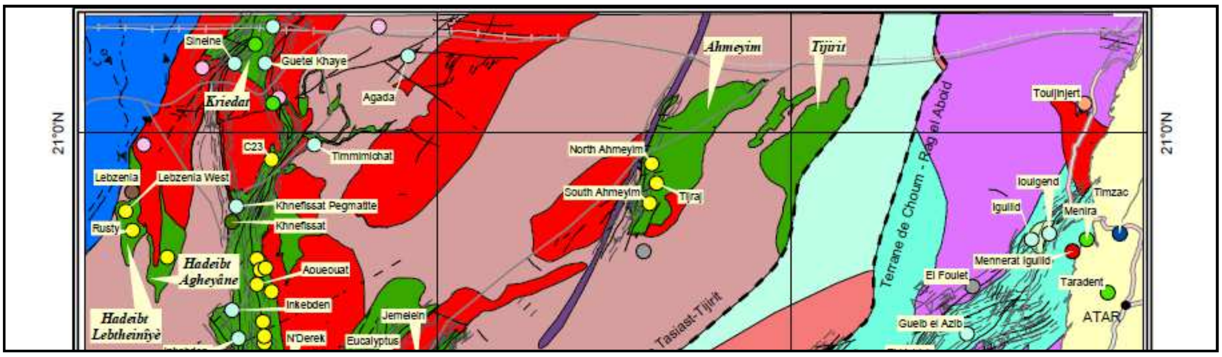
SURICATE S.A.R.L

NOUAKCHOTT - MAURITANIE

PERMITS2196B2 & 2217B2
FOR GOLD &BASE METALS EXPLORATION
NORTHERN TASIAST
MAURITANIA



AVAILABLE GEO-SCIENTIFIC DATA COMPILATIONAND ANALYSIS STUDY
AND
EXPLORATION WORK PLAN PROPOSAL

SEPTEMBER 2014

SOCIETE D'ETUDES ET DE SUIVI
SES sarl
SES
Géologie - Géophysique
Etudes - Suivi - Contrôle
Prestation de Services

ARAFAT – ROUTE DE L'ESPOIR - IMMEUBLE LEKBEID – PREMIER ETAGE - APPARTEMENT N°S-06
NOUAKCHOTT – MAURITANIE TEL : +222 25 01 29 48, +222 46 81 62 35 Email : sessarl2011@gmail.com

INTRODUCTION

The company SURICATE S.A.R.L, a Mauritanian group, specialised in natural resources exploration and development, owns as application the permits n° 2196B2 and 2217B2 in the TASIAST region, north-western Mauritania.

The company is engaged in the process of an exploration project targeting the development of the base metal potential of the area of the permit through an ambitious exploration program.

As part of the company strategy, it was decided to undertake a compilation study on the mineral potential of the area of the applications. This study targets the estimation of the potential in Gold, Copper and base metals mineralization within the area of the permits.

The study focused on the analysis of all the available geo-scientific data on the area of the permits. The bibliography has been accessed and different digital information layers were cut, processed and overlaid with the help of GIS. All this was done in an effort to define and delineate potential areas for gold and base metals mineralization targets.

Information was compiled from a wide range of sources including published scientific papers and conferences, university research theses, companies and government reports.

This report describes the study process, gives its results in details and presents the exploration future program to be executed in the following stages.

The report is presented in three chapters. It presents the geographical, geological and metallogenic framework of the study, gives an overview of the known mineral potential in the area of the permit and the previous works in the first chapter.

It shows the results of the available geo-scientific data analysis in the second chapter and, as final result, concludes the products of the study with a plan proposal for the future works to be carried out on the areas of interest.

1. GENERALITIES

1.1. GEOGRAPHICAL SITUATION

The permit is situated in the southern part of Mauritania, in the Wilaya of Gorgol. It is located around the village of Mbout within a populated area.

M'bout is almost 500 km away from Nouakchott and is accessible via a bitumen road in a good state. The permit access is characterised by easinessespeciallyduring the dry season and the hydrographical network is relatively dense.

The figure below shows the geographical situation of the permit.

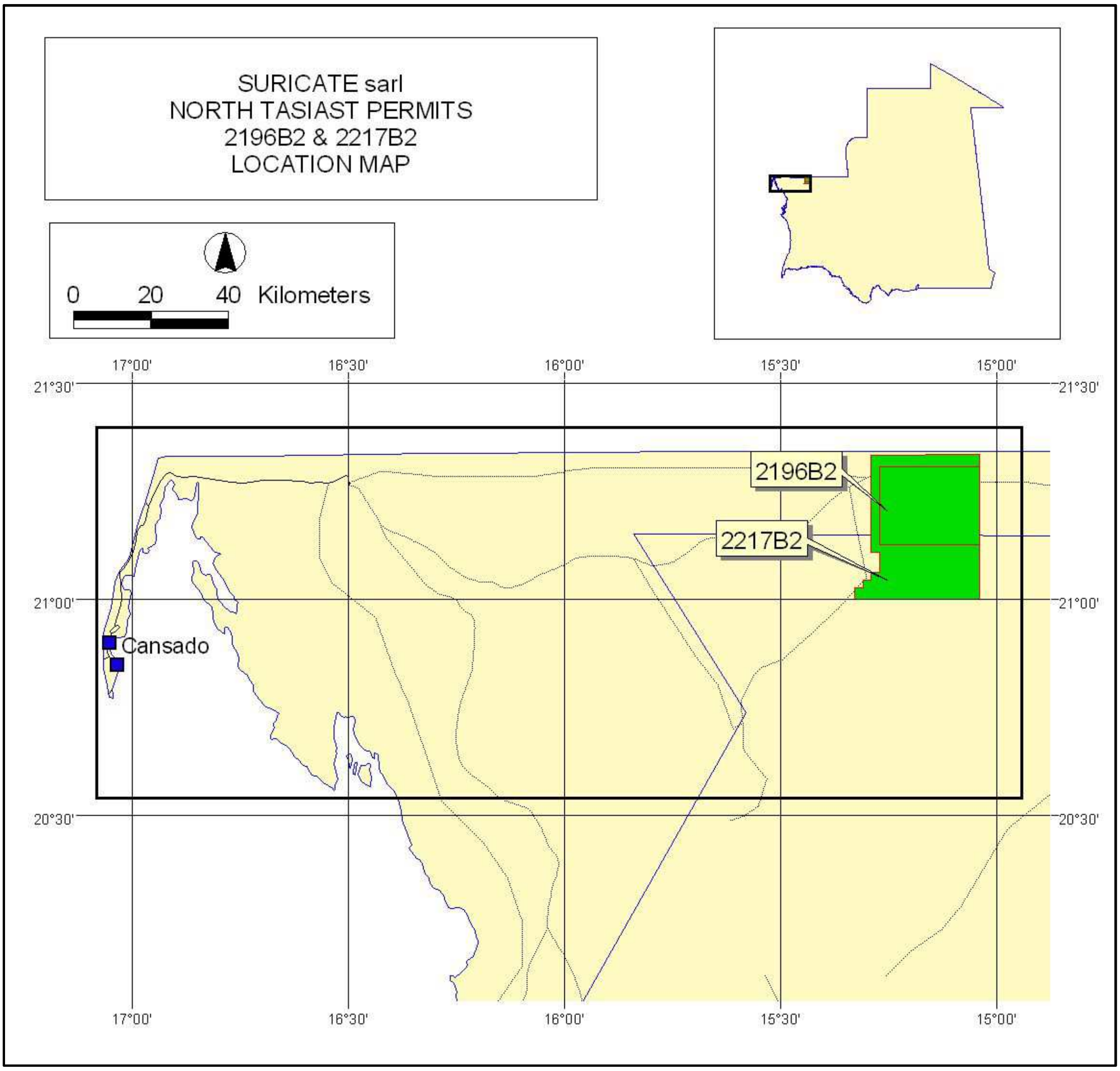


FIGURE 1: PERMIT LOCATION MAP

1.2. GEOLOGICAL FRAMEWORK

1.2.1. OVERVIEW

The permits area belongs to The Rgueïbat Shield which forms the north-western part of the West African Craton that underlies much of north-west Africa (an area of about 4,500,000 km2). However, large areas of the West African Craton, including the eastern part of the Rgueïbat Shield, are concealed beneath Neoproterozoic and Phanerozoic sedimentary deposits.

The exposed western part of the Rgueïbat Shield west of the Taoudeni Basin in north-west Mauritania was investigated during the BGS mapping project. A north–south-trending escarpment in the Atar-Choum area that is capped by Taoudeni strata defines the eastern exposed limit of the Shield.

The exposed southern and western margins of the Rgueïbat Shield within the project area are defined by components of the linear 'Pan African' Mauritanides Orogenic Belt. Exposed parts of the Rgueïbat Shield continue northwards from the project area into the Western Sahara and northernmost Mauritania.

That part of the Rgueïbat Shield in north-west Mauritania mapped as part of the BGS study is overlain by a flat-lying, gravel-covered surface ('Reg') with a gentle south-westerly dip towards the Atlantic Ocean. The 'Reg' plateau generally lies at a level 100–200 m lower than the rocky plateau defined by the Taoudeni Basin strata to the east. The 'Reg' is locally covered by north-east-trending, essentially static dune belts, as well as by mobile isolated barchan dunes and less permanent hummocky sand deposits. The two major dune belts, the Azeffâl and Akchâr, cut right across the mapped area.

Previous studies, confirmed by isotopic dates obtained during the present project, have concluded that Archaean rocks dominate the Rgueïbat Shield in the present study area. Two major Archaean terranes have been identified in this mapping programme. These are an eastern Choum-Rag el Abiod Terrane and a western Tasiast-Tijirit Terrane. A roughly north-north-east-trending zone of intense ductile shearing up to about 40 km in width separates the two terranes. Small-scale movement indicators suggest sinistral horizontal offset along, and east-directed thrusting across the eastern part of this transpressive shear zone.

A new U-Pb zircon age of 2954±11 Ma from a syntectonic granite dates the major ductile shearing event within this deformation zone. Table 4.1 summarises the stratigraphical terms now adopted for the various mapped units as well as the major lithologies within the Rgueïbat Shield of north-west Mauritania. Figure 4.1 shows the locations of these terranes, major structures and the principal greenstone belts. Major basaltic dyke swarms with a dominant north-east trend (and four subsidiary sets) cut across the whole exposed part of the Rgueïbat Shield in the project area. All these dykes pre-date the Taoudeni Basin sedimentation that commenced during the Neoproterozoic Era.

Tasiast-Tijirit Terrane

The Tasiast-Tijirit Terrane comprises the typical Archaean association of granites, greenstones and granitoid gneisses, in contrast to the strongly sheared, granulite facies rocks of the eastern Choum-Rag el Abiod Terrane. The oldest rocks are variably migmatised tonalitic gneisses that are cut by all the other granitic phases and tectonically or unconformably underlie the greenstone belts.

The main greenstone belts in the Tasiast- Tijirit Terrane are named, from east to west, as follows:

- *Tijirit Greenstone Belt*
- *Ahmeyim Greenstone Belt*
- *Sebkhet Nich Greenstone Belt*

- *Kreidat Greenstone Belt*
- *Chami Greenstone Belt*

Two small greenstone belts in the west-central part (Sheet 2015, Chami) are referred to as the Hudeibt Agheyâne and Hadeibt Lebtheinîyé greenstone belts and are collectively referred to as the Lebzenia greenstone belts. In addition there are a number of elongate, predominantly amphibolitic units within the granite-gneiss terrane that are interpreted as greenstone belt remnants.

The various greenstone belts are characterized by low- to medium-grade metamorphic mineral assemblages in an assortment of metavolcanic and metasedimentary strata. Basic metavolcanics and siliciclastic metasedimentary rocks appear to dominate the various Greenstone Belt and the westernmost greenstone remnants). Intermediate to felsic metavolcanic rocks are rare. Ultramafic rocks are locally common (e.g. Sebkhet Nich Greenstone Belt).

The greenstone belts are locally intensely sheared with individual shear zones preferentially following specific lithologies. Major ductile shears control both the present shape of the greenstone belts and the folds within these belts. Ultramafic rocks are typically disrupted into lenses by the shearing. Whole rock geochemical analyses on samples from the various greenstone belt metavolcanic lithologies undertaken by Normandy LaSource (unpublished report, 2001) suggest that these rocks were originally emplaced in an island arc setting.

It is possible that the greenstone belts originally formed a more continuous carapace over the gneissic basement. Subsequent tectonic events and major granitic magmatism (approximately 30 million years after the extrusive volcanicity) have disrupted this continuous cover. The larger greenstone belts may originally have been volcanic centres with their wide range of volcanic lithologies. It is possible that the metasedimentary rocks of the Ahmeyim Greenstone Belt successions preserve a transition from shallow subaqueous deposition in the north to deeper water turbiditic deposition in the south. New isotopic dating indicates that the original volcanism occurred at about 2960 Ma based on dates obtained from intermediate volcanic rocks of the Chami Greenstone Belt.

