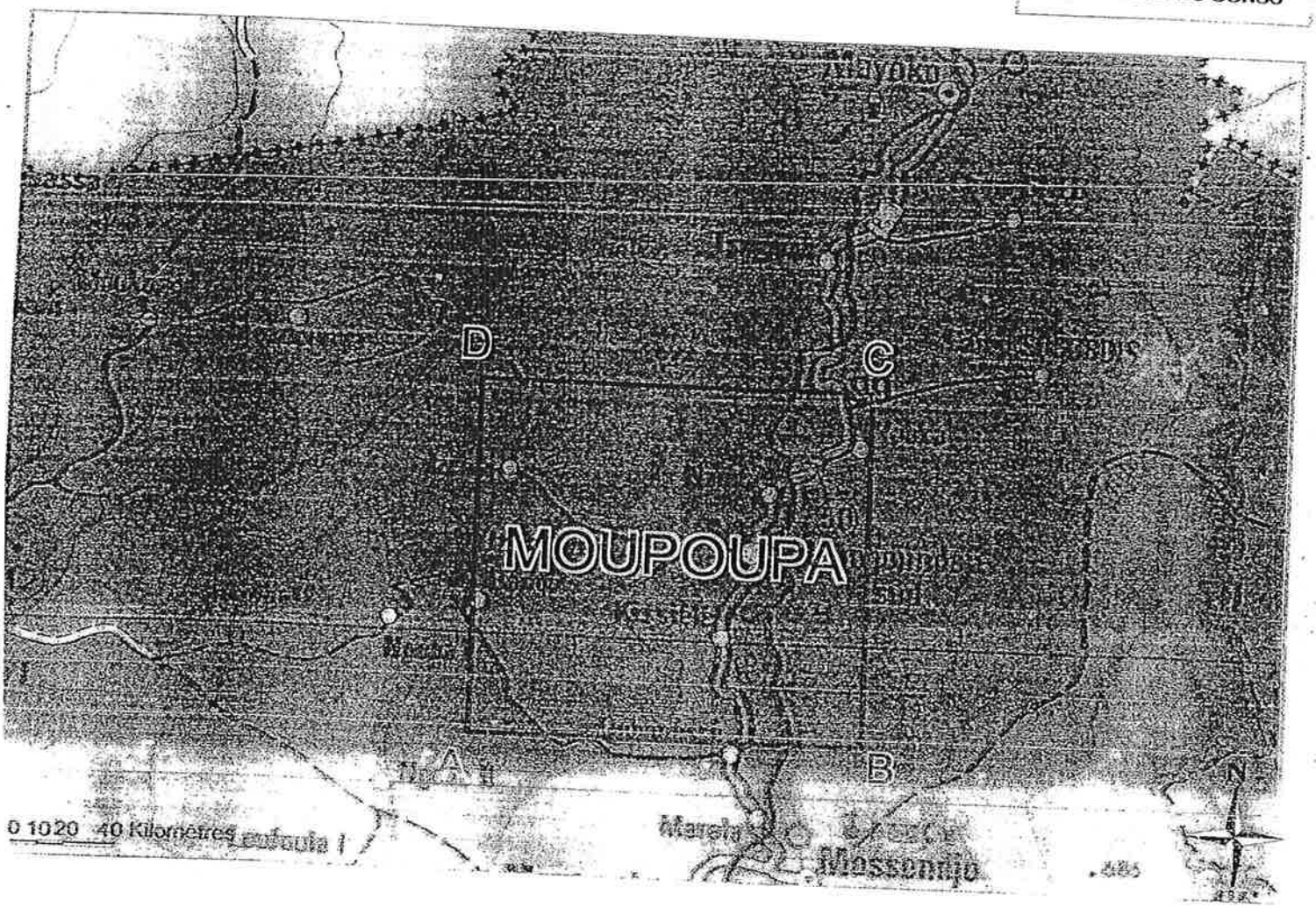
Gilbert ONDONGO.-

# PERMIS DE RECHERCHES <<MOUPOUPA>> POUR LA COLOMBO-TANTALITE DU DEPARTEMENT DU NIARI ATTRIBUE A LA SOCIETE SADEM CONGO.

**Coordonnées géographiques**

| Sommets | Longitude | Latitude |
|---|---|---|
| A | 12°27'11" E | 2°32'42" S |
| B | 12°43'45" E | 2°32'42" S |
| C | 12°43'45" E | 2°50'13" S |
| D | 12°27'11" E | 2°50'13" S |

Superficie: 1116 Km2

PRESIDENCE DE LA REPUBLIQUE

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SECRETARIAT GENERAL
DU GOUVERNEMENT

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REPUBLIQUE DU CONGO
Unité*Travail*Progrès

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Décret n° 2012 - 750 du 16 juillet 2012
portant attribution à la société africaine pour le développement minier d'un permis de recherches minières pour la colombo-tantalite dit « permis Matsanga-Mounkilingomo » dans le département du Niari

LE PRESIDENT DE LA REPUBLIQUE,

Vu la Constitution ;
Vu la loi n° 50-84 du 7 septembre 1984 fixant les taux et les règles de perception des droits sur les titres miniers telle que modifiée par les lois n$^{os}$ 18-88 du 17 septembre 1988 et 24-2010 du 30 septembre 2010 ;
Vu la loi n° 4-2005 du 11 avril 2005 portant code minier ;
Vu le décret n° 2005-313 du 29 juillet 2005 portant attributions et organisation de la direction générale des mines ;
Vu le décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative ;
Vu le décret n° 2009-395 du 13 octobre 2009 relatif aux attributions du ministre des mines et de la géologie ;
Vu le décret n° 2009-471 du 24 décembre 2009 portant organisation du ministère des mines et de la géologie ;
Vu le décret n° 2011-558 du 17 août 2011 portant nomination de nouveaux ministres et fixant la composition du Gouvernement ;
Vu le décret n° 2011-737 du 12 décembre 2011 modifiant la composition du Gouvernement ;
Vu la demande de permis de recherches minières formulée par la société africaine pour le développement minier en date du 4 juin 2011.

