



Alternative Minerals– Potential for Guyana (Part 1)

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Regional Geology–Brief

- ▶ Guyana lies within the Amazonian Craton, which forms the northern part of the South American Continent. (Brazil, Bolivia, French Guiana, Guyana, Suriname and Venezuela). The Amazonian Craton is subdivided into two geographic shields, the Guiana Shield in the north (in which Guyana is situated) and the Central Brazil Shield in the south.
- ▶ The Amazonian Craton shows striking similarities to the West African Shield. Both connected and formed part of a larger continent, prior to the opening of the Atlantic during the Mesozoic period.
- ▶ Guyana is largely covered by two terrains
 - A granulitic and gneissic terrain
 - A granite – green stone terrain



KAOLIN



KAOLINITE FROM LINDEN, GUYANA



KAOLIN USES AND FACTS

- ▶ Kaolin is used in ceramics; it is generally the main component in porcelain
- ▶ as a light diffusing material in white incandescent light bulbs
- ▶ in cosmetics & for facial masks or soap
- ▶ for its semi-reinforcing properties in rubber
- ▶ in organic farming, as a spray applied to crops to deter insect damage, and in the case of apples, to prevent sun scald
- ▶ as whitewash in traditional stone masonry homes
- ▶ as an indicator in radiological dating since kaolinite can contain very small traces of uranium and thorium
- ▶ to soothe an upset stomach
- ▶ as adsorbents in water and wastewater treatment