This age also provides a minimum age for the migmatitic gneisses that underlie the greenstone belts. The commonest intrusive rock in the Tasiast-Tijirit terrane is biotite-granodiorite or tonalite (locally altered to epidote-granodiorite) that forms a number of very large plutons within and marginal to the greenstone belts. Xenoliths can be a major component of granodiorite-tonalite exposures and these xenolithic rocks are shown as separate units on the accompanying geology map.

Most xenoliths are amphibolitic and they are angular to rounded, and locally have ragged edges. The granodiorites and less common leucocratic granitic rocks may be roughly contemporaneous. Thus, although there are veins of the leucogranite in the granodiorites, in some places the two rocks merge into each other. The two new isotopic ages for the Bir Igueni and Gleibat El Fhoud granites also suggest that much of the plutonism was essentially coeval at about 2920 Ma (ages of 2912±36 Ma and 2933±16 Ma).

A distinctive coarse-grained to pegmatitic muscovite-granite forms a series of small intrusions throughout the Tasiast-Tijirit Terrane, in the eastern half of the Chami Sheet. The granite is leucocratic and dominated by quartz and white feldspar with disseminated muscovite flakes. However, its pegmatitic phase (that usually forms sheets and veins) is characterised by a range of unusual lithium, strontium and beryllium minerals as well as opaques, tourmaline, biotite and red garnet. Muscovite books in the pegmatites are up to 1 m in length.

Secondary epidote gives the rocks a pale green colour. The muscovitepegmatitic granites are the youngest of the various granitic intrusions. It is locally strongly fractured. Several small sodalite-

syenite intrusions were mapped in the centre of the Tasiast-Tijirit Terrane on Sheet 2014 (Ahmeyim). These intrusions are generally elongate and parallel to the tectonic fabric of the host rock. They have rounded to lensoid outlines suggesting passive emplacement. They commonly contain rounded amphibolitic xenoliths that are aligned with the locally strong foliation. A hillside quarry for facing stone at 20°03'52"N / 14°13'45"W provides the best syenite exposures.

Large cut surfaces expose coarse grained, sodalite- aegerine-biotite-feldspar-quartz-syenite with veins rich in sodalite emplaced along joints that locally define imbricate textures. Quartzofeldspathic pegmatites are common in the various gneisses and migmatitic gneisses as sharply defined veins up to about 1 m in thickness. Early pegmatites are folded and the youngest veins are linear but cut by brittle fractures. Zoning in pegmatites is defined by variable biotite distribution.

Tiny orange to red garnets are locally present in pegmatites associated with the Bir Igueni Granite. The youngest pegmatites are micaceous with large (several cm in length) books of biotite flakes, with or without tourmaline, muscovite and garnet. They are spatially associated with leucogranite.

The map in the figure below shows the regional geological framework of the permit.

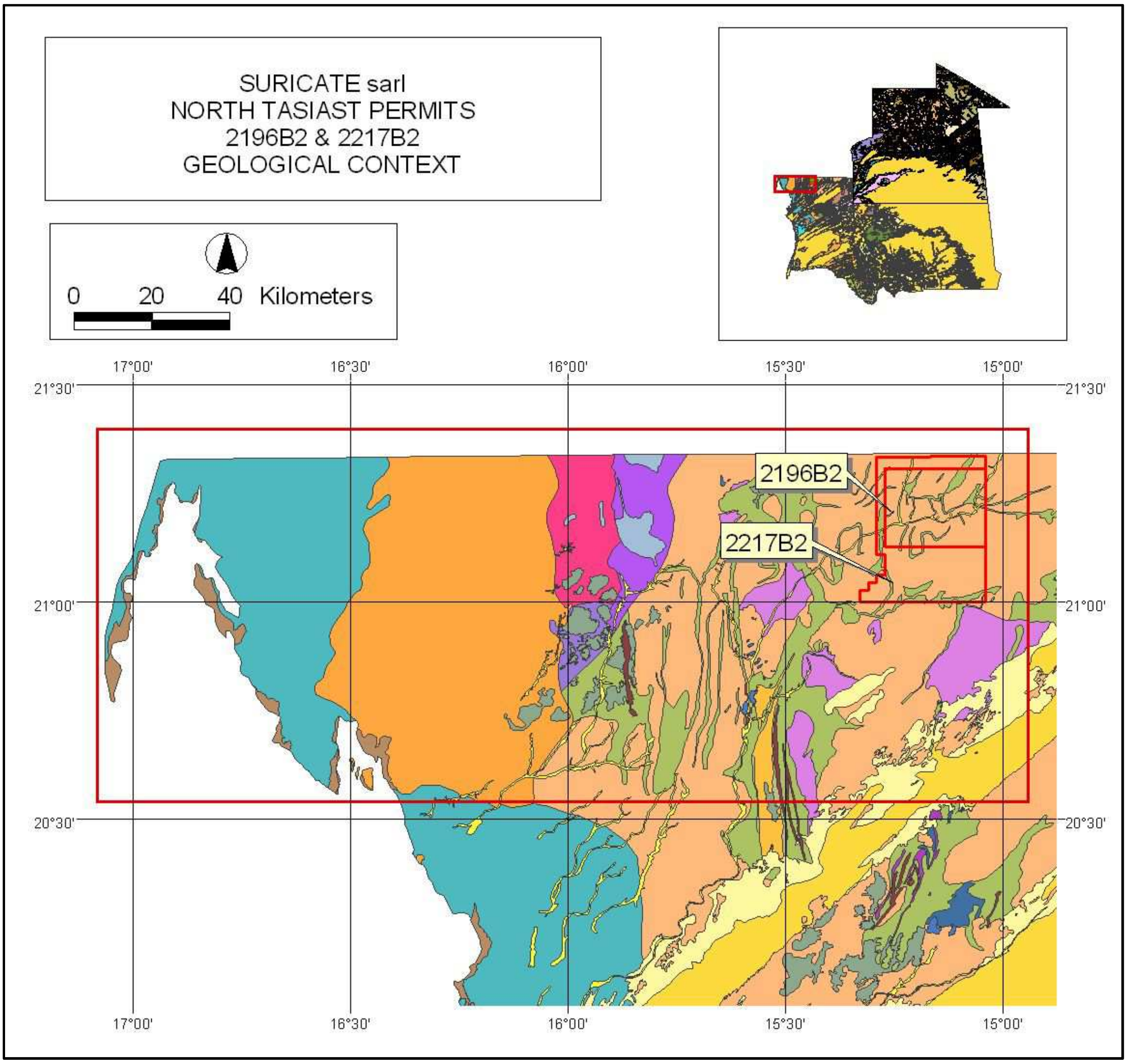


FIGURE 2: PERMIT REGIONAL GEOLOGICAL CONTEXT

2. GEOSCIENTIFIC DATA ANALYSIS

For the purpose of the current study, all the geo-scientific data related to the area of the permit was collected, compiled and analyzed. The main data collected contains:

- *The 1.200/000 geological map of the area undertaken by the British Geological Survey (BGS) in 2005;*
- *The airborne magnetic and radiometric data collected by Fugro Airborne Surevy in 2006;*
- *The geochemical data related to the work undertaken by General Gold International (GGI) in 1996-1997;*
- *The Landsat TM (7 bands) imagery of the area processed and geo-referenced by the BGS;*
- *The mineral potential of the area based upon the BGS and the The United States Geological Survey (USGS) works in consecutively 2005 and 2013;*

2.1. GEOLOGY

The Tasiast-Tijirit Terrane comprises the typical Archaean cratonic association of granites, greenstones and granitoid gneisses. The oldest rocks (>2970Ma) are variably migmatised tonalitic gneisses of the Complexe de Çtel Ogmâne that are cut by all the other granitic phases and tectonically or unconformably underlie the greenstone belts.

The metavolcanosedimentary greenstone belt association (Groupe de Lebzenia) is subdivided into four formations although original stratigraphical relationships between these remain unclear. Basic metavolcanics and siliciclastic metasedimentary rocks with low- to medium-grade metamorphic mineral assemblages appear to dominate the various greenstone belts. BIF and ultramafic rocks are locally common and intermediate to felsic metavolcanic rocks are rare.

The greenstone belts are locally intensely sheared with individual shear zones and melange zones preferentially following specific lithologies. Major ductile shears control both the present shape of the greenstone belts and the folds within these belts. Ultramafic rocks are typically disrupted into lenses by the shearing.

Whole rock geochemistry of the various greenstone belt metavolcanic lithologies suggests that these rocks were originally emplaced in an island arc setting. It is possible that the greenstone belts originally formed a more continuous carapace over the gneissic basement. Subsequent tectonic events and major granitic magmatism approximately 30 million years after the extrusive volcanicity (dated at 2960Ma) have disrupted this continuous cover. The larger greenstone belts may originally have been volcanic centres with their wide range of volcanic lithologies. Metasedimentary rocks of the Ahmeyim Greenstone Belt successions appear to preserve a transition from shallow subaqueous deposition in the north to deeper water turbiditic deposition in the south. This age also provides a minimum age for the migmatitic gneisses that underlie the greenstone belts.

A number of large tonalite-granodiorite plutons and subordinate granitic stocks, comprising the Cortège de Tasiast, are emplaced within and marginal to the greenstone belts. The tonalitic intrusions locally contain abundant xenoliths of amphibolitic metabasic rocks; these are shown as separate units on the geological maps.

The granodiorites and less common leucocratic granitic rocks are virtually contemporaneous. The two new isotopic ages for the granitoids of Bir Igueni and the Sous-cortège de Gleibat El Fhoud also *suggest that much of the plutonism was essentially coeval at about 2920 Ma (ages of 2912±36 Ma and 2933±16 Ma).*

Coarse-grained to pegmatitic muscovite-granite forms a series of small intrusions throughout the eastern part of the Tasiast-Tijirit Terrane (e.g. Khnéfissat). These stocks are the youngest of the various granitic intrusions. The pegmatitic phase (mostly as sheets and veins) locally carries Li, Be and Nb-Ta minerals. Several small foid-syenite intrusions with veins rich in sodalite were mapped in the centre of the Tasiast-Tijirit Terrane.

Various generations of dc-scale quartzofeldspathic pegmatites are common in the various gneisses and migmatitic gneisses. Early pegmatites are folded and the youngest veins are linear but cut by brittle fractures. The youngest pegmatites are micaceous and are spatially associated with leucogranite.

There are deposits of gold and iron and known occurrences of Au, Cu, Fe, Li, Be, U in the cratonic domain. Recently completed feasibility studies have shown the shearzone related and BIF-hosted gold deposits at the Aouéoua prospect in the Chami greenstone belt to be economically viable (>1Moz). The greenstone belt sequences are prospective for Au, Fe, Cu, Ni, W, Bi, Sb and other metals. There is significant potential for shear zone-related mesothermal gold deposits, notably within BIF units.

This is also a favourable setting for base-metal VMS, komatiitic nickel, porphyry copper and granitoid-associated lithophile element deposits.

The supergene-enriched Algoma-type iron formation deposits (oxide and subordinate silicate-carbonate lithofacies) of Lebzenia in the Lebtheiniye greenstone belt of the Chami district represent a substantial iron resource. All ultrabasic units are targets for Ni mineralization. There are recorded occurrences of beryl, tourmaline and amethyst in muscovite-granites and associated pegmatitic veins. This may indicate a limited potential for Be, Li and other REE-bearing minerals.

There are known occurrences of Au, Cu, Cr, Fe, Be, Li, U, sillimanite, rose quartz, fluorite, strontianite, and calcite within the Choum-Rag el Abiod terrane. The quartz mylonite shear zones are prospective for Au and W. The dunite-carbonate breccias have potential for hosting Au and PGM mineralization and the layered mafic intrusives for Cu-Ni and PGM's.

Extensive commercial exploration for diamondiferous kimberlites is taking place throughout the Rgueïbat Shield and a number of prospects occur within northern Mauritania. Small pyroxenite, meladiorite, lamprophyric and kimberlitic intrusions have been recognised and a recent announcement by Rex of the recovery of a diamond from a kimberlite dyke in the Tasiast-Tijirit terrane confirms the potential of the project area for primary diamond deposits.

The Nouadhibou-Choum-Zouerat railway with ready access to the coastal port facilities provides an opportunity for economic exploitation of high-volume industrial minerals such as ornamental dimension stone for an export market. Trial quarries have been opened close to the railway on a number of the basement lithologies including sodalite-bearing syenite, anorthosite, garnetiferous quartzofeldspathic gneisses and pyroxene-bearing gneisses.

Pegmatitic muscovite-granite (TSpg)

A distinctive, coarse-grained to pegmatitic muscovite-granite, forms a series of small intrusions throughout the Tasiast-Tijirit Terrane in the Sheet 2015. The type locality of this distinctive granite is around 20º46'56"N / 15º34'46"O. Here there are a number of large trenches into granite pavements.

The trenches were excavated in order to better assess the various exotic mineral phases that can be seen in exposed muscovite-rich pegmatites.