Sur rapport du ministre chargé des mines.

En Conseil des ministres,

DECRETE :

**Article premier** : Il est attribué à la société africaine pour le développement minier, domiciliée : 12, rue du poisson salé, Mpila, B.P. : 587, Brazzaville, République du Congo, et dans les conditions prévues par le présent décret, un permis de recherches dit « permis Matsanga-Mounkilingomo » valable pour la colombo-tantalite, dans le département du Niari.

**Article 2** : La superficie du permis de recherches, réputée égale à 882 $km^2$, est définie par les limites géographiques suivantes :

| SOMMETS | LONGITUDES | LATITUDES |
|---|---|---|
| A | 12°30'42" E | 2°14'46"S |
| B | 13°01'38" E | 2°14'46"S |
| C | 13°02'47" E | 2°22'50"S |
| D | 12°30'09" E | 2°22'50"S |
| Frontière | Congo | Gabon |

**Article 3** : Le permis de recherches visé à l'article premier du présent décret est accordé pour une durée de trois ans. Il peut faire l'objet de deux renouvellements d'une durée de deux ans chacun, dans les conditions prévues par le code minier.

**Article 4** : Le programme des travaux à exécuter dans le cadre de ce permis de recherches est défini à l'annexe du présent décret.

La société africaine pour le développement minier est tenue de faire parvenir à la direction générale de la géologie, chaque fin de trimestre, les rapports des travaux.

**Article 5** : La société africaine pour le développement minier doit associer, à chaque étape des travaux de recherches, les cadres et techniciens de la direction générale de la géologie.

**Articles 6** : Les échantillons prélevés au cours des travaux, destinés à des analyses ou des tests à l'extérieur du territoire congolais, doivent faire l'objet d'un certificat d'origine délivré par le directeur général de la géologie.

**Article 7** : Conformément aux dispositions des articles 149, 150 et 151 de la loi n° 4-2005 du 11 avril 2005 portant code minier, la société africaine pour le développement minier bénéficie de l'exonération de tous droits et taxes à l'importation et de toutes taxes intérieures sur les matériels et matériaux nécessaires à l'exécution des travaux de recherches minières.

Toutefois, la société africaine pour le développement minier doit s'acquitter d'une redevance minière à taux fixe sur les produits principaux et les éléments en traces valorisés.

**Article 8** : Conformément aux articles 36, 91 et 92 de la loi n° 4-2005 du 11 avril 2005 portant code minier, le permis de recherches minières visé par le présent décret peut, en cas de non-exécution ou d'arrêt des travaux pendant neuf mois consécutifs sans raison valable, faire l'objet d'une suspension ou d'un retrait.

**Article 9** : En cas de découverte d'un ou de plusieurs gisements exploitables dans la superficie visée à l'article 2 du présent décret, il sera attribué de droit un permis d'exploitation, pour chaque gisement, à la société africaine pour le développement minier.

**Article 10** : Conformément aux dispositions des articles 98 et 99 de la loi n° 4-2005 du 11 avril 2005 portant code minier, une convention d'établissement doit être signée entre la société africaine pour le développement minier et l'Etat congolais.

Cette convention définit les conditions dans lesquelles la société africaine pour le développement minier doit exercer les activités minières, les droits et obligations de chaque partie, ainsi que les modalités de suivi et de contrôle de celles-ci par l'Etat.

**Article 11** : Le ministre des mines et le ministre des finances sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera enregistré et publié au Journal officiel de la République du Congo./-

2012 - 750

Fait à Brazzaville, le 16 juillet 2012

Denis SASSOU-N'GUESSO.-

Par le Président de la République,

Le ministre des mines et de la géologie

Pierre OBA.-

Le ministre des finances, du budget et du portefeuille public,

Gilbert ONDONGO.-

PERMIS DE RECHERCHE « MATSANGA MOUKILINGOMO » POUR LA COLOMBO TARTALETTE DU DÉPARTEMENT DU NIARI ATTRIBUE A LA SOCIETE SADEM CONGO