USES OF KAOLIN



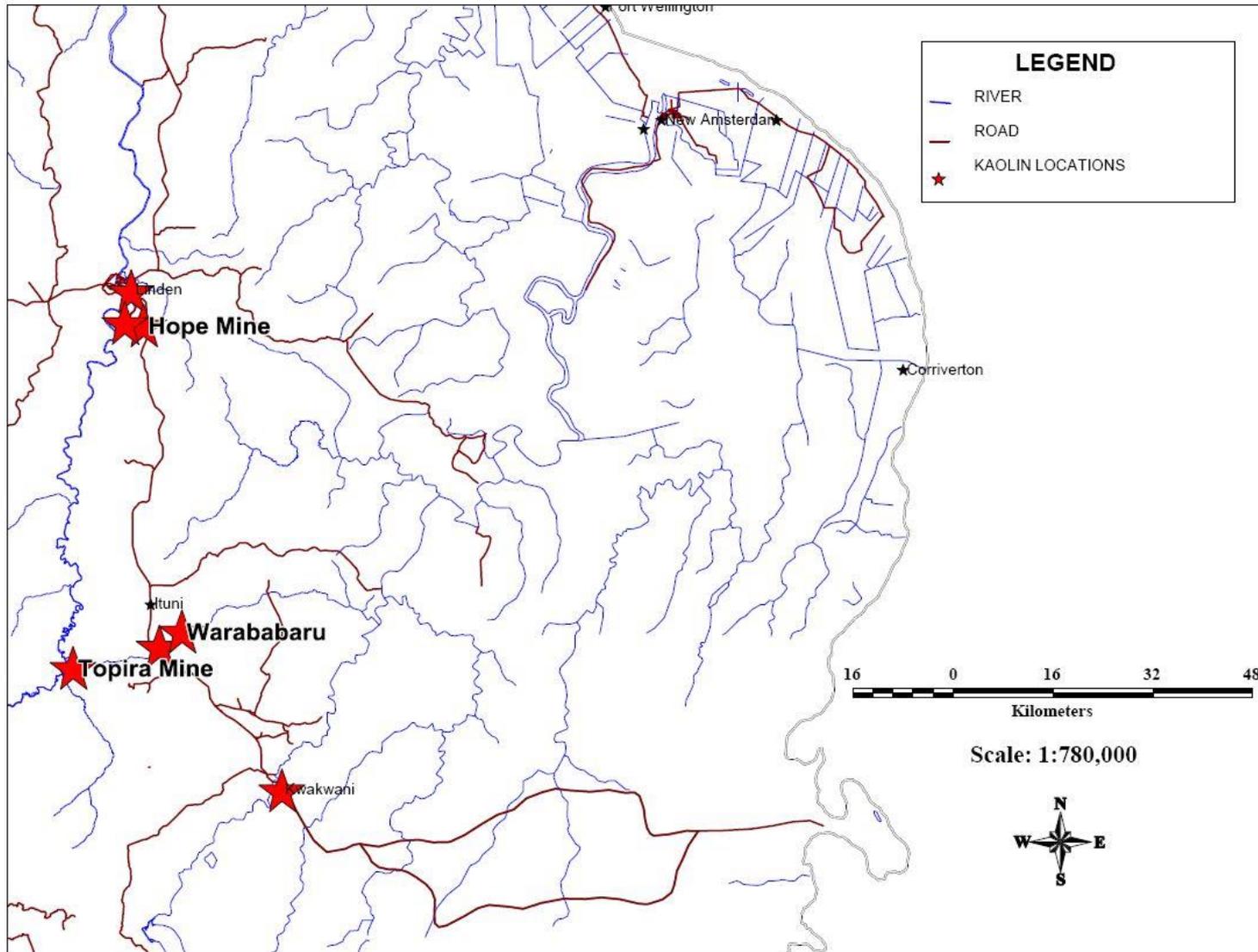
FINE CHINA



FACIAL MASKS



KAOLIN OCCURRENCES IN GUYANA





NICKEL



NICKELINE (NICKEL ORE)



NICKEL USES AND FACTS

- ▶ About 65% of the nickel which is produced is used to manufacture stainless steels.
- ▶ Another 20% is used in other steel and non-ferrous alloys – often for highly specialized industrial, aerospace and military applications.
- ▶ About 9% is used in plating and 6% in other uses, including coins, electronics, and in batteries for portable equipment and hybrid cars.



NICKEL USES AND FACTS (contd)

- ▶ In many of these applications listed above, there are no substitute for nickel without reducing performance or increasing cost.
- ▶ The major producers of Nickel are Australia, Russia, Cuba, Canada, Brazil, New Caledonia, South Africa, Indonesia and China.
- ▶ The average price of the nickel is US \$ 32,000 per metric tones (Ref: www.infomine.com, dated 5th July 2007 to 5th August 2007).