These intrusions can be recognised on satellite imagery due to their high reflectance, as they tend to expose as flat sheets devoid of vegetation. The granite is leucocratic and dominated by quartz and white feldspar with disseminated muscovite flakes.

However, its pegmatitic phase (that usually form sheets and veins) is characterised by a range of unusual lithium, strontium and beryllium minerals as well as opaques, tourmaline, biotite and red garnet. Muscovite books in the pegmatites are up to 1m in length. These are well exposed at the type locality. Secondary epidote gives the rocks a pale green colour. Smoky quartz crystals are present in the granite exposed at 20º29'59"N / 15º36'57"O. Offshoots from the granites cut into surrounding rocks (of the Chami Greenstone Belt). Locally the granites are strongly fractured.

Sous-cortège de Ndaouâs: Biotite-tonalite-granodiorites (TSgb, and including gneissic, foliated and xenolithic plutons, TSdb, TSdf, TSgx,)

The commonest intrusive rock in the Tasiast-Tijirit Terrane is biotite-tonalite that forms a number of very large plutons within and marginal to the greenstone belts (Figures 2.2 and 2.21). The tonalite is relatively well exposed and generally a pale pinkish-brown weathering, medium to coarse-grained, equigranular, massive rock (Planche 2.28). Quartz and plagioclase are the dominant minerals with biotite as the main mafic phase present in variable amounts. Magnetite blebs up to about 1cm in diameter are a minor phase. More common are white feldspar microphenocrysts up to about 0.5cm in diameter. In thin section (e.g. 201501037, 201501055, 201501066, 211501065) these rocks contain 3-8% olive to greenish-brown biotite, rare hornblende and accessory ilmenite, sphene (titanite), apatite and zircon.

Secondary minerals include muscovite, sericite, epidote calcite and sphene (after ilmenite). Small mafic xenoliths generally comprise less than 1% of the rock volume but are locally common as described below. Pink-weathering microgranite and white granite veins up to about 15cm thick are generally rare but are locally a major phase.

Secondary epidote infills shears and brittle fractures. Quartz veins and quartz-rich pegmatites are locally present. The tonalite is locally strongly foliated, for example in the northern part of the large

pluton in the centre of the Chami Greenstone Belt (at 20º41'N / 15º29'O). Quartz ribbons define the fabric with plagioclase grains deformed in the foliation to locally define an augen texture (SL fabric). SC fabrics are also locally present in deformed tonalite.

Amphibolites in migmatites (LbB)

There are numerous isolated exposures of amphibolite in migmatitic gneisses surrounding the main greenstone belts. These amphibolites are black to dark green in colour and locally blue-green weathering rocks that form ridges parallel to their penetrative planar fabrics. They vary from massive, speckled, medium grained rocks to colour banded (centimetre-scale) rocks to amphibole-schists. They are also locally migmatitic with discordant, quartzofeldspathic veins. The veins and any colour banding are folded, locally with an axial planar foliation. Hornblende is the main mineral component with variable amounts of plagioclase, quartz, opaques and secondary epidote, carbonate and chlorite. Sulphides are rare.

Ultramafites (Lbu, LbAu, LbSs, LbTs)

Ultramafic rocks (ultramafites) are very common in all the greenstone belts forming lenticular bodies aligned in the regional foliation. They are mostly schistose apart from a massive unit in the core of a major tight synform in the western half of the Sebkhet Nich Greenstone Belt. The larger ultramafites form low ridges or rounded hills commonly capped by massive birbirite and associated laterite. The ultramafites comprise fissile actinolite-schists, silver-blue talc-schists (Planche 2.25), blue-grey chlorite-amphibole-schists, talc-pyroxene pods, epidote-amphibole-schists, dark green hornblendites and grey-brown serpentinite pods in talc-schists. Individual lithologies commonly form pods elongated along shears. The various schists vary from fine to medium grained, equigranular rocks to rocks with randomly oriented acicular amphibole needles in a fine-grained matrix. Mm-thick silicified asbestos veins are present in some birbirites. Talc-schists commonly have more than one foliation with strong intersection lineations.

Exceptionally there is a massive, black, extremely competent ultramafic rock in the Sebkhet Nich Greenstone Belt. This thick unit helps defines a regional isoclinal fold in the western half of the greenstone belt. It has a stellate texture and was provisionally identified as a komatiite in the field. However, thin sections of this rock revealed (see Annexe 2) that metamorphic assemblages have replaced all of the primary minerals so it was not possible to confirm from the textural evidence that

these rocks are komatiitic. There are excellent exposures of this metavolcanic rock at 20º23’26”N / 15º11’14”O where it has a thin white weathered rind and fresh rocks have a vitreous appearance. The rock has a pitted, almost gossan-like appearance at 20º23’26”N / 15º11’14”O where tiny, interstitial carbonate? Grains have been removed by weathering.

Complexe de Çtel Ogmâne -gneiss tonalitique migmatitiqus (CO).

Migmatitic gneisses are generally exposed as pavements, whalebacks or small koppies and standing stones. Migmatitic gneisses also underlie Çtel Ogmâne, which is the largest bare rock mountain in the Chami area. These rocks are best exposed in the area between the Chami and Ahmeyim greenstone belts. There is a gradational contact from migmatitic gneisses into the Bir Igueni Granite with a gradual decrease in white felsic veining away from the granite.

The gneisses are intruded by biotite-tonalites and granodiorites. They tectonically, and locally unconformably, underlie the various greenstone lithologies, as shown on the schematic cross sections on the published Chami Sheet (Maurin et al., 1997). Migmatitic gneisses comprise a grey tonalitic gneiss host (palaeosome) cut by several generations of intersecting felsic (leucosome) veins, and by much less common metamafic dykes. The metamafic dykes are relatively late intrusions and cut most felsic veins. The veins mostly comprise over 20% of the rock volume.

Early quartzofeldspathic veins are folded with the gneissosity and later veins cut across these folds. All veins are curvilinear and cut by several generations of ductile and brittle shears (see below). The granitic neosome forms diffuse zones in the palaeosome as well as discrete veins and sheets. There are cuspate margins to the sheets. There is also locally a gneissic fabric in the larger granite sheets that is discordant to the gneissic fabric preserved in host tonalite gneisses.

However, patches of massive, undeformed granite within the palaeosome gneisses appear to be partial melts and lack any new fabric. There are also zones of ‘hybrid’ rocks in which neosome granite has pervasively invaded older gneisses. Locally the neosome has completely assimilated the older rock with a relict gneissosity as the only indication of the assimilation process. The main difference between these migmatitic gneisses and the Bir Igueni Granite is the lack of plastic deformation of the neosome veins and sheets in the Bir Igueni Granite.

The migmatitic gneisses show a number of classic textures (Mehnert, 1971) and these are illustrated in Planches 2.19 et 2.20. The most common texture is phlebitis (veined) where folded veins cut stromatic gneisses. The thicker quartzofeldspathic veins define ptygmatic and convolute fold structures, and mafic layers define surreitic (dilatational) structures. The grey gneiss palaeosome is generally coarse grained and massive. It is locally fissile in major shear zones where there is a lineation developed on foliation planes. The gneisses are locally mafic-rich (with common hornblende), notably adjacent to greenstone belt selvedges.

As noted above, there is a complex history of vein emplacement (at least 4 generations of veins) separated by periods of ductile shearing. The youngest (muscovite and biotite-bearing) pegmatites post-date the various episodes of ductile shearing, but are cut by brittle fractures. Metamafic dykes are up to about 1m in thickness and can be traced across the larger exposures for over tens of metres as weakly curviplanar features. They have sharp, discordant contacts with the host gneisses and the various felsic veins. The metamafic dykes are fine to medium grained, equigranular amphibolites. Larger migmatitic gneisses exposures have an antiformal or dome-like aspect. For example, the huge inselbergs at Çtel Ogmâne form the core of a large dome structure mantled by amphibolites.

Quartzofeldspathic pegmatites containing biotite, red garnet and magnetite are the youngest phase (apart from the mafic dykes of the great NE-dyke swarm) in the migmatitic gneisses.

Weakly veined tonalite gneisses forms mappable units, notably in the northwestern part of the Tasiast-Tijirit Terrane. The gneisses are exposed in a series of whalebacks, pavements, low ridges and flat pavement in dry valleys e.g. at 21º 01’ 19”N 14º 58’ 06”O. A regular (stromatic) gneissosity on a mm- to cm-scale is defined by felsic seams and parallel biotite/hornblende seams and lenses. There are aligned amphibolite lenses in the gneissosity and minor discordant white felsic veins, including pegmatites (that are locally garnetiferous).

Various ductile and brittle shears are variably developed. The metamafic (amphibolite) dykes seen in the migmatitic gneisses are also locally found in the grey gneisses where they are up to 50cm in thickness. There are two linear, N-S belts of medium to coarse-grained, pale grey and white stromatic gneisses on either side of the Kreidat and Chami greenstone belts. These migmatitic gneisses are very distinctive rocks with a regular gneissosity on a millimetre- to centimetre-scale accentuated by parallel white felsic veins up to about 30cm in thickness and which comprise between about 10% and 50% of the rock volume.

The gneissosity and veins can be followed for tens of metres across large rock pavements parallel to the mean trends of the two outcrop belts. However, there are tight intrafolial folds within the gneissosity. Seams containing red garnet grains are locally present. The gneissosity forms an axial planar fabric to cuspate folds defined by discordant fine-grained amphibolite sheets. Pink-weathering granitic veins that are locally pegmatitic (offshoots from the pegmatitic granites) cut the gneissosity. Ductile shear zones are ubiquitous to all exposures. A biotite foliation is axial planar to isoclinal folds of the gneissosity. The gneissosity is clearly a relatively late fabric, and is interpreted as related to the parallel ductile shearing pervasively developed through the western half of the Tasiast-Tijirit Terrane.

The migmatitic orthogneisses of the Complexe de Çtel Ogmâne (5 samples) yield a more restricted range of SiO2 contents (72.16-74.7%) that as a group are consistently more silicic than the Complexe d’Amsaga gneisses (Tableau 2.2; Annexe 3). Conversely, Fe, Mg and Ti contents are generally lower. The total alkalis fall within the range 6.9-8.35% and all samples plot within the rhyolite field on the TAS diagram (Figure 2.4). The chondrite-normalised REE profiles are slightly steeper which is largely a reflection of lower HRE values (Tb-Lu: 4.0-0.6). In general these granitoid gneisses have a similar *derivation but appear more fractionated than those of the Complexe d'Amsaga. They constitute a calc-alkaline magmatic arc crustal protolith.*

The map in the figure below shows the main geological units, structures, mineral occurrences and geological lineaments observed within the area of the permit.

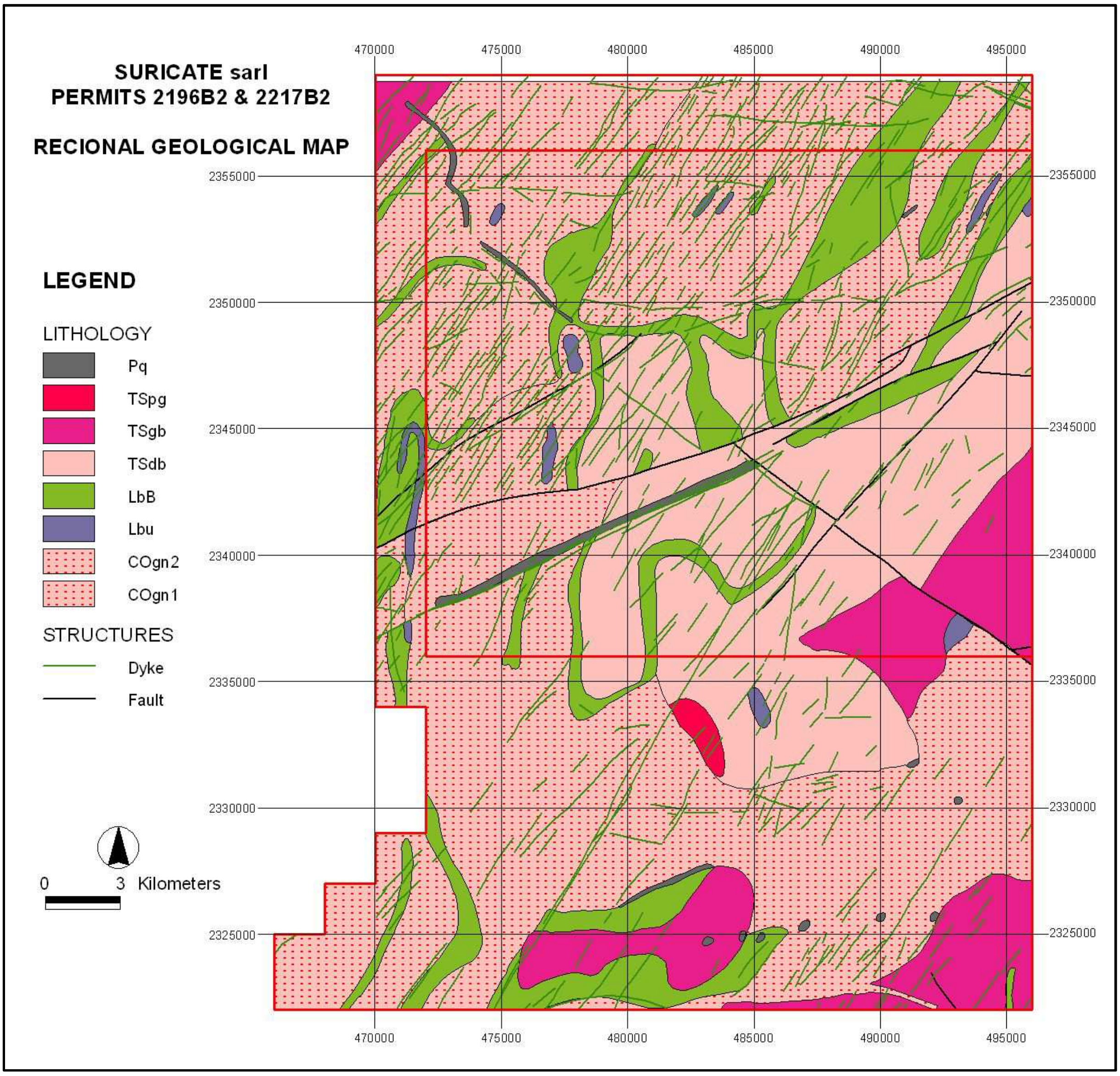


FIGURE3: DETAILED GEOLOGICAL MAP

2.2. GEOPHYSICAL DATA

2.2.1. THE MAGNETIC DATA

The magnetic data have been widely used in mineral exploration to detect structures which may be linked to phenomena that have marked the geological history of the area and have accordingly relations with the mineralization enrichment phenomenon.Many types of images can be produced from the magnetic data which are now routinely acquired for regional geological studies and mineral exploration.