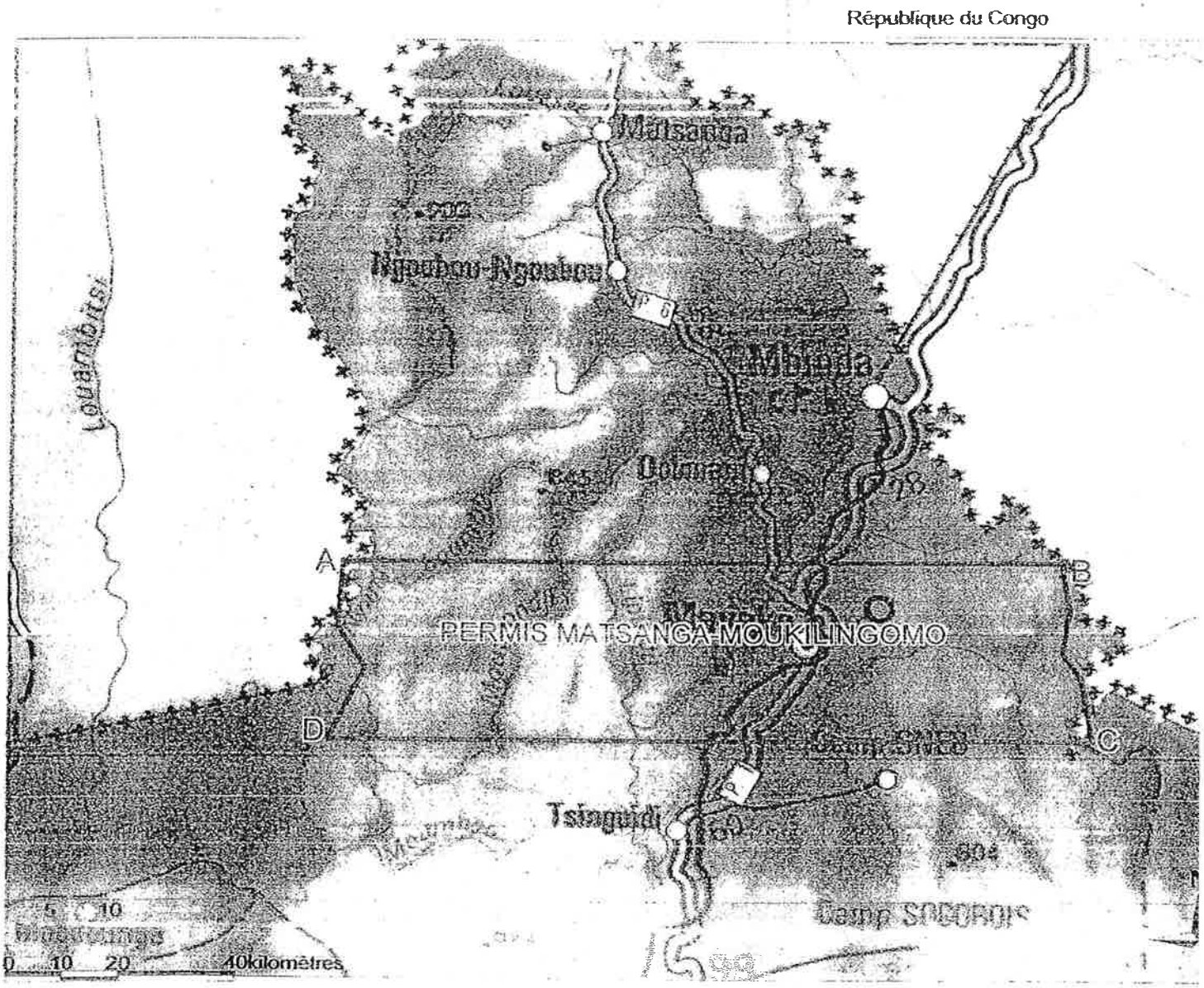
Coordonnées géographiques

| Sommets | Longitude | Latitude |
|---|---|---|
| A | 12°30'42" E | 2°14'46" S |
| B | 13°01'38" E | 2°14'46" S |
| C | 13°02'47" E | 2°22'50" S |
| D | 12°30'09" E | 2°22'50" S |

Frontière: Congo-Gabon

Superficie: 882 km2

Zone de recherche



PRESIDENCE DE LA REPUBLIQUE

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SECRETARIAT GENERAL
DU GOUVERNEMENT

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REPUBLIQUE DU CONGO
Unité*Travail*Progrès

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**Décret n° 2012 - 742 du 16 juillet 2012**
**portant attribution à la société africaine pour le développement minier d'un permis de recherches minières pour la colombo-tantalite dit « permis Marala-Lebiha » dans le département du Niari**

LE PRESIDENT DE LA REPUBLIQUE,

Vu la Constitution ;
Vu la loi n° 50-84 du 7 septembre 1984 fixant les taux et les règles de perception des droits sur les titres miniers telle que modifiée par les lois n°s 18-88 du 17 septembre 1988 et 24-2010 du 30 septembre 2010 ;
Vu la loi n° 4-2005 du 11 avril 2005 portant code minier ;
Vu le décret n° 2005-313 du 29 juillet 2005 portant attributions et organisation de la direction générale des mines ;
Vu le décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative ;
Vu le décret n° 2009-395 du 13 octobre 2009 relatif aux attributions du ministre des mines et de la géologie ;
Vu le décret n° 2009-471 du 24 décembre 2009 portant organisation du ministère des mines et de la géologie ;
Vu le décret n° 2011-558 du 17 août 2011 portant nomination de nouveaux ministres et fixant la composition du Gouvernement ;
Vu le décret n° 2011-737 du 12 décembre 2011 modifiant la composition du Gouvernement ;
Vu la demande de permis de recherches minières formulée par la société africaine pour le développement minier en date du 4 juin 2011.

Sur rapport du ministre chargé des mines.

En Conseil des ministres,

DECRETE :

**Article premier** : Il est attribué à la société africaine pour le développement minier, domiciliée : 12, rue du poisson salé, Mpila, B.P. : 587, Brazzaville, République du Congo, et dans les conditions prévues par le présent décret, un permis de recherches dit «Marala-Lebiha » valable pour la colombo-tantalite, dans le département du Niari.

**Article 2** : La superficie du permis de recherches, réputée égale à 1.108 $km^2$, est définie par les limites géographiques suivantes :

| SOMMETS | LONGITUDES | LATITUDES |
|---|---|---|
| A | 12°30'09" E | 2°22'50"S |
| B | 13°02'47" E | 2°22'50"S |
| C | 13°02'47" E | 2°32'32"S |
| D | 12°30'09" E | 2°22'50"S |

**Article 3** : Le permis de recherches visé à l'article premier du présent décret est accordé pour une durée de trois ans. Il peut faire l'objet de deux renouvellements d'une durée de deux ans chacun dans les conditions prévues par le code minier.

**Article 4** : Le programme des travaux à exécuter dans le cadre de ce permis de recherches est défini à l'annexe du présent décret.

La société africaine pour le développement minier est tenue de faire parvenir à la direction générale de la géologie, chaque fin de trimestre, les rapports des travaux.

**Article 5** : La société africaine pour le développement minier doit associer, à chaque étape des travaux de recherches, les cadres et techniciens de la direction générale de la géologie.

**Articles 6** : Les échantillons prélevés au cours des travaux, destinés à des analyses ou des tests à l'extérieur du territoire congolais, doivent faire l'objet d'un certificat d'origine délivré par le directeur général de la géologie.