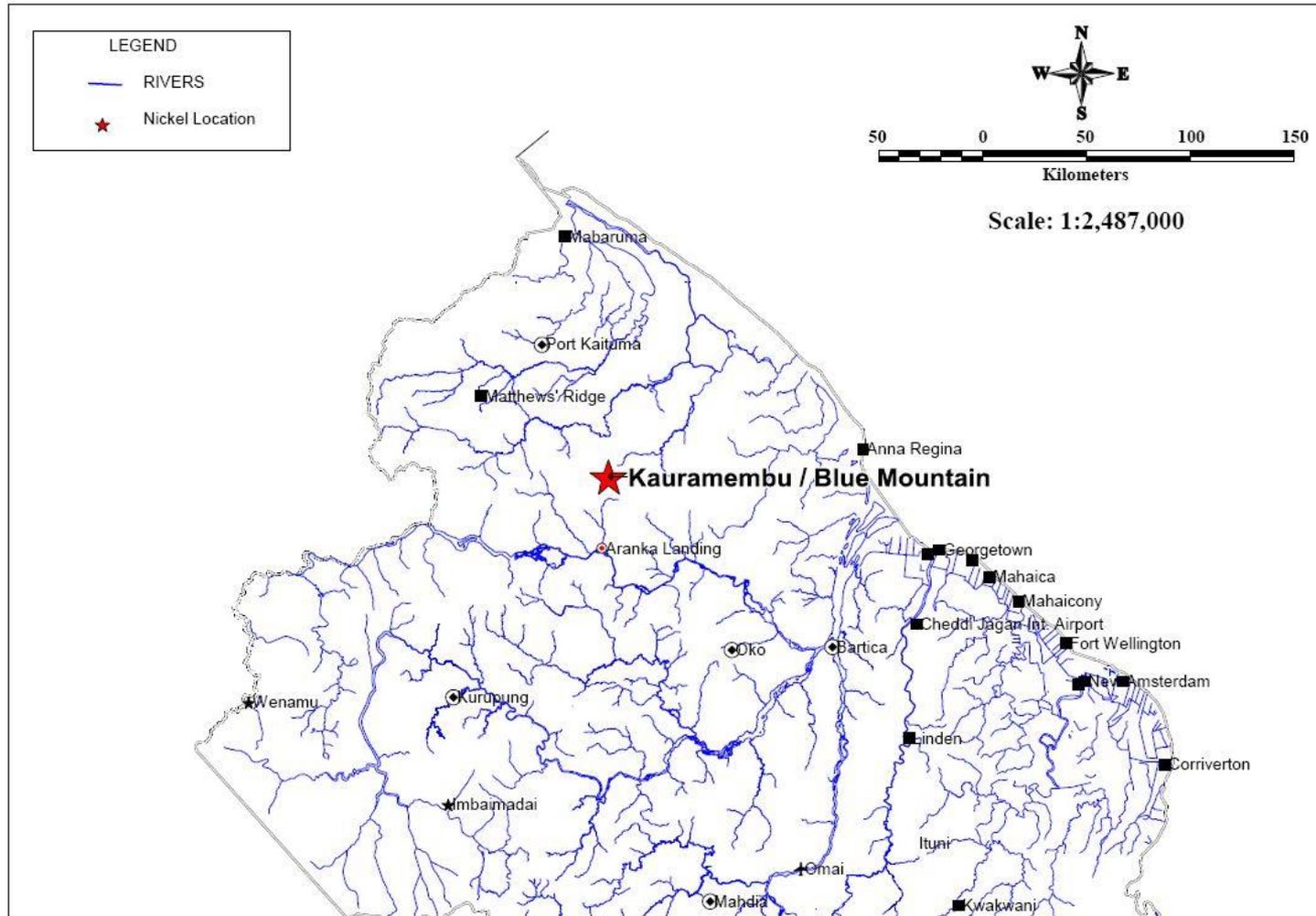


NICKEL OCCURRENCES IN GUYANA

- ▶ In Guyana, Nickel occurs primarily in the Kauremembu Blue Mountains, Northwest Mining District.
- ▶ A UN assessment of the area in 1960 indicated that an area of nickel laterite was discovered overlying narrow bands of ultramafic rocks.
- ▶ The nickel is largely associated with olivine minerals of the serpentized peridotites in the area.
- ▶ Drilling of this area showed conclusively that though Ni grades were high, the area was too small for commercial exploitation.



NICKEL OCCURRENCE IN GUYANA





MOLYBDENUM



MOLYBDENUM ORE



MOLYBDENUM USES AND FACTS

- ▶ valuable alloying agent, as it contributes to the hardness and toughness of quenched and tempered steels.
- ▶ used in certain nickel-based alloys which are heat-resistant and corrosion-resistant to chemical solutions.
- ▶ electrical and nuclear applications and as a catalyst in the refining of petroleum.
- ▶ There are significant molybdenum resources around the world with an average price of US 25 per pound according to USGS mineral summary, 2006.



MOLYBDENUM OCCURRENCES IN GUYANA

- ▶ Molybdenum has been found in significant quantities, during drilling, geochemical soil and sediment survey at following four regions: (1) Yakishuru Hill, Barama (2) Eagle Mountain, Potaro District (3) Ianna Hill, Barama (4) Jubilee – Million Mount, Puruni.
- ▶ For Eagle Mountain, mineralization is generally associated with the eagle mountain granite porphyry.
- ▶ For Yakishuru Hill, Molybdenite mineralization occurs as veinlets and disseminations in leucocratic granite (“alaskite”) stock which intrudes feebly molybdeniferous intermediate basic volcanics.