Different images enhance different features that enable the informed regional/exploration geologist to make full use of the data. Unfortunately, not all of the image types are readily available to the geologist, so vital geological information may remain untapped.

The airborne magnetic raw data covering the area of the permit was collected and processed with GEOSOFT software to give birth to a set of products grids which could assist in the interpretation of these data. These include:

- ***TOTAL MAGNETIC INTENSITY (TMI)***

This component provides a snapshot of the magnetic signature of various formations constituting the permit. The regional response is also present in this component.

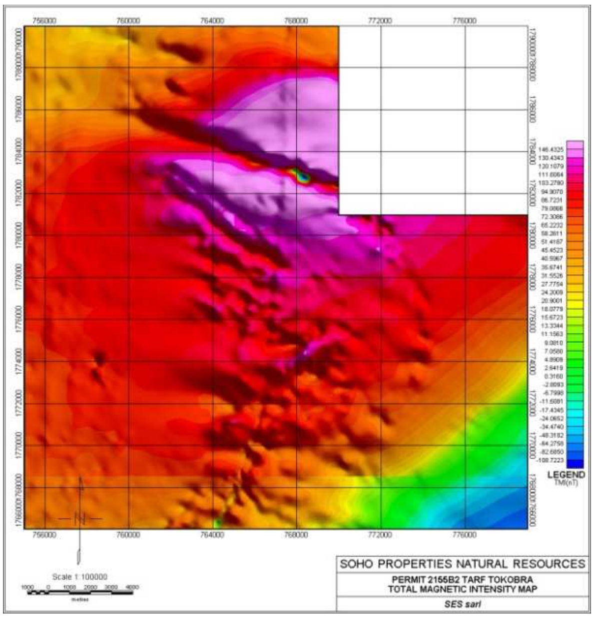


FIGURE 4: TOTAL MAGNETIC INTENSITY MAP

- ***THE TMI VERTICAL DERIVATIVE (TMI-VD)***

Vertical and horizontal Derivative of the magnetic field can better draw the lines between the different magnetic and non-magnetic entities and to draw the linear magnetic features.First vertical derivative data have become almost a basic necessity in magnetic interpretation projects. The second vertical derivative has even more resolving power than the first vertical derivative, but its application *requires high quality data as its greater enhancement of high frequencies results in greater enhancement of noise.*

The lineaments observed on the TMI-VD map were drown. These lineaments may correspond to structural features such as faults, dykes and veins.

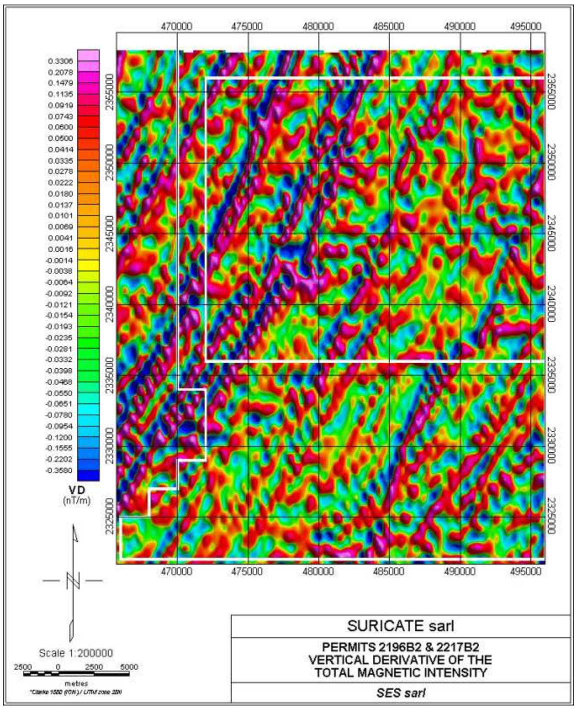


FIGURE5.A: TMI VERTICALDERIVATIVE

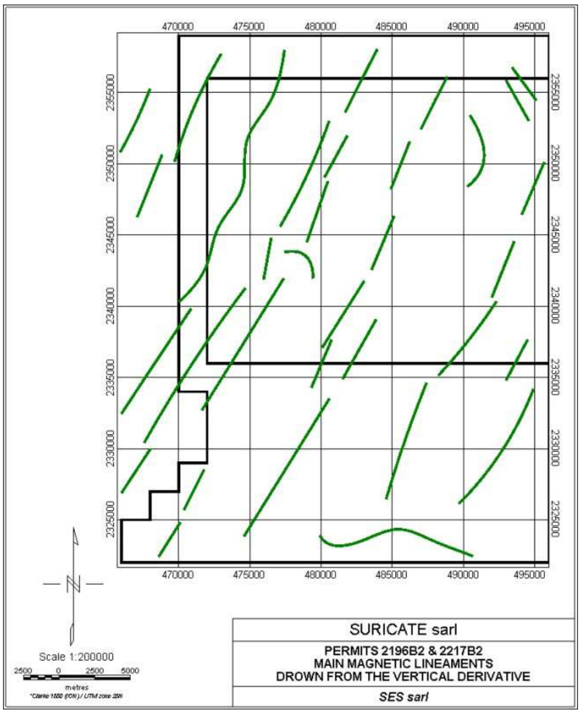


FIGURE5.B: MAIN MAGNETIC LINEAMENTS

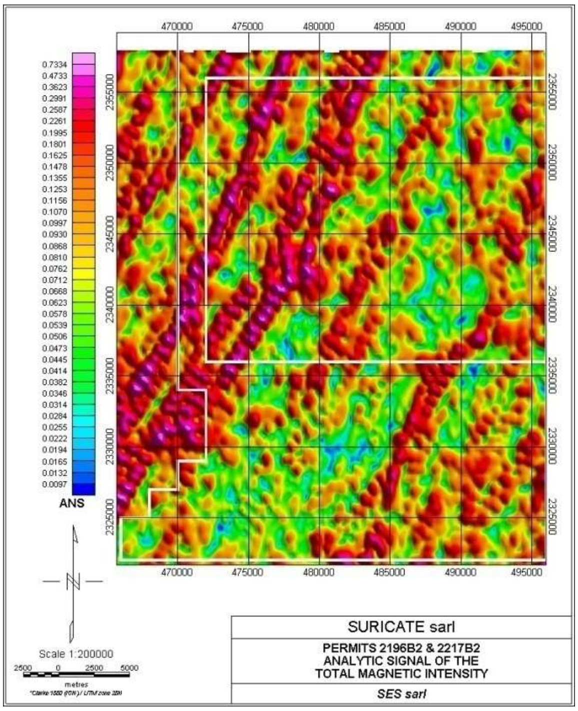
- ***TMI ANALYTIC SIGNAL (TMI-ANS)***

The analytical signal is a product to focus and accentuate the effect of shallow magnetic bodies and to reduce the regional anomaly. Analytic signal maps and images are useful as a type of reduction to pole, as they are not subject to the instability that occurs in transformations of magnetic fields from low magnetic latitudes.

They also define source positions regardless of any remanence in the sources.

In many contexts, the analytic signal of the magnetic intensity field gives the extension and the shape of the shallow magnetic bodies. High values of the TMI-ANS are often in good correspondence with the outcropping and shallow magnetic formations.

The TMI-ANS map was used to draw the contours of the main magnetic anomalies observed on the area of the permit.



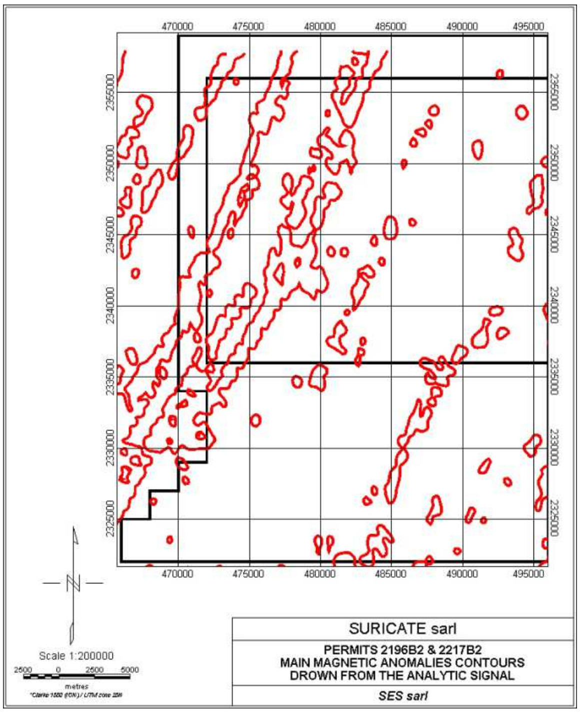


FIG6.A: TMI ANALYTIC SIGNAL *FIG6.B: ANOMALIES LIMITS DROWN FROM THE ANS*

FIGURE 7: SYNTHETIC GEOPHYSICAL MAP

2.2.2. THE RADIOMETRIC DATA

The airborne radiometric data derived from the geophysical survey realized by Fugro in 2006 over the southern part of the country was collected and processed using Geosoft software.

This process gave birth to a set of grids and maps such as:

- *Uranium map (ppm);*
- *Potassium map (%);*
- *Thorium map (ppm).*

These three grids were combined to produce the ternary image of the main radioactive elements (U, Th, K) of the area of the permit.Radiometric ratios were also used (mainly the Th/K) for the representation of the areas eventually favorable to contain hydrothermal enrichment mineralization.The radiometric data is a useful tool for the geological mapping purpose while it gives the content of the surface rocks in main radioactive elements.