**Article 7** : Conformément aux dispositions des articles 149, 150 et 151 de la loi n° 4-2005 du 11 avril 2005 portant code minier, la société africaine pour le développement minier bénéficie de l'exonération de tous droits et taxes à l'importation et de toutes taxes intérieures sur les matériels et matériaux nécessaires à l'exécution des travaux de recherches minières.

Toutefois, la société africaine pour le développement minier doit s'acquitter d'une redevance minière à taux fixe sur les produits principaux et les éléments en traces valorisés.

**Article 8** : Conformément aux articles 36, 91 et 92 de la loi n° 4-2005 du 11 avril 2005 portant code minier, le permis de recherches minières visé par le présent décret peut, en cas de non-exécution ou d'arrêt des travaux pendant neuf mois consécutifs sans raison valable, faire l'objet d'une suspension ou d'un retrait.

**Article 9** : En cas de découverte d'un ou de plusieurs gisements exploitables dans la superficie visée à l'article 2 du présent décret, il sera attribué de droit un permis d'exploitation, pour chaque gisement, à la société africaine pour le développement minier.

**Article 10** : Conformément aux dispositions des articles 98 et 99 de la loi n° 4-2005 du 11 avril 2005 portant code minier, une convention d'établissement doit être signée entre la société africaine pour le développement minier et l'Etat congolais.

Cette convention définit les conditions dans lesquelles la société africaine pour le développement minier doit exercer les activités minières, les droits et obligations de chaque partie, ainsi que les modalités de suivi et de contrôle de celles-ci par l'Etat.

**Article 11** : Le ministre des mines et le ministre des finances sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret, qui sera enregistré et publié au Journal officiel de la République du Congo./-

2012 - 742

Fait à Brazzaville, le 16 juillet 2012

Denis SASSOU-N'GUESSO.-

Par le Président de la République,

Le ministre des mines et de la géologie,

Pierre OBA.-

Le ministre des finances, du budget et du portefeuille public,

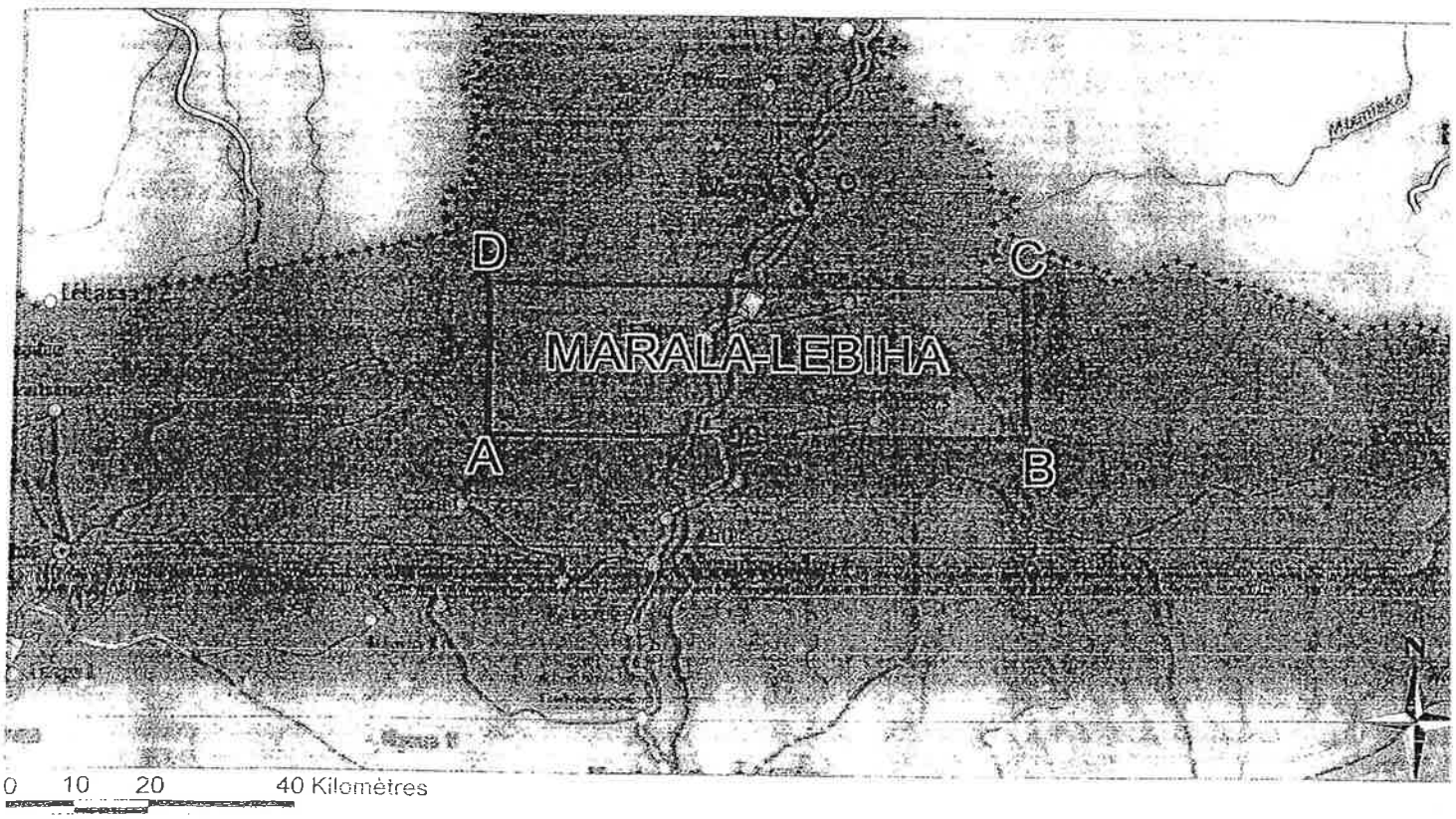
Gilbert ONDONGO.-

*PERMIS DE RECHERCHES <<MARALA-LEBIHA>> POUR LA COLOMBO TANTALITE DU DEPARTEMENT DU NIARI ATTRIBUE A LA SOCIETE SADEM*

**Coordonnées géographiques**

| Sommets | Longitude | Latitude |
|---|---|---|
| A | 12°30'09" E | 2°22'50" S |
| B | 13°02'47" E | 2°22'50" S |
| C | 13°02'47" E | 2°32'32" S |
| D | 12°30'09" E | 2°22'50" S |