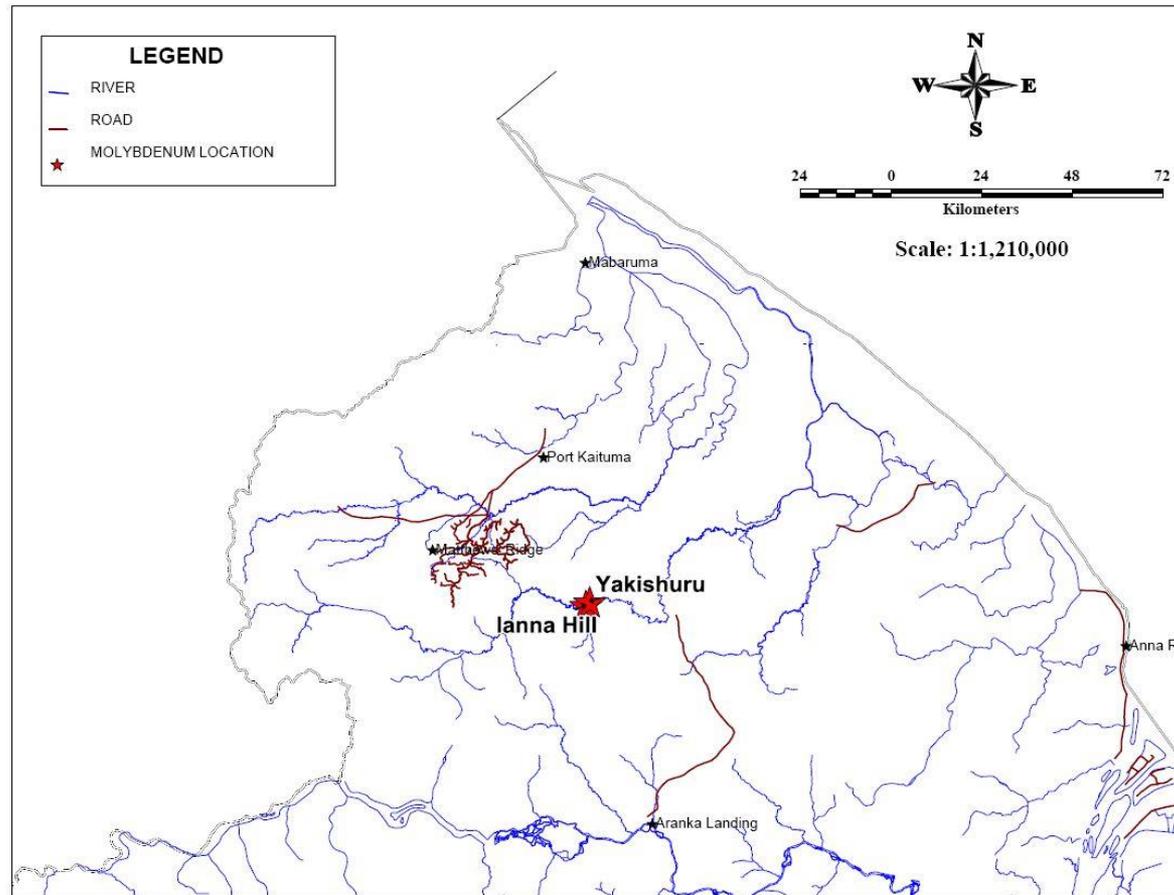


MOLYBDENUM OCCURRENCE IN GUYANA (contd)

- ▶ For Ianna Hill, There are mainly two types of anomalous zones in Ianna area, they are Eastern and Western Anomalous zone, both the zones contain molybdenum soil anomaly.
- ▶ For Jubilee – Million Mount, Soils over rather leucocratic porphyry carry up to 50 ppm. Molybdenum on a background of less than 7 ppm. Unchecked soil values nearly reach 130 ppm. Only a small part of the porphyry area has been examined.