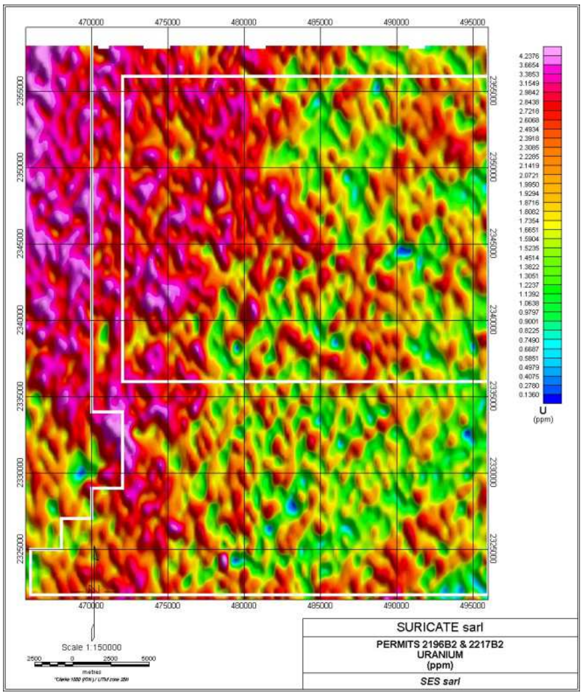


FIGURE 8..A: URANIUM MAP

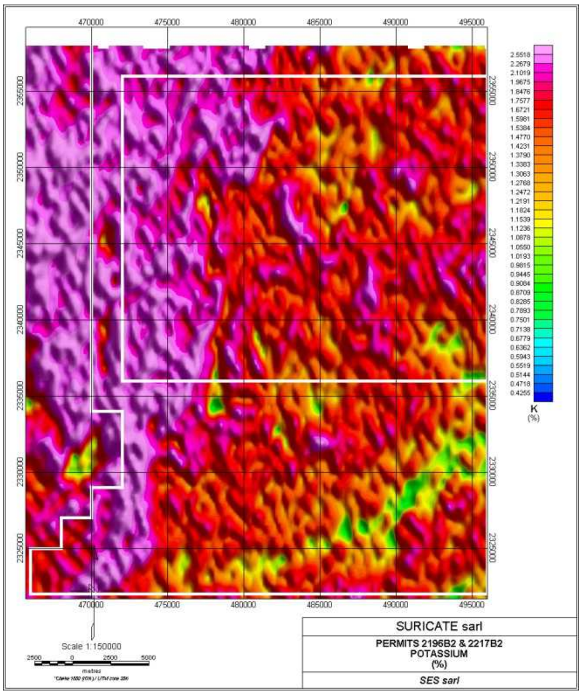


FIGURE8.B: POTASSIUM MAP

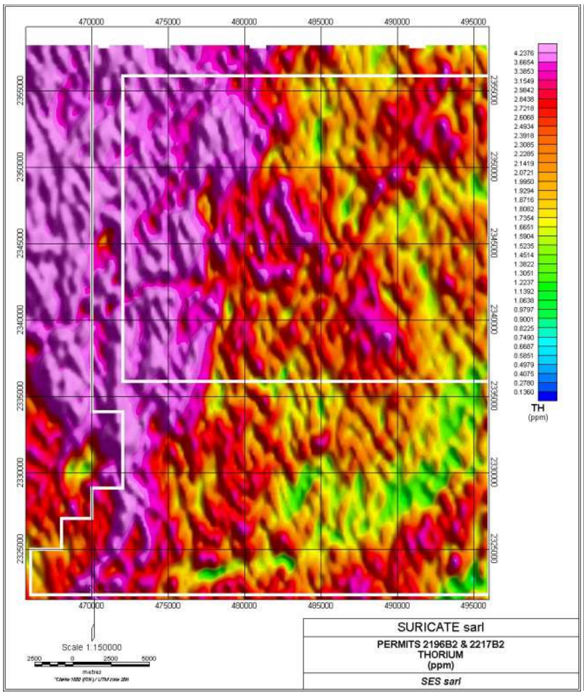


FIGURE 8.C: THORIUM MAP

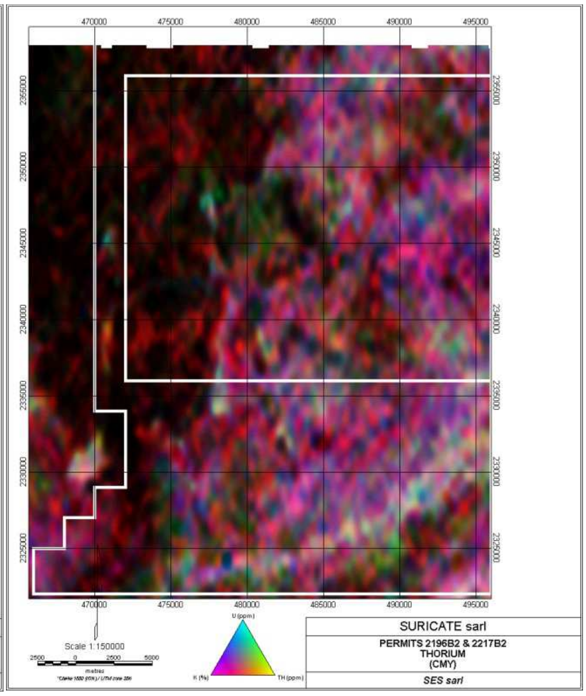


FIGURE 8.D: TERNARY IMAGE

2.3. SATELLITE IMAGERY

Satellite imagery enables the investigation of the properties of the earth surface in remoteareas and over large areas through the mapping of physical properties from satellite basedsensors. Optical imagery delivers information about land-use, water features and surfacerocks. Microwave radar imagery maps surface roughness when back-scattered at hardsurfaces and paleo-drainage when penetrating dry sand cover.

The interpretation of satellite imagery can assist in the planning of surface geological surveysthrough assessment of logistic and data quality risks early in the planning. Interpretation of satellite imagery can provide estimates of thesource and receiver data quality and static corrections.

Consistent geological models can begenerated from the interpretation of satellite imagery for geomorphological and lithostructuralproperties integrated with geological and geophysical data.

Multi-band images use three or more bands combined in continuous colour or red-green-blue(RGB) images. RGB images provide significantly more shades than single or dual bandimages: for 8 bit imagery an arithmetic combination of 3 bands provides 256 shades whereasan RGB image offers 16.8 million colors (Guo et al., 2008).

The landsat TM7 images covering the area of the permit were acquired and processed to produce a false color image with 7, 4 and 1 bands combination. This image is shown on the figure below.

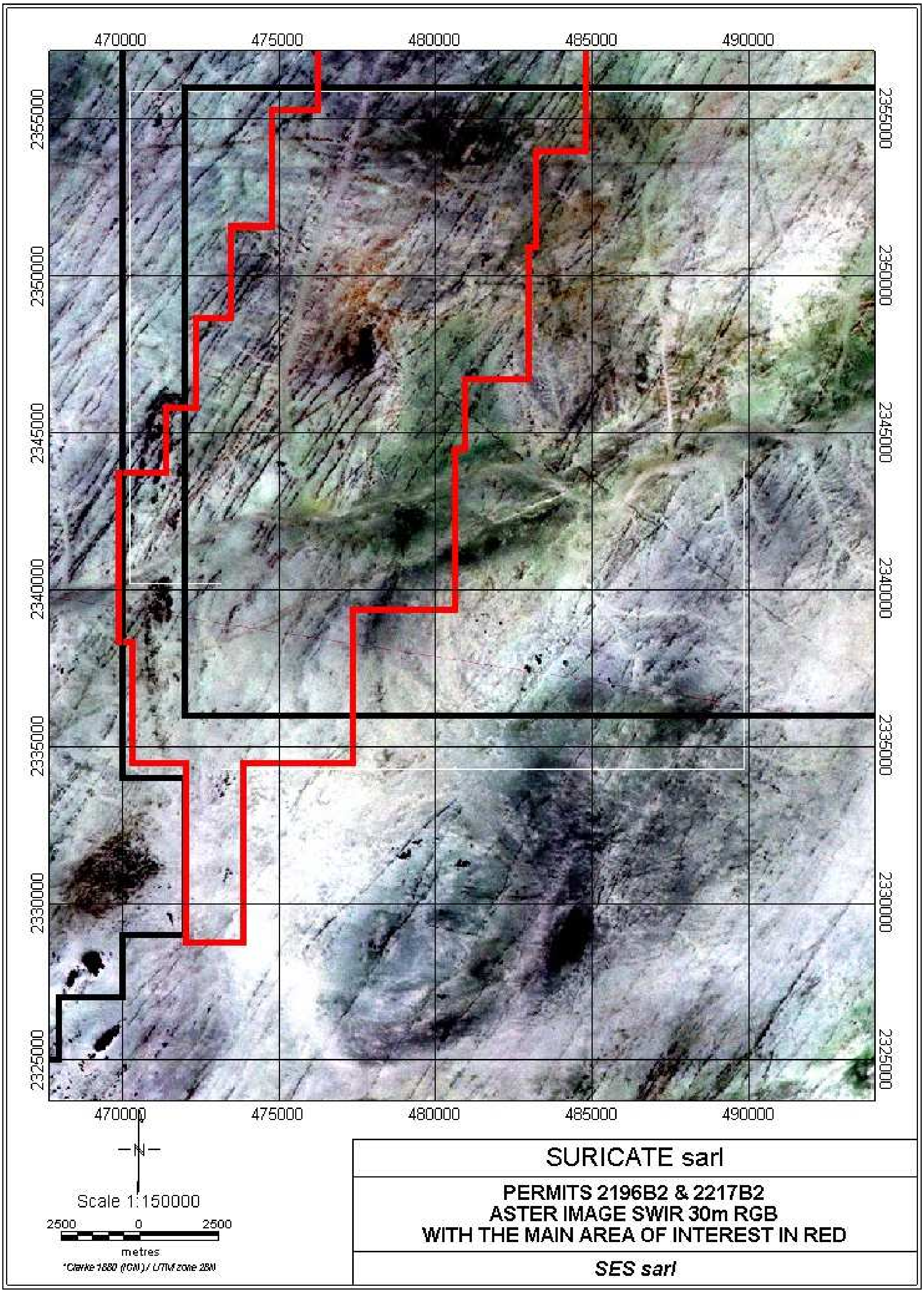


FIGURE 9: FALSE COLOR 7, 4 & 1 BANDSCOMBINAITION IMAGE

2.4. MINERAL POTENTIAL

Introduction

Archaean granite-greenstone terrains host a wide variety of metalliferous mineral deposits worldwide. The deposit types that are known or likely to occur in that part of the Rgueïbat Shield that underlies the north-western part of the project area are reviewed in turn. For each class known, occurrences are described, previous exploration activities are summarized and the potential for undiscovered deposits is assessed. In addition, key exploration criteria and guidelines are identified.

Considerable exploration has previously been carried out over the greenstone belts of the Rgueïbat Shield. Gold has been the focus of most attention in recent years, chiefly in the Tasiast, Tijirit and Ahmeyim belts, where there has been considerable exploration success at some prospects. In addition there has also been significant exploration for diamonds in the Archaean craton in Mauritania. However, this has yielded less promising results in the project area than in other sectors of the Rgueïbat to the north-east. In addition, limited investigations have also been carried out for a range of other metals including copper, iron, chrome, nickel and rare metals.

Mesothermal gold deposits

Background

Archaean greenstone belts are major sources of gold, with important production in several countries, notably Australia, Canada, Zimbabwe, India and Brazil. Archaean greenstone belts account for almost 20% of cumulative world gold production and contain some very large deposits or clusters of deposits (Robert and Poulsen, 1997). More than 220 gold deposits containing more than 1 tonne of gold are known in the Archaean Superior and Slave cratons in Canada and 14 of these are contain more than 100 t of gold. The Yilgarn craton in Western Australia has more than 160 deposits containing more than 1 tonne of gold of which 15 have more than 100 t.

The majority of gold deposits in Archaean greenstone belts may be classified as mesothermal (Hagemann and Cassidy, 2000). They are mostly quartz-vein-related, gold-only deposits found in low- and medium-grade metamorphic terranes in deformed supracrustal rocks. Disseminated and replacement styles of mineralisation are also developed in some deposits. Their locations are structurally controlled and, although they are hosted by all lithologies of granite-greenstone terrains, they have no consistent spatial or temporal relationship with igneous intrusive activity. The gold mineralization may be continuous over extensive lateral and vertical distances although high-grade ore shoots are sporadic and typically smaller, with maximum dimensions of a few metres or tens of metres. The deposits are characterised by high Au/Ag ratios and carbonate alteration of the wallrocks. There is no consensus on the source of the hydrothermal fluids responsible for these deposits. Metamorphic devolatilisation, fluid release from felsic intrusions and mantle sources have been suggested by various others (Bohlke and Kistler, 1986; Colvine et al., 1988; Cameron et al., 1989; Hodgson, 1993).

Mesothermal gold deposits occur in belts dominated by volcanic sequences (especially magnesium-rich volcanic and intrusive rocks, commonly komatiites) and others dominated by clastic sedimentary rocks (Hodgson, 1993). Many deposits in the latter group are Mesozoic in age, although deposits hosted by Precambrian banded iron formation (BIF) are an important sub-group.

Banded iron-formation (BIF)-hosted gold deposits fall into two categories: stratiform and non-stratiform (Kerswill, 1993). Stratiform deposits are located in thin, laterally continuous sulphide BIF units that are conformably interlayered with barren (carbonate or silicate) BIF and clastic *sedimentary rocks. They are relatively rare, but may form large, high grade (ca. 10 g/t) deposits. The gold occurs in discordant quartz veins or as disseminations with pyrite and arsenopyrite. The most important deposits are Morro Velho, Brazil, Homestake, USA and Lupin, Canada. Both Homestake and Morro Velho have produced several hundred tonnes of gold since production started in the nineteenth century.*

Non-stratiform deposits have more similarities with typical mesothermal lode gold deposits. They are much smaller in size and the distribution of ore is controlled by veins and/or late structures (Kerswill, 1993). They are clearly epigenetic in origin with the associated iron sulphides, pyrrhotite and pyrite, commonly less deformed than their host rocks and formed by replacement of pre-existing iron minerals such as magnetite. Non-stratiform BIF-hosted gold deposits are relatively common, although they are more difficult to evaluate and to mine than stratiform deposits. Numerous deposits of this type are found in Western Australia and Canada, with some examples in Zimbabwe and Brazil.