**Superficie: 1108 Km2**

**Annex "A"**

MINISTERE DES MINES ET DE
LA GEOLOGIE

CABINET

REPUBLIQUE DU CONGO
Unité – Travail – Progrès

**ARRETE N° 5907 /MMG/CAB**

**Portant attribution à la Société Africaine pour le Développement Minier d'une autorisation de prospection pour la colombo-tantalite « Matsanga-Marala »**

**Le ministre des mines et de la géologie,**

Vu la Constitution ;

Vu la loi n° 50/84 du 7 septembre 1984 fixant les taux et les règles de perception des droits sur les titres miniers telle que modifiée par la loi n°18/88 du 17 septembre 1988 ;

Vu la loi n° 4-2005 du 11 avril 2005 portant Code minier ;

Vu le décret n° 2009 – 395 du 13 octobre 2009 relatif aux attributions du ministre des mines et de la géologie ;

Vu le décret n° 2009 – 471 du 24 décembre 2009 portant organisation du ministère des mines et de la géologie ;

Vu le décret n° 2005-314 du 29 juillet 2005 portant attributions et organisation de la direction générale de la géologie ;

Vu le décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative ;

Vu le décret n° 2009-335 du 15 septembre 2009 portant nomination des membres du gouvernement ;

Vu la demande de prospection formulée par la Société Africaine pour le Développement Minier en date du 10 décembre 2010.

**ARRETE**

**REPUBLIQUE DU CONGO**

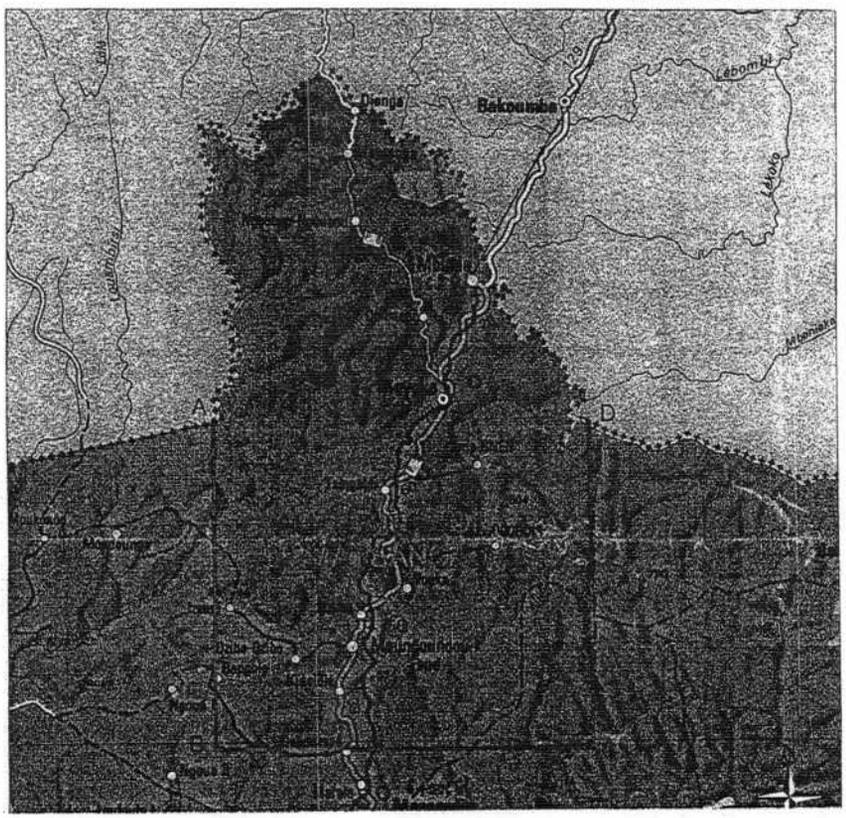
*AUTORISATION DE PROSPECTION <<MATSANGA-MARALA>> POUR LA COLOMBO-TANTALITE DU DEPARTEMENT DU KOUILOU ATTRIBUEE A LA SOCIETE SADEM-CONGO*

**Coordonnées Géographiques**

| Sommets | Longitude | Latitude |
|---|---|---|
| A | 12°27'14" E | 2°19'33" S |
| B | 12°27'14" E | 2°50'13" S |
| C | 13°02'42" E | 2°50'13" S |
| D | 13°02'42" E | 2°19'51" S |

Frontiere: Congo-Gabon

Superficie: 6000 Km2

**Article 1er** : La Société Africaine pour le Développement Minier (SADEM-Congo), domiciliée : Office National de Maitre Jean MOUSSOUNDA, 1er niveau de l'Immeuble City Center, B.P: 587, Brazzaville, République du Congo, est autorisée à procéder à des prospections minières valables pour la Colombo Tantalite dans la zone de Matsanga-Marala du département du Niari.