MOLYBDENUM OCCURRENCES IN GUYANA





MAGNESITE



MAGNESITE ORE



MAGNESITE USES AND FACTS

- ▶ Similar to the production of lime, magnesite can be burned in the presence of charcoal to produce MgO , which in the form of a mineral is known as periclase. Large quantities of magnesite are burnt to make magnesium oxide: an important refractory material used as a lining in blast furnaces, kilns and incinerators.
- ▶ Magnesite can also be used as a binder in flooring material. Furthermore it is being used as a catalyst and filler in the production of synthetic rubber and in the preparation of magnesium chemicals and fertilizers.
- ▶ In fire assay, magnesite cupels can be used for cupellation as the magnesite cupel will resist the high temperatures involved.
- ▶ At times magnesite is dyed to make beads used as ornaments.



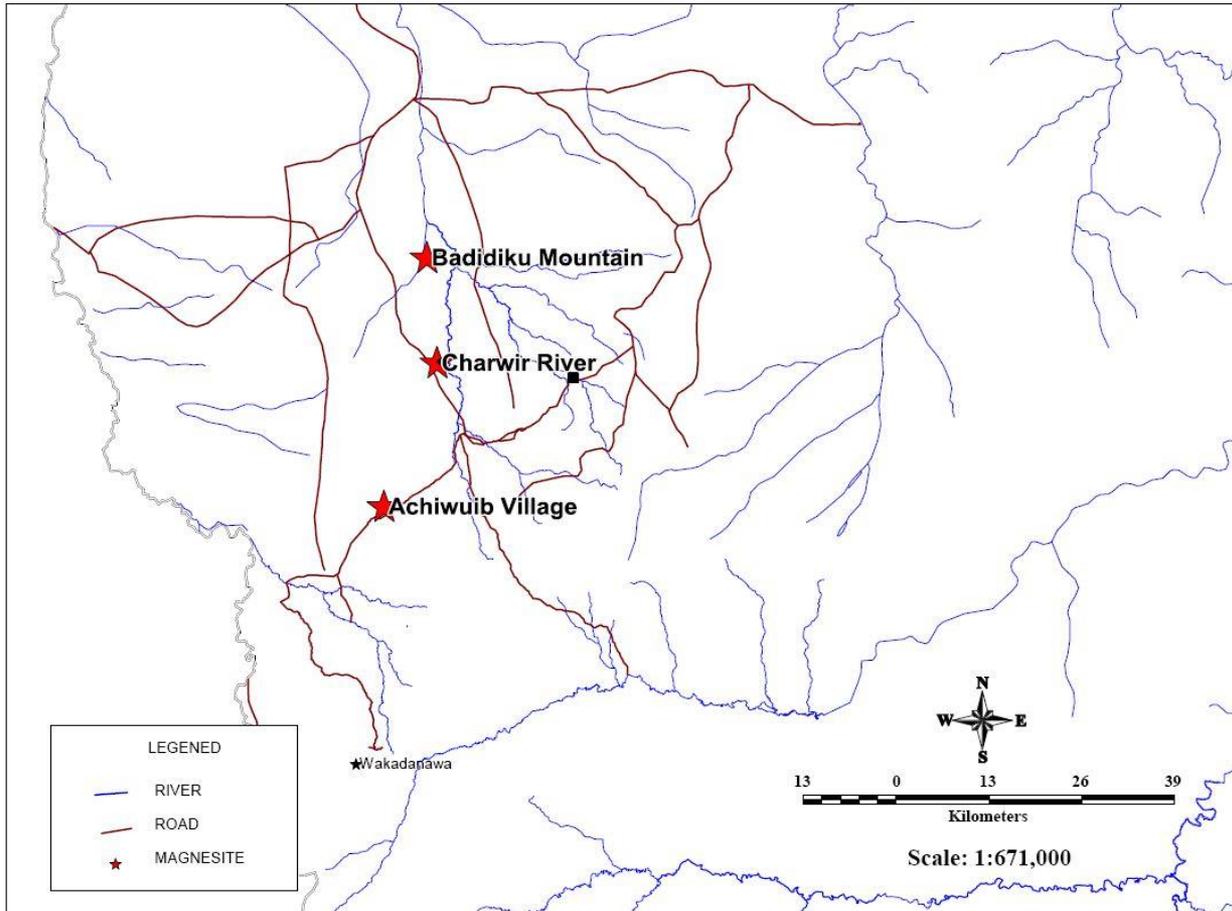
MAGNESITE USES



MAGNESITE CUPEL



MAGNESITE OCCURRENCES IN GUYANA





KYANITE





KYANITE USES AND FACTS

- ▶ Used in the manufacture of refractory products such as the bricks, mortars and kiln furniture used in high temperature furnaces.
- ▶ Kyanite is also in products used in the automotive and railroad industries where heat resistance is important.
- ▶ Kyanite has properties that make it exceptionally well suited for the manufacture of a high refractory-strength porcelain – a porcelain that holds its strength at very high temperatures.
- ▶ Kyanite's heat resistance and hardness makes it an excellent material for use in the manufacture of grinding wheels and cutting wheels.



KYANITE USES AND FACTS

- ▶ Clear and colourful Kyanite is highly prized by those who cut gemstones.
- ▶ Kyanite is a mineral found mainly in metamorphic rocks. It most often forms from the high pressure alteration of clay minerals during the metamorphism of sedimentary rocks.
- ▶ Kyanite specimens have a variable hardness even on the same crystal face.
- ▶ The average value of Kyanite mineral is approximately US \$ 144.45 per ton.



USES OF KYANIITE



The porcelain insulator on this spark plug is made from kyanite.