The typical ore mineralogy of non-stratiform BIF-hosted gold deposits is native gold, pyrite, arsenopyrite, magnetite and pyrrhotite, with subordinate chalcopyrite, sphalerite, galena and stibnite. The gangue mineralogy is dominantly quartz, chert, and carbonates (calcite, dolomite, ankerite) with graphite, grunerite, stilpnomelane, tourmaline and albite being important in some examples.

Previous work

Between 1993 and 1996 the Office Mauritanien des Récherches Géologiques (OMRG) and BRGM carried out gold exploration in the Tasiast–Tijirit region with funding from the European Union. Studies in the first two years of the programme included 1:50,000 scale geological mapping and regional soil geochemistry, concentrating on the greenstone belts. Extensive, multi-site geochemical anomalies were identified in the Aouéouat area of the Chami greenstone belt and in 15 other zones. Follow-up work, involving detailed soil sampling and trenching, confirmed the presence of significant anomalies at 10 sites, with the best located in the Aouéouat area.

Subsequently, between 1996 and 2001, Normandy La Source Development SAS carried out extensive exploration over the greenstone belts of Chami, Khnéfissat and Hadeibt Agheyâne in Sheet 2015 (Chami). Primary exploration by manual or deep mechanical auger sampling and associated rock sampling identified geochemical anomalies in several areas many of which were subsequently explored by trenching and drilling. Airborne geophysical surveys, both magnetic and multi-channel radiometric, were also flown by Normandy LaSource over the Chami and adjacent greenstone belts (Figure 4.2). The aeromagnetic data provides clear discrimination of the Banded Iron Formations including their extensions beneath sand cover.

This survey also provides significant additional geological information, for example, clearly delineating metagabbro dykes trending between 005° and 020° that are widespread in Sheet 2015 (Chami). (Figure 4.2). These dykes are locally offset by late faults trending approximately east-north-east as, for example, at the south-western end of the Chami greenstone belt, around 20° 23’N, 15° 35’W.

RC or RAB drilling (total ca. 32,000 m), normally to depths not exceeding 100 m vertical, was carried out on the most promising anomalies, with selected targets investigated by limited diamond drilling (3,300 m total). Recommendations were made in 2001 for follow-up in several areas of the Chami greenstone belt and its continuation beneath sand cover to the south (Normandy LaSource Mauritanie, 2001). However this work was not carried out as Normandy LaSource withdrew from Mauritania in 2002.

Tasiast deposit, Chami Greenstone Belt

The most significant discovery made by Normandy LaSource, with potential for an economic deposit, occurs in the Aouéouat sector of the Chami greenstone belt where anomalous gold values occur over a strike length of about 20 km (Figure 4.2). Two main target zones were identified in a north–south zone of sheared BIF: the Branche Est over a strike length of 5 km and the Branche Ouest over 2 km. The most significant mineralisation occurs in the Branche Est where Normandy LaSource estimated potential for the occurrence of 1–2 million ounces of gold in ore grading more than 2 g/t. In the Branche Est encouraging intersections exceeding 30 m thickness (downhole) with grades in the range 2–5 g/t were reported in several boreholes by Normandy LaSource (2001). Little testing of depths greater than 100 m was carried out at that stage.

Three main mineralised zones were identified in the Branche Est: the Colonne Piment, South Piment and North Piment, each including 2-3 high-grade ore shoots. Together these zones constitute the Tasiast gold deposit (Plates 4.1 and 4.2).

In mid-2002 Strata Mining of Australia acquired the Tasiast project from Normandy LaSource, including exploration permits covering approximately 5000 km2 in the Tasiast, Tijirit and Ahmeyim belts. Ownership then passed to Midas Gold plc, a company set up by Strata to take the project forward to feasibility. Midas carried out a programme of infill drilling in the first half of 2003 comprising approximately 26,000 m of RC drilling (303 holes) and 1976 m of diamond drilling (29 holes) in Branche Est. This programme defined significant gold mineralization over a 4 km strike length. Later in the same year Defiance Mining Corporation of Toronto, Canada acquired Midas Gold. Drilling results reported by Defiance from the Colonne Piment zone define a 20-25 m wide oxide orebody, exposed at surface, and extending to depths of approximately 40 m. There appears to be some supergene enrichment with intercepts of 43.5 m @ 22.1 g/t and 30.0 m @ 12.2 g/t, both measured from surface. In October 2003 Defiance announced an updated resource estimate (measured + indicated) for Tasiast totalling 12.07 Mt @3.06 g/t at a 1.0 g/t cut-off, for a gold content of 1.185 Moz gold (Defiance Mining Corporation, 2003).

In addition, an inferred resource of a further 12.4 Mt @ 2.3 g/t Au was announced, also using a cut-off grade of 1.0 g/t Au. Results of metallurgical test work were announced in January 2004: overall gold recoveries using gravity separation and cyanide leaching are in the range 94–95% for both oxide and sulphide ores forming the various mineralised zones. In the same month the Government of Mauritania awarded Defiance an exploitation permit covering 312 km2 allowing all construction required for the development of the project.

Further drilling by Defiance in early 2004 was carried out to test strike extensions between the individual orebodies and to delineate the vertical extent of high grade shoots beneath one of the proposed open pits. The results of this drilling announced in May 2004 traced one of two known high-grade shoots to a vertical depth of 230 m with intercepts including 12 m @ 7.3 g/t beginning at a downhole depth of 247 m, and 9 m @ 18.2 g/t beginning at a downhole depth of 240 m (Defiance Mining Corporation, 2004a).

SNC Lavalin Inc. completed a bankable feasibility study of the Tasiast project in April 2004 (Defiance Mining Corporation, 2004b). The outcome of this study was positive and supported the viability of an open-pit operation producing an average of 1.12 Mt per annum of ore, over a minimum life of 8 years, based on a reserve (proven and probable) of 9.0 million tonnes @ 3.06 g/t Au. In the first three years, due to accelerated production of the oxide ores, the project would produce 110,000 ounces per *annum. In subsequent years annual production would be approximately 102,000 ounces. The total capital cost of the project would be US$48 million equating to an average cash cost of US$226 per ounce.*

In September 2004 Rio Narcea Gold Mines Ltd acquired Defiance Mining Corporation including all its interests in Mauritania. At that time Rio Narcea announced plans for further drilling and for mine construction to commence before the end of 2004. Production was expected to commence in early 2006 (Rio Narcea Gold Mines Ltd, 2004). The Aouéouat sector is underlain by a sequence of Archaean age comprising epiclastic rocks, quartzites, BIF, pelitic and semipelitic schists, occasional thin cherts and metafelsic volcanic rocks that strike approximately north–south and dip steeply towards the east. The epiclastic rocks are schistose and highly silicic, with sporadic crystals of blue and white quartz,

plagioclase and biotite and lithoclasts up to about 1 cm in size. The principal host to the ore is oxide BIF that comprises ferruginous quartzite well banded on a mm–cm scale, sometimes interbedded with pelitic schists, commonly garnet-bearing.

The metafelsic volcanic rocks are fine-grained, glassy and range in composition from rhyolitic to dacitic. The major host rock is BIF although minor mineralisation also occurs in the politic schists, dacite and epiclastic sediments. The depth of the oxidation zone is about 50 m. Below this level fresh rock appears over a short distance with no significant transition zone. Major steeply inclined to vertical ductile shear zones trending approximately north–south exert important control on the location of the mineralisation, not only acting as a fluid conduit but also juxtaposing lithologies of contrasting physical and chemical properties to create favourable traps for mineral deposition. The shear zones are relatively late in the evolution of the greenstone belts, belonging to the D5 event recognised in the mapping (Pitfield et al., 2004).

All lithologies are highly deformed, although the effects are most conspicuous in the BIF where the fine banding clearly shows boudinage, small-scale tight folding and shearing. Multi-phase quartz and carbonate veinlets are widespread but vary greatly in abundance and time of emplacement relative to deformation. Colourless amphibole (grunerite) is common and widespread in the mineralised BIF but is not always easy to identify in hand specimen. Minor tourmaline and sericite occur in proximity to quartz veins in the metafelsic volcanic rocks.

After magnetite, pyrrhotite is the most abundant ore mineral in the mineralised BIF, varying greatly in abundance, locally up to about 10 vol % over 1 metre. It commonly replaces magnetite but has several modes of occurrence. Early pyrrhotite occurs in association with quartz veins, both in pressure shadows and infilling extensional cracks. In later stages it is associated with, and marginal to, narrow sinuous quartz and carbonate veinlets a few mm thick.

With increased disruption by small-scale folding and shearing, quartz±carbonate veining is more prominent, together with an associated increase in pyrrhotite. Arsenopyrite and pyrite are widespread minor phases. Chalcopyrite and traces of graphite have also been reported in mineralised drillcore in some areas. Overall, there appears to be a good correlation between sulphide abundance and gold grade. Gold tenor is also reported to correlate with increased intensity of shearing, but a detailed study of mineralisation, deformation and assay data are required to verify this independently.

Each deposit comprises high-grade shoots plunging towards the south with an average dip of about 25° within BIF that itself is dipping towards the east at 55–70°. These shoots are located within an envelope of discontinuous low-tenor gold mineralisation of variable grade. The controls, on the distribution of grade in and around the shoots, are not well understood. In the course of this project *limited petrographic and mineralogical studies were carried out on thirteen samples from the Chami greenstone belt (Appendix 2). Eleven of these were drillcore specimens from the main mineralised area, Branche Est, while the other two were from occurrences C6-7 and C23E. In most samples metallic phases, principally pyrrhotite and magnetite, comprise between 5–15% of the rock by volume, associated with grunerite and carbonate The BIF comprises recrystallised psammitic and semipelitic rocks of sedimentary origin, finely banded on a scale of a few mm to 1–2 cm. The bands comprise dark fine grained quartz-magnetite rich layers alternating with grunerite-carbonatequartz±garnet±biotite bands that are paler in colour, buff to pale yellow-green.*

Dark politic layers, locally with abundant garnets, are commonly intercalated with the BIF. The appearance of the deformation in the BIF is accentuated by the development of thin (<1 mm) selvedges of grunerite along the contacts between bands of contrasting composition. Pyrrhotite is concentrated in the grunerite-carbonate-rich layers as streaks and patches parallel to the foliation, although, as mentioned above, it also has several other modes of occurrence, including irregular monomineralic patches and veinlets discordant to the banding, patchy replacements of magnetite, and discontinuous patches and streaks within or marginal to discordant quartz±carbonate altered zones.

Gold was identified in four of the samples studied from the Branche Est zone. In these samples the gold grains are located either within or partially enclosed by pyrrhotite, or in magnetite that has been partially replaced by pyrrhotite. It also occurs in close content of three gold grains analysed ranges from 7–11 wt%. In general the outcrop of the BIF is conspicuous on images of aeromagnetic data, although there are at least two zones of low magnetic intensity within the BIF outcrop in the Aouéouat belt. These include one area about 2 km in length in the vicinity of the Branche Est zone and another of similar size about 10 km farther north. In the latter a conspicuous discordant north-east-trending fault cuts the BIF, but the area is devoid of known significant mineralisation. It is difficult to account for the demagnetisation in these zones and there is no evidence for underlying igneous intrusions. Furthermore observations of magnetic susceptibility made on drillcore from the Branche Est zone indicate very high values, generally in the range 100–800 x 10-3 SI measured on flat surfaces of drillcore, for the BIF.

Intercalated pelitic schist and underlying felsic metavolcanic rocks give values less than 1 x 10-3 SI.

Other gold occurrences in the Chami Greenstone Belt

Several other extensive geochemical anomalies in proximity to, or along strike from, theBranche Est zone, were drilled by Normandy LaSource between 1997 and 2000. Theseinclude anomalies C6-7 (and Fennec, its northern extension), C6-8 (E and W), C6-12, C6-9S, C6-14 and C6-15 all of which share similar geological and structural settings to the mainTasiast deposit (Figure 4.2). The majority of these anomalies are closely associated with BIFwhich exhibits conspicuous high-tenor elongate aeromagnetic anomalies, both whereexposed at surface and where buried beneath superficial deposits. The key features of theseanomalies and the results obtained by Normandy LaSource are summarised in Table 4.2.

Exposure at these prospects is generally sparse and the exploration trenches are now filledwith sand. Rock debris excavated from the trenches provides a general overview of thelithologies and style of mineralisation and veining present.Anomaly C23 is located near the northern end of the Chami greenstone belt (Figure 4.2),close to the contact between amphibolites to the west and granodiorite to the east.

Twoparallel major regional faults trending north-north-east are mapped close to the prospect.Anomalous gold values in soil samples extend over an area about 5 km in length and up to1.5 km wide, with the highest value of 440 ppb located at the strongly deformed contactbetween the amphibolite and the granodiorite. Trenching and RC drilling (10 holes, 510 m)revealed a sequence of gneisses, interpreted as epiclastic or sedimentary in origin, andamphibolites (fine-grained metabasalts) together with possible felsic intrusive, passingeastwards into the feldspar-biotite-amphibole gneiss of granodioritic composition.