**Article 2** : La superficie de la zone à prospecter, réputée égale à 6.000 km², est définie par les limites géographiques suivantes :

| SOMMETS | LONGITUDE | LATITUDE |
|---|---|---|
| A | 12° 27' 14" E | 2° 19' 33" S |
| B | 12° 27' 14" E | 2° 50' 13" S |
| C | 13° 02' 42" E | 2° 50' 13" S |
| D | 13° 02' 42" E | 2° 19' 51" S |
| **Frontière :** | **Congo - Gabon** | |

**Article 3** : Conformément aux dispositions de l'article 9 du décret n° 2007-274 du 21 mai 2007 fixant les conditions de prospection, de recherche et d'exploitation des substances minérales et celles d'exercice de la surveillance administrative, la Société Africaine pour le Développement Minier est tenue d'associer aux travaux de prospection les cadres et techniciens de la direction générale de la géologie.

**Article 4** : Les échantillons prélevés au cours des travaux et destinés à des analyses ou tests à l'extérieur du territoire congolais doivent faire l'objet d'un certificat d'origine délivré par le directeur général de la géologie.

**Article 5** : La Société Africaine pour le Développement Minier fera parvenir les rapports des travaux, chaque fin de trimestre, à la direction générale de la géologie.

**Article 6** : Conformément aux dispositions des articles 149 et 151 de la loi n°4 2005 du 11 avril 2005 portant code minier, la Société Africaine pour le Développement Minier, bénéficie de l'exonération de tous les droits et taxes à l'importation et de toutes taxes intérieures sur les matériels et matériaux nécessaires à l'exécution des travaux de prospection minière.

Cependant, la Société Africaine pour le Développement Minier s'acquittera d'une redevance superficiaire, conformément aux textes en vigueur.

**Article 7** : Conformément aux articles 91 et 92 de la loi n°4-2005 du 11 avril 2005 portant code minier, l'autorisation de prospection visée par le présent arrêté pourra faire l'objet d'une suspension ou d'un retrait en cas de non exécution ou d'arrêt des travaux pendant trois mois consécutifs, sans raison valable.

**Article 8** : La durée de validité de la présente autorisation de prospection est de douze mois, renouvelable dans les conditions prévues par le code minier.

**Article 9** : Le directeur général de la géologie est chargé de veiller à l'application des présentes dispositions.

**Article 10** : Le présent arrêté sera enregistré et publié au Journal Officiel.

Fait à Brazzaville, le 7 avril 2011

**Pierre OBA.-**

# APPENDIX 2

DESCRIPTIONS OF VISITED SITES

In total, 27 sites were visited by the author during his stay.

***Site 88040001, UTM33, E0254591, N9741949***

Vestiges of deviation channels can still be recognized at this former Avoine Mining gold mining site on the Imvouala River. The alluvium worked consists of 80% quartz pebbles and 20% lithic pebbles (weathered rock, schist, etc.). Approximately 50 g of heavy mineral concentrate was recovered from each 5 litre pan. The concentrate appears to contain a substantial proportion of coltan along with magnetite and hematite.

Sample 88040002 was collected at the same location and represents a very small concentrate with abundant gold flecks.

***Site 88040003, UTM33, E0254827, N9741715***

The site consists of gravel spoil tips from former Avoine Mining operations containing 80% quartz pebbles. Four pans, a total of 20 litres, yielded about 20 g of concentrate.

***Site 88040004, UTM33, E0254944, N9741689***

Site located at the intersection of a forest road built by Congo Mining and the Imvouala River. The gravels were scraped from the riverbed and washed by local workers for Congo Mining for making concrete. These gravels appear to have been left by Avoine Mining and then worked by local miners. A total of 5 pans, about 20 litres, yielded nearly 1 kg of concentrate. This was the most prolific site visited. Several small, less than one centimeter, fragments of coltan were found in the gravel.

The gravel pile prepared by Congo Mining, several tens of cubic meters in size, consists of 70% quartz pebbles, locally tourmaline bearing, 20% fragments of amphibole schist with traces of pyrites preserved and 10% various weathered pebbles.

***Site 88040005, UTM33, E0255006, N9741602***

Artisanal gold mining site located approximately 100 m upstream from the Avoine workings (site 88040004). A ledge is formed in the stream by meter sized blocks of amphibole schist, probably the same material as described in the 88040004 gravels. Approximately 220 grams of concentrate was obtained from each 5 litre pan, along with numerous centimeter sized coltan fragments.

***Site 88040006, UTM33, E0255129, N9741715***

A recent gold mining site reworking the gravels situated upstream from Avoine Mining's workings (88040004) and the previous site. The artisanal exploitation covers about 100 m, recognisable by the small gravel piles left here and there. The material worked consists of gravel, sand and mud. Only a small, 6 g concentrate was obtained.

***Site 88040007***

Located approximately 50 m upstream from the previous site, it shows little evidence of old mining activity. The thalweg is covered by a second growth forest, the stream getting lost under the vegetation. An 80 gram concentrate was obtained.

***Site 88040008, UTM33, E0255333, N9741581***

An artisanal gold mining operation spread over 100 m along the thalweg. Coltan grains are visible in the gravel. Approximately 60 g of concentrate were obtained from each pan. An altered banded iron formation outcrop, showing hematite and magnetite facies, developed a ledge across the stream. Abundant biotite flakes, smaller than a centimeter in size, can be seen in the gravel: evidence for the existence of a pegmatite nearby.

***Picture 18****: Biotite flakes at site 88040008 and coltan grains collected at site 88040008.*

***Site 88040009, UTM33, E0255361, N6741633***

The site is a stream bed consisting of gravel and numerous blocks of banded iron formation reaching 3 m in size. Coltan is abundant; small, 0.1-2 cm large pebbles could easily be gathered by hand. Forty-five grams of concentrate was collected.

***Site 88040010, UTM33, E0255518, N9741716***

The site is located in a narrow, less than 10 m wide thalweg cut into the laterite about 100 m upstream from the previous site. The thalweg bed consists of approximately 50 cm of quartz gravel deposited on whitish clay. Some banded iron formation blocks and flagging tape from MDC are also present. The concentrates were on the order of 20 g per pan for a total of 80 g. Coltan pebbles up to 5 mm in size as well as a 3 cm equant crystal were found (88040011).