Kyanite is used to make jewellery

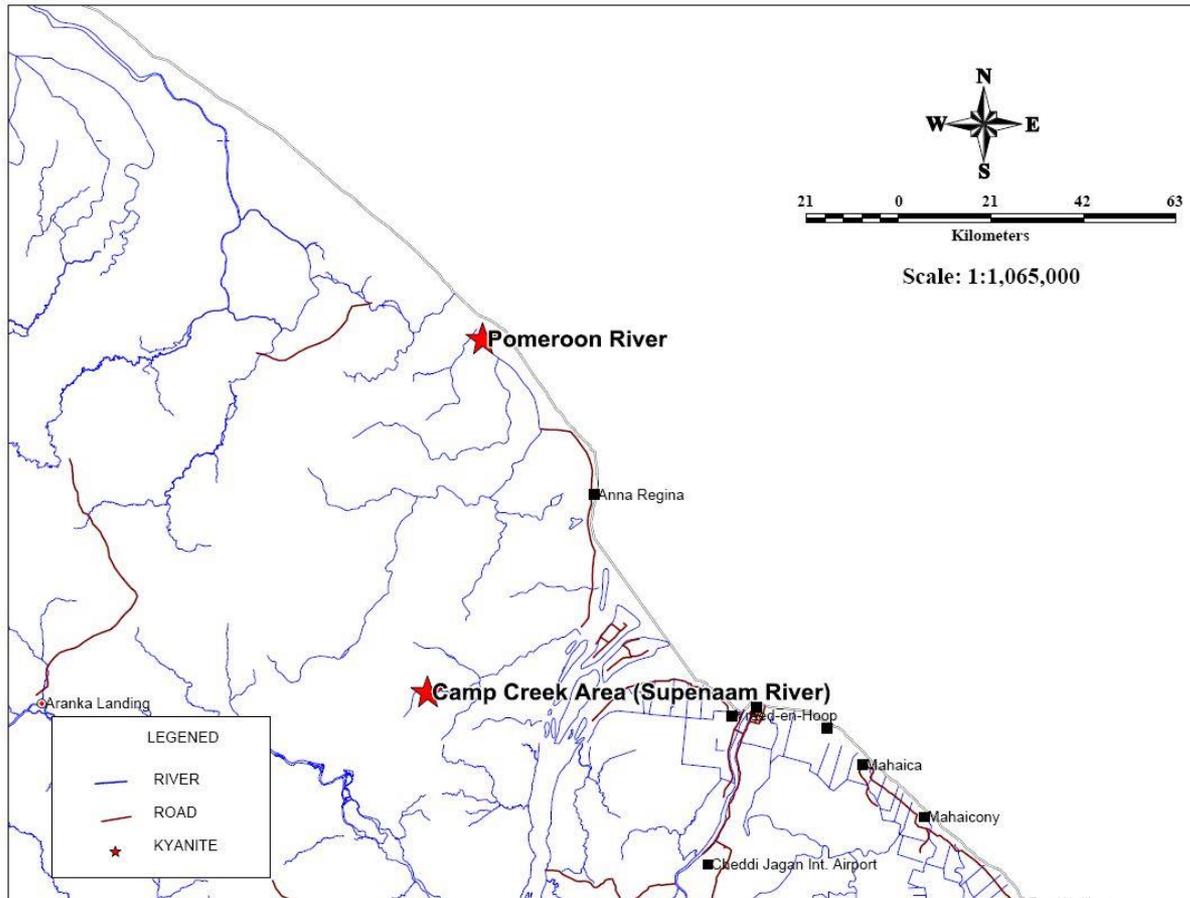


KYANITE OCCURRENCE IN GUYANA

- ▶ In Guyana, Kyanite is particularly abundant in the upper Karani/Camp Creek area of the Supenaam Basin.
- ▶ Kyanite occurs primarily in the meta sediment stratum as kyanite schists.
- ▶ Mabulla 1973 indicated that the combined reserve of kyanite schists in the area as 3.7 MMT.



KYANITE OCCURRENCES IN GUYANA



MANGANESE



MANGANESE ORE



MANGANESE USES AND FACTS

- ▶ Manganese is the fourth largest metal consumed in the world, behind iron, aluminum and copper and is in short supply.
- ▶ Nearly 90% of all Mn produced each year is used in the production of steel and iron.
- ▶ Manganese Dioxide(MnO_2) is used in cell batteries to prevent the formation of Hydrogen.
- ▶ Mn is used as a drying agent in black paints.
- ▶ Mn is used to remove the green colour in glass that is caused by iron contaminants.