Deformation is strong throughout with numerous shear zones trending about 035° especiallyconspicuous in the amphibolites. Silicification and quartz veining/stockworking are widelyobserved throughout C23, in association with tourmaline, iron oxides, boxworks and tracesof chlorite, biotite and magnetite. Banded chert with epidote and garnet and oxidized disseminated pyrite occurs locally. Minor felsic intrusions, up to 60 m wide, occur in thecontact zone between the amphibolites and the supracrustal gneisses. These are silicified andhave secondary disseminated biotite, pyrite, magnetite and sericitised feldspars. Thisalteration is similar to potassic alteration found in the porphyry environment. A late stage ofepidote alteration post-dates the biotite. The gold appears to be related chiefly to weakphyllic alteration (quartz-sericite-pyrite) in the orthogneiss (granodiorite), with the potassicalteration concentrated in aplite and quartz-porphyry in the contact zone. Geochemical datafrom the drilling revealed sporadic low tenor Au mineralisation within the orthogneiss.

Thebest intersections were 1.5 m @ 1.01 g/t and 1.5 m @ 1.91 g/t.In the present study visible gold was observed in quartz vein float found in proximity totrenches excavated in orthogneiss on the east side of the C23 prospect. This sample (2015-03050, Appendix 2) comprises a heterogeneous, brecciated and fractured vein composed offine-grained massive pale grey quartz with irregular, mm–cm scale patches and fracturefilling of secondary iron oxides, commonly with malachite coatings and cavity fills andminor chalcocite.

LaSource concluded that the C23 anomaly required further investigation by drilling toexplain the observed geochemistry and alteration. A comparison was made between the styleand setting of this mineralisation and that of the Big Bell deposit in Western Australia.

Gold occurrences in other greenstone belts in Sheet 2015 (Chami)

On the basis of previous exploration by OMRG and BRGM and the success of NormandyLaSource in the Chami greenstone belt, GGISA acquired a licence (M46) over an area of1180 km2 of the Lebzenia greenstone belts in the western part of the Chami map sheet(General Gold International, 1998a and 1999a) (Figure 4.3). They carried out regionalmapping and rock chip and soil geochemistry, together with detailed soil auger samplingover anomalies at the Rusty and Lebeznia West prospects (Figure 4.1). At the former a zoneof weakly anomalous gold values extends over about 500 m in an area underlain by a narrowtightly folded sequence of mafic volcanic rocks and BIF. The maximum Au value in rocksamples was 105 ppb in a rusty stained quartz vein sample. The Lebzenia West prospect islocated in a structurally complex zone underlain by greenstone. Only one anomalous Au value wasidentified in follow-up sampling in this zone. The tract of ground 1800 m widebetween the two prospects and underlain by favourable lithologies remains untested.

Mineralisation in the C5-1 zone of the Hadeibt Agheyâne belt (Figure 4.1), about 25 km westof the main Chami belt, is not associated with BIF. Low tenor Au enrichment (up to 9.6 m at1.54 g/t Au) occurs mainly in quartz veins at sheared contacts between amphibolites andfelsic intrusive rocks. Potassic alteration (biotite, minor K-feldspar) and minor disseminatedpyrrhotite and pyrite are associated with the gold mineralisation. This style of mineralization is similar to that identified *elsewhere (C6-2, C6-11, C6-12 and C23) in the greenstone beltsof the Chami map-sheet and is considered to have low economic potential.*

Normandy LaSource also undertook preliminary work in the Khatt-Attoui and Tasiast South(Figure 4.3) permits in the south of the Chami sheet where aeromagnetic data show that theChami greenstone belt extends beneath sand cover. This work involved chiefly top-ofbedrocksampling using a powered auger drill. In many cases soil anomalies previouslyidentified in regional surveys were not verified. However, sampling on a 500 x 200 m gridacross anomalous magnetic features led to the identification of the Anomalie N'Derek whereanomalous Au values were found over an area about 5.5 km in length and up to 1.7 km wide(Figures 4.1 and 4.2). Eleven RAB holes, totalling 537 m, were drilled to investigate thegeochemical anomalies. Sporadic, discontinuous mineralisation exceeding 0.5 g/t Au wasintersected in a sub-horizontal sequence of amphibolites and epiclastites.

The best resultswere 12.0 m @ 0.73 g/t and 2.4 m @ 3.33 g/t.Normandy LaSource also carried out reconnaissance gold exploration in the N'Daouasspermit (Figure 4.3), a large area on the eastern side of the Chami sheet, covering, in itssouthern part, the buried northern extension of the Sebkhet Nich greenstone belt andextending to the narrow belt of exposed greenstones that runs from the central part of theChami greenstone belt towards the north-east corner of the sheet 2015. In the southern sectoraeromagnetic data indicates that that the greenstones extend north beneath the dunes of theAzefal belt. However 95% of the anomalies are covered by sand and most are of lowamplitude or poorly defined. No further work was carried out because of the poor results andthe inaccessibility of the area. Reconnaissance soil sampling was conducted over the outcropof the greenstones in the northern part of the N'Daouass permit, with a more detailed grid(results not available to the author) over the most anomalous site (163 ppb Au).Noanomalous Au values were reported in rock chip samples from the N'Daouass permit.

Potential for mesothermal gold in the Rgueïbat Shield

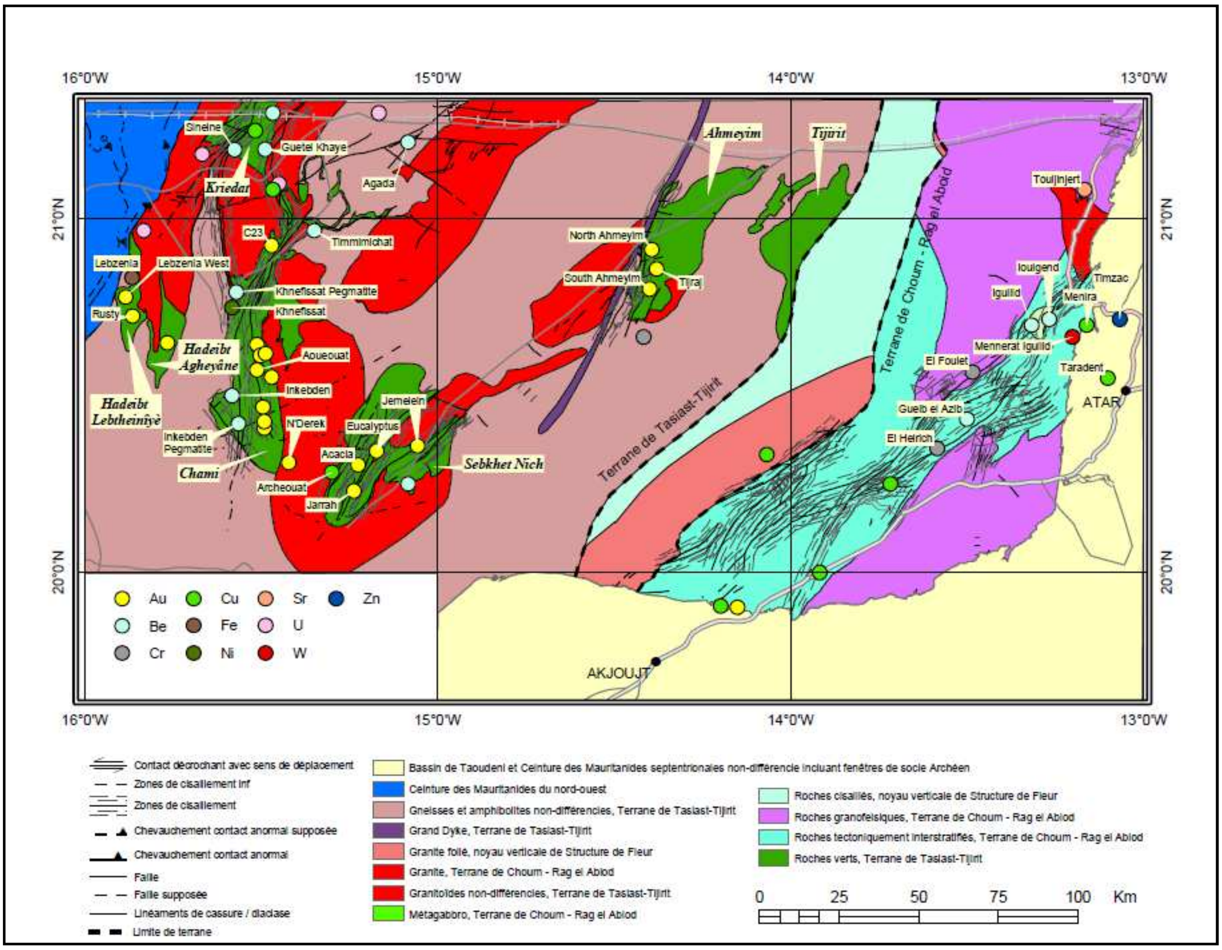
Potential for mesothermal gold occurrences in the BGS study area of the Rgueïbat Shield hasbeen identified in two main target settings: the greenstone belts of the Tasiast-Tijirit Terraneand in association with major shear zones in the Choum-Rag el Abiod Terrane, chiefly onSheet 2013 (Atar).

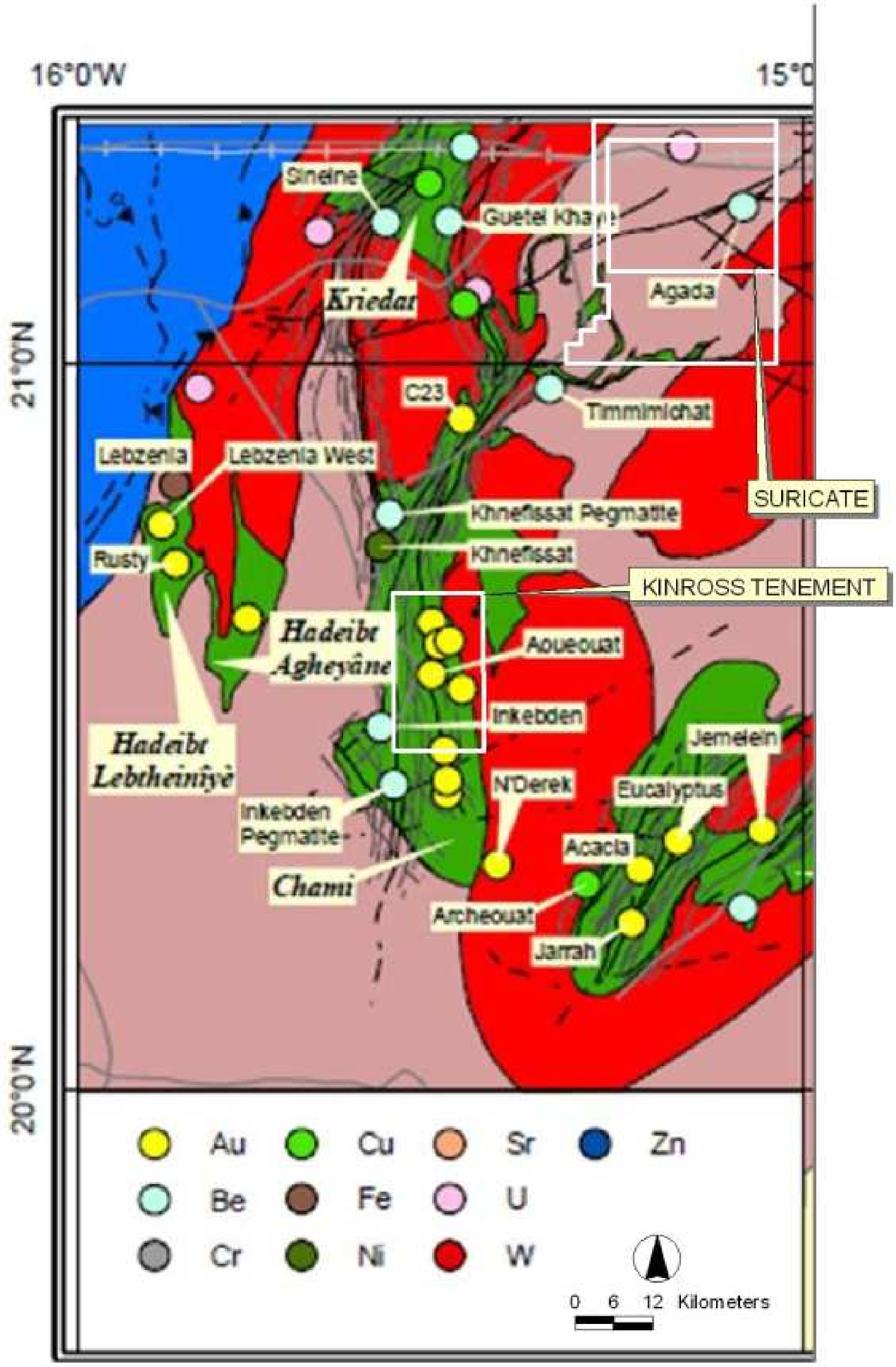
Numerous gold occurrences have been identified by recent commercial exploration over theChami, Sebkhet Nich and Ahmeyim greenstone belts. Many of these have not beeninvestigated in detail and drilling has commonly been restricted to a small number of shallowRC holes to depths not exceeding 100 m. The identification of an economic deposit at Tasiastprovides a clear indication of the potential of these targets and when mining gets underwaythere is no doubt that the region will attract considerable further exploration investment.