***Site 88040012, UTM33, E0255439, N9741647***

The site is located in a small, about 20 m wide alluvial plain, which appears to be near the head of the stream (***pictures 19*** and ***20***). Traces of mining activity are visible everywhere. The bed of the alluvial plain consists of quartz gravel that yielded approximately 25 g of concentrate from 3 pans of 5 litres each. There is an altered pegmatite block or outcrop. Please note that a sodolithic pegmatite is the probable source of the coltan.

***Picture 19-20****: A view of the pegmatite at site 88040012. The gravel bed worked by artisanal miners is now covered by a luxuriant second-growth forest.*

***Site 88040013, UTM33, location not noted***

An active gold mining site located in a widening of the stream. The stream bed consists of gravel that is heavily disturbed by the mining activity. Traces of coltan were observed in the pans (prepared by our workers), approximately 10 g per pan for a total of 55 g.

The gold was being washed by a team of 5 children, 8-12 years old, including the son of the village chief! It was possible to visualize the method used by Avoine Mining and still carried on by the local workers. The gravel is shovelled into a sluice box, shaken and

rejected in a pile. The method accounts for the holes and gravel piles observed all over at the different sites. Apparently, each team recovers a few grams of gold per day. A few specs of gold could be seen in the bottom of the sluice box or when washing the contents of our pans (sample 88040014). The result of a day's work was seen in the evening when a miner sold his gold at the Banzoko Maki. The price paid to the miners is approximately 80% of its value, which seems fair. The gold is sold by the trader directly to the Pointe-Noire goldsmiths.

***Site 88040015, UTM33, E0254409, N9741566***

A recent gold mining site located about 200 m upstream from the previous site. Approximately 10 g of concentrate were obtained from 5 pans.

***Site 88040016, UTM33, E0254199, N9741171***

An old mining site located at the head of the stream. About a dozen grams of concentrate was recovered per pan, the sample consisted of 4 pans.

***Site 88040016b[46], UTM33, E0256082, N9742739***

On Saturday, November 12, another tributary was visited to the south of Banzoko. The site is difficult to reach via a trail constructed by MDC for drill access. In addition, two future drilling sites marked with concrete markers were visited. There is about a 100 m vertical descent from the trail to the stream.

There are blocks of amphibole and biotite schist containing remobilized material, probably from the migmatite. The presence of the migmatite could indicate a favourable environment for the development of LCT pegmatite, the main source of coltan. Four pans of gravel were washed and produced 13 g of concentrate. Coltan grains up to 5 mm in size were found.

Mr. NGamye mentioned that he had previously collected a (5 litre?) laterite sample in the MDC trail from a trench made using a bulldozer; the sample contained coltan. This information could not be confirmed and no laterite could be sampled during our visit. However, the presence of coltan in the laterite would suggest a local source; an important fact to validate during the next visit.

[46] Sampling error in the field. There is some confusion in the sample number, the two 88040016 samples could be inversed in the results.

***Site 88040017, UTM33, E0251712, N9739842***

The site is located on a small tributary north of the trail. An old Avoine Mining dam and a small deviation channel can be seen. The dam is about 4 m high and causes a widening of the stream bed. The small outwash plain is built against a rocky ridge formed by an altered paraschist outcrop and a pile of 2 to 5 m amphibolite schist blocks. The stream bed consists of muddy gravel over 5 m wide and 2 m (?) thick. Coltan grains 2 to 5 mm in size, occasionally reaching 10 mm, were found here and there. Four 5 litre pans yielded 45 g of concentrate.

***Site 88040018, UTM33, E0251781, N9739882***

The site is located about 100 m upstream from the previous site (***pictures 21*** and ***22***). A thin gravel accumulation developed in the narrow thalweg because of the presence of a rocky ledge consisting of amphibolite. Four pans produced five grams of concentrate containing up to 5 mm coltan grains and traces of gold.

***Picture 21-22****: Site 88040018, showing the amphibole schist flaking into the stream. The geologist, Mr. N'Gamye is standing next to the ledge in the right picture. The slightly altered amphibolites contrast with the highly laterized quartzofelspathic schists.*

***Site 88040019, UTM33, E0249272, N9736830***

The site is located beside the old Comilog maintenance road, the now abandoned access road to the region (***pictures 23*** and ***24***). A walk of a few kilometres gives access to the site. The site is located on a tributary of the Bamboma River, a few kilometres south of the village of Banzoko, completely outside the area described in the old reports (Boineau, 1956).

The site is a few hundred meters wide, broadening plain created by Avoine Mining. The only visible sign of previous gold washing operations is the 50 or so year old second growth forest covering the plain. The gravel is covered by a 0.5 m thick accumulation of organic material. One pan yielded approximately 20 g of concentrate.

***Picture 23-24**: A view of the alluvial plain at site 88040019, which was worked by Avoine Mining in the 1950s. The plain is artificial, created by sediment accumulating behind the dam used to divert the stream toward the washing operations. Note the umbrella tree (Musanga cecropioides or parasolier) in the fore ground. The photo on the right shows a 40 cm wide tree trunk in the secondary forest developed since Avoine ceased operations.*

***Site 88040020, UTM33, E0248911, N9737976***

The site is located on another tributary of the Bamboma River, not far from Avoine Mining's old Malambani camp. The site is a small, about a hundred metre wide, gravel covered plain. About a 30 cm thick layer of organic matter covers the gravel. Four 5 litre pans yielded 20 g of concentrate for an approximate average of a few grams per pan. Coltan pebbles up to 1 cm in diameter and a few gold grains were present.

**Site 88040020b[47], UTM33, E0249056, N9738013**

The site is located on another tributary of the Bamboma called Bamboma #1[48] , in a hundred or so metre wide flooded plain covered by a second growth forest. Gravel piles left by Avoine Mining are clearly visible. Four 5 litre pans of this gravel yielded approximately 20 g of concentrate. Gold grains can also be seen in the concentrate.

***Site 88040021, UTM33, E0247077, N9737272***

The site is located on the Bamboma #2 Tributary, in a hundred or so metre wide plain previously worked by Avoine Mining. Legend has it that there were more than 10 tonnes of gold extracted here from a 30 m wide gravel pit. The material is rusty or oxidized gravel. Several vestiges of previous operations are visible despite the growth of a secondary forest where tree trunks are up to 30 cm in diameter. The reworked gravel piles can be up to 5 m thick. The washing of four 5 litre pans yielded approximately 30 grams of heavy mineral concentrates.

***Site 88040022, UTM33, E0247286, N9737293***

The site is located on a tributary of Bamboma n$^{o}$2, showing evidence of previous gold mining. The gravel piles consist of 40% quartz pebbles, 40% amphibolite or metabasalt pebbles and 20% altered schists A few grams of very fine coltan were collected from each 5 litre pan for a total of 13 g. The maximum crystal size was under 1 mm.

***Site 88040023, UTM33, E0241909, N9731521***

The site was visited on Sunday, November 13. It is located on the Ikakada (Ikkda?) Creek, about 15 or so kilometres south-west of the village of Banzoko, well beyond the region described in Avoine Mining's reports (Boineau, 1956) and outside the maps available to the author. The area is accessible via a logging road leaving the village of Moupoupa or Biyamba(?). The site was worked by local miners, but does not appear to have been worked by Avoine Mining, even though other tributaries visibly were. The alluvial gravel consists of about 50% quartz pebbles; the rest is altered granodiorite, a few blocks of magnetite-quartz-siderite iron formation and amphibolite blocks. A few blocks of pegmatite were also seen, however the level of alteration of the feldspars made identification difficult. Four 5 litre pans yielded 8 g of concentrate with coltan grains

[47] Numbering error in the field notes.

[48] It is a local custom to number the small tributaries sequentially, using the name of the river that they flow into. However, the author could not obtain a map with the names of these tributaries. Thus it is not certain if this designation is universal or if these numbers were correctly used by Mr. Bonate.

of 2 to 5 mm in size. Please note that this site is located far from the known coltan occurrences, extending its distribution significantly[49].

***Site 88040024, UTM33, E0242752, N9740805***

A recent gold working site located on the Lipindi River, north of the village of Moupapa (?) and the Louessé River. The site does not appear to have been worked by Avoine Mining. The stream bed contains over 80% quartz pebbles, blocks of magnetite iron formation (BIF), silicate-carbonate iron formation (SCIF), quartz pegmatite, altered schists and granitoids. The amphibolite blocks are special, showing a sheaf-like texture suggestive of a silicate iron formation. The gravel contains small coltan grains here and there, yielding approximately 17 g of concentrate from five 5 litre pans. Two small mauve garnets were noted; possibly pyropes which could be an indication of a kimberlite[50] in the area. But no gold was seen.

Avoine Mining's old Boumana camp (1948) was visited. It is remarkable for the presence of a mature safou (*Dacryodes edulis)* (E0243499, N9741927). It is located about 10 km to the west of the village of Banzoko.

In the same area, an outcrop was exposed during the construction of a logging road. (*UTM33, E0244388, N9741425)*. The rock is fine grained syenite with orthoclase, plagioclase and hornblende. The presence of this syenite with slightly alkaline affinity contrasts with the metamorphosed supracrustal facies seen at the other localities. The presence of alkaline rocks is not to be overlooked in the development of a metallogenic model for coltan or gold formation.

Congo Mining's iron drilling operations were observed not far from the area of the outcrop. Several drill collars, a water supply line and samples left in place were noted.

***Site 8804025, UTM33, E0244347, N9741413***

The site is located in the Makoko River. The river bed is covered in gravel, 90% of which consists of quartz pebbles. However, abundant numbers of blocks several tens of centimetres in size can also be seen. Fifty percent of these blocks are syenite, similar to the one described above. Four pans yielded 2 g of very fine grained concentrate with no coarse grains of coltan.

[49] Unless a coordinate reading error occurred when noting GPS info, which cannot be excluded.

[50] Kimberlite is the source rock for most of the primary diamond deposits. However, the presence of kimberlites does not mean that they are diamond bearing. Detailed mineralogical studies are needed before stating diamond exploration.

***Site 88040026, UTM33, E0246947, N9743530***

The site is located on the Bonati River, near to its confluence with the Makengui River. The site was worked by local gold miners, but not by Avoine Mining. The gravel consists of 70% quartz pebbles, 20% variably altered schist and 10% grey chert. It is about 20 m from a Congo Mining drill site, suggesting of the presence of iron formation in the underlying bedrock. Coltan grains of a few millimetres is size were found. A 22 g concentrate was obtained from four 5 litre pans. A few gold grains were also seen.

***Site 88040027, UTM33, E0247933, N9743659***

The site is located over Congo Mining's iron deposit in the Makengui Creek. An Algoma type quartz-magnetite iron formation (BIF) ledge cuts across the stream. The 19 grams of concentrate obtained per pan is mostly magnetite and hematite. The amount of coltan cannot be estimated. One to three millimetre sized coltan grains are suspected, but not confirmed. A few gold grains are also present.

***Samples provided by Mr. N'Gamie***

A series of coltan granules were provided to the author by Mr. N'Gamie during their meeting in Pointe-Noire. These are sub-centimetric to pluricentimetric grains, for a total weight of 498 g. These were provided to Mr. N'Gamy by Mr. Bonate, likely collected in the course of his previous field campaigns. However, their exact provenance is not known or disclosed. It must be noted that the tantalum content of these grains is significantly higher than the average found in the samples collected by the author. Mr. N'Gamy's samples were numbered 88040028 in the database.