Particularly favourable settings for the development of gold mineralisation in theseenvironments are major regional structures and stratigraphic breaks. The mineralisation iscommonly localised by related subsidiary structures, especially where BIF is juxtaposedagainst volcanic and volcaniclastic rocks. Contacts between sedimentary and volcanic rocksand pinch-outs and facies changes are commonly important loci for mineralisation.

Major shear zones trending east-north-east in the granulitic rocks of the Choum-Rag el AbiodTerrane juxtapose a wide variety of lithologies on all scales from several metres up to severalkilometres in length. These shears are infilled by quartz mylonites that vary from severalcentimetres up to tens of metres in thickness (Plates 4.13 and 4.14). These zones are potentialtargets for mesothermal gold mineralisation although there are no known reported goldoccurrences in this sector. These zones were sampled at several localities during the BGSproject but no analytical data are available at the *time of writing. Few indications ofextensive fluid flow, alteration and mineralisation were observed in these zones during thefield programme.*

The map in the figure below shows the permit in its mineral potential context.





CHAMI SHEET
SIMPLIFIED GEOLOGY
AND MAIN MINERAL OCCURENCES

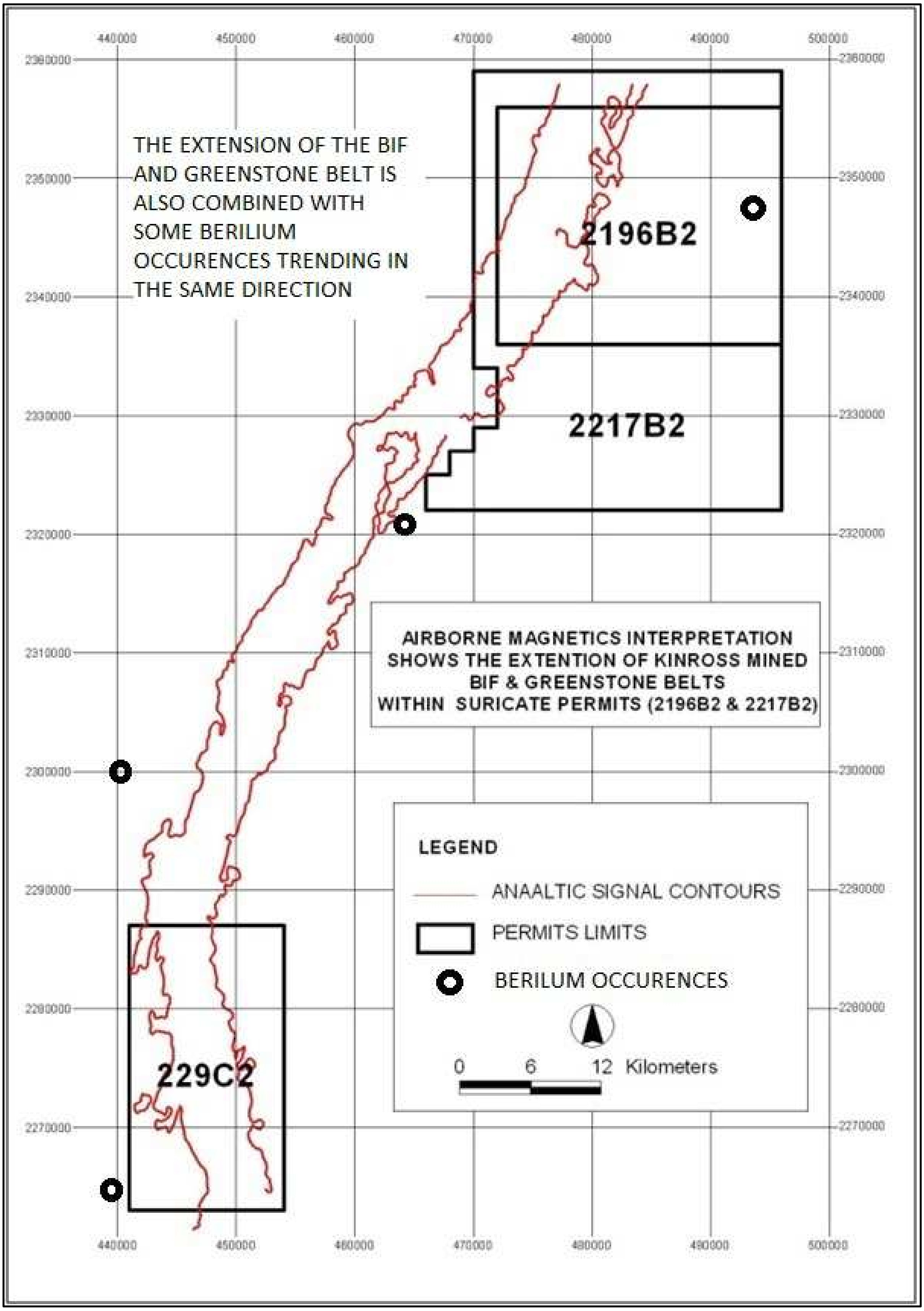


FIGURE 10: THE PERMIT IN ITS MINERAL POTENTIAL CONTEXT

3. CONCLUSION

3.1. RESULTS

This study shows that the area of the permit is highly permissive for base metal mineralization with the presence of the following indicators:

- *Permit located completely within the permissive area of BGS 2005;*
- *Permit located completely within the permissive area for gold based upon USGS works in 2013;*
- *The presence of many mineral occurrences and prospects for Cu, Mn and Ba;*
- *The existence of many magnetic anomalies and lineaments;*
- *The presence of areas with low Th/k ratio (eventual hydrothermal alteration);*
- *Geological units known as permissive for base metal mineralization.*

As a result, the areas of interest within the area of the permit were drown, delimited and classed by priority order based upon the existence of one or more indicators.

The map in the figure below shows the main areas of interest within the area of the permit classed by priority.

FIGURE5.11: AREAS OF INTEREST

An exploration plan was also set up to target these areas and the appropriate methods were defined.

3.2. EXPLORATION PLAN

*It's recommended prior to any detailed exploration work to carry out a short **reconnaissance trip** to the area of the permit. This trip should target the following objectives:*

- *Visiting the area of the permit as a whole;*
- *Checking the mineral occurrences existence, nature, shape and extension;*
- *Sampling the mineral occurrences for analysis;*
- *Exploring the area access to get an idea about the logistics needed in further field works;*
- *Get in touch with local authorities and explaining the objectives of the project.*

In a second order, the following works should be undertaken:

- ***Mapping and sampling***

The areas characterized by the presence of mineral occurrences or presenting low values for the ratio TH/K (eventual hydrothermal alteration) should be targeted by a sampling and mapping program. This program should include:

  - *Soil sampling;*
  - *Rock ship sampling;*
  - *Drain sampling and*
  - *Detailed geological and structural mapping.*

- ***Ground geophysical survey***

The areas showing magnetic anomalies on the regional survey should be targeted through a ground geophysical survey.This survey should include:

  - *Ground magnetic truthing of the anomalies;*
  - *Systematic ground magnetic survey on the confirmed anomalies to get more details on the sources;*
  - *IP and EM survey over the main anomalies detailed by the ground magnetic survey to localize eventual conductive areas which may be related to massive sulphide mineralization;*

*At a third stage, a **drilling program** should be planned and executed over the permissive areas delineated based upon the results of the last phase.*

The areas to be targeted during the exploration program are delineated in the figure below.

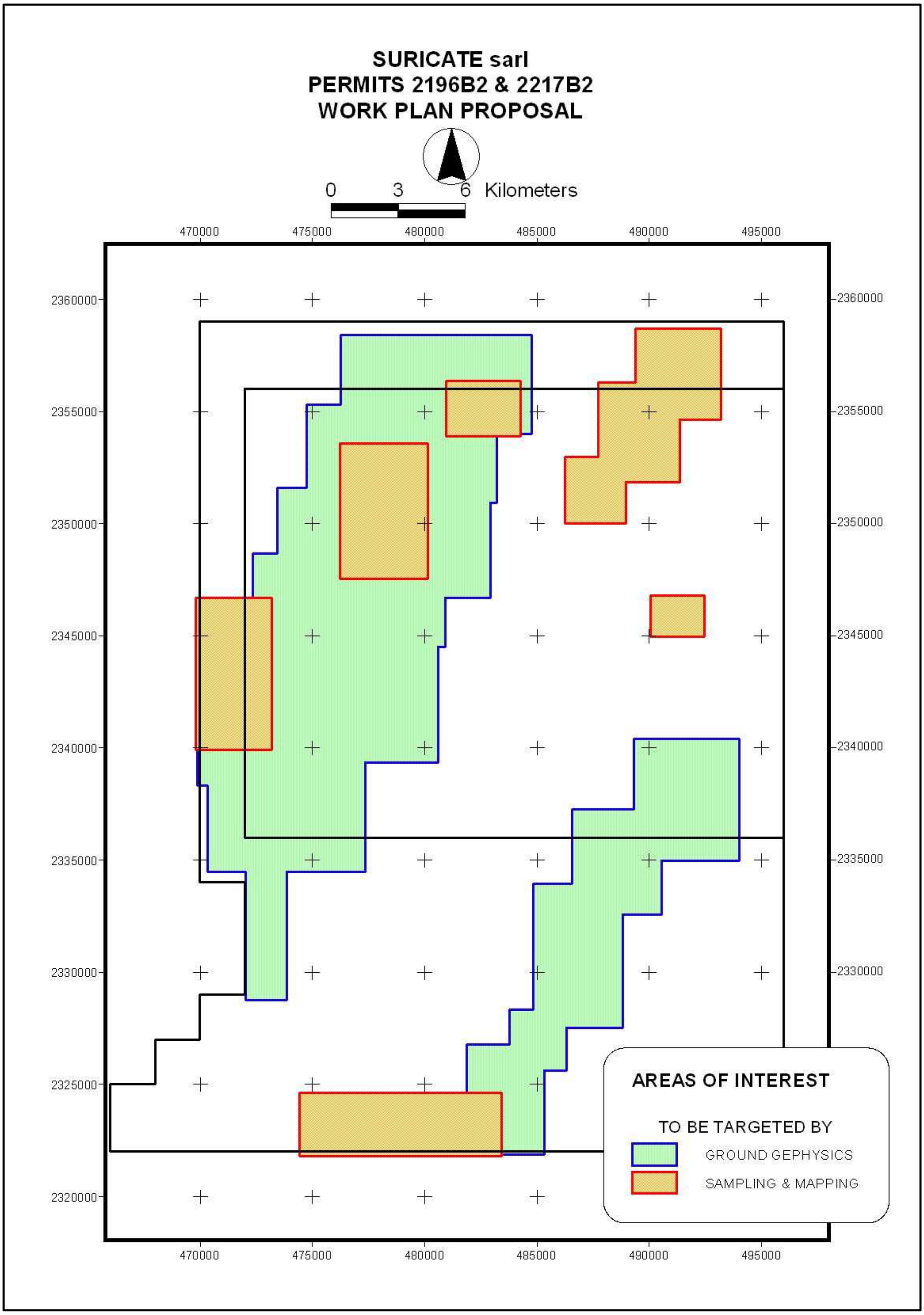


FIGURE5.12: EXPLORATION PRELIMINARY PLAN

BIBLIOGRAPHY:

- *PITFIELD, P E J, KEY, R M, WATERS, C N., HAWKINS, M.P.H., SCHOFIELD, D.I., LOUGHLIN, S. AND BARNES, R P. 2004. NOTICE EXPLICATIVE DES CARTES GEOLOGIQUES ET GITOLOGIQUES A 1/200 000 ET 1/500 000 DU SUD DE LA MAURITANIE. VOLUME 1 – GEOLOGIE. DMG, MINISTERE DES MINES ET DE L'INDUSTRIE, NOUAKCHOTT.*

- *GUNN, A G, PITFIELD, P E J, MCKERVEY, J A, KEY, R M, WATERS, C N AND BARNES, R P. 2004. NOTICE EXPLICATIVE DES CARTES GEOLOGIQUES ET GITOLOGIQUES A 1/200 000 ET 1/500 000 DU SUD DE LA MAURITANIE. VOLUME 2 – POTENTIEL MINIER. DMG, MINISTERE DES MINES ET DE L'INDUSTRIE, NOUAKCHOTT.*

- *PLAN MINERAL DE LA REPUBLIQUE ISLAMIQUE DE MAURITANIE ; A. BLQNCHOT BRGM ; JUIN 1975 ;*
- *MAURITANIA: A GREENFIELDS EXPLORATION OPPORTUNITY IN NORTH WESTERN AFRICA; SEG NEWSLETTER N° 91 OCTOBER 2012*