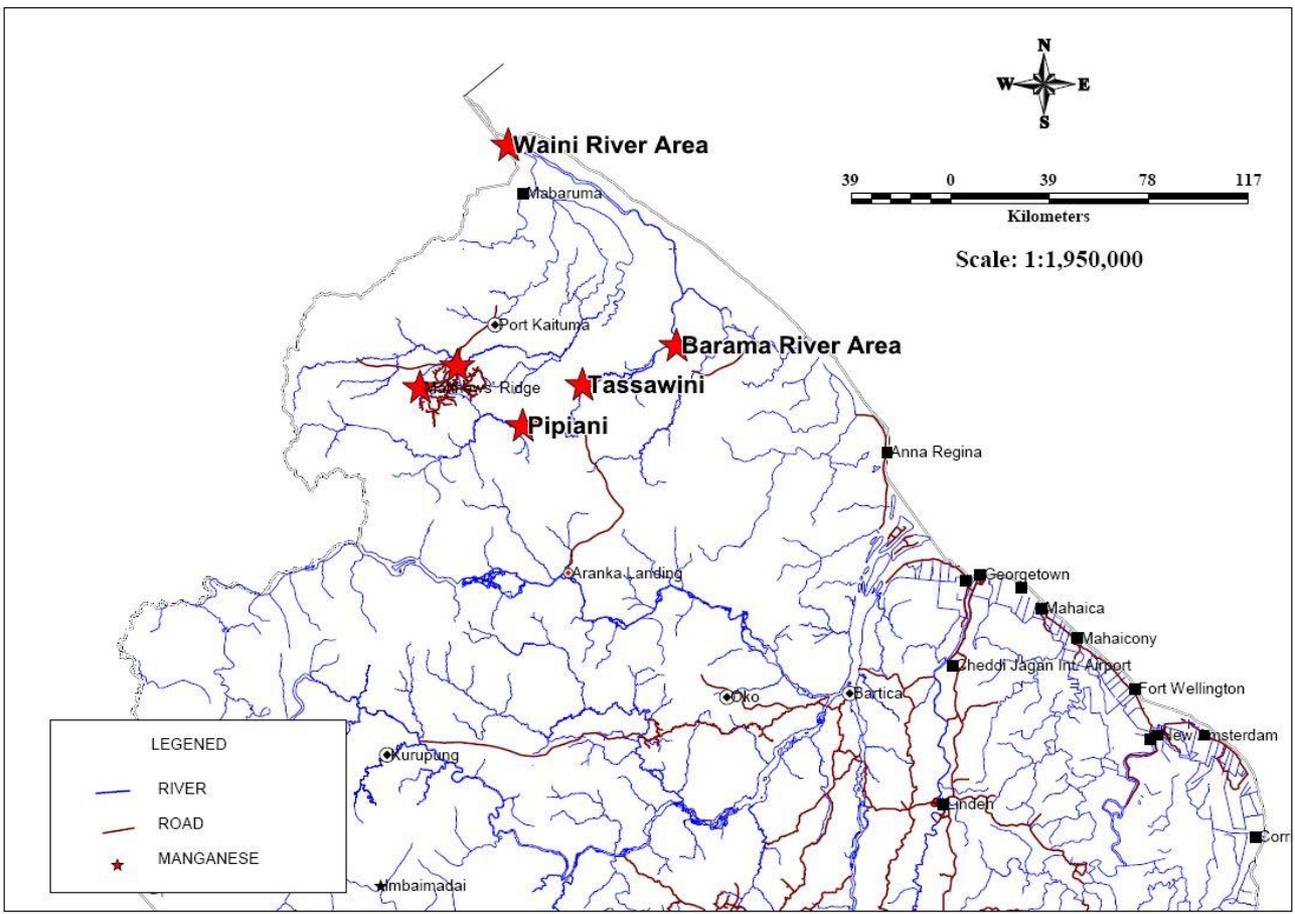


MANGANESE OCCURRENCE IN GUYANA

- ▶ During the 1962–1968 mining operations at Matthews Ridge, in excess of 1.66 million tonnes of manganese concentrate were shipped from the mine out of a resource of 2.6 million tonnes of manganese concentrate at the start of the operations in 1962.
- ▶ At Pipiani, the historically calculated resources of available concentrates, based on the mining and beneficiation methods used at Matthews Ridge, were 642,000 tonnes of 42% Mn on the basis of 35 drill holes, numerous pits and trenches.
- ▶ Total historical in situ resources at Matthews Ridge were estimated to be 3.6 million tonnes of 33.4% Mn recoverable concentrate.



MANGANESE OCCURRENCES IN GUYANA





NIOBIUM-TANTALUM MINERALS



RAW ORE



NIOBIUM – TANTALUM USES AND FACTS

- ▶ as the metal powder, it is used in the production of electronic components, mainly capacitors and some high-power resistors
- ▶ It is also used to produce a variety of alloys that have high melting points, are strong and have good ductility
- ▶ It is used for coating in the construction of orthopaedic implants due to the ability to form a direct bond to hard tissue and its bio inertness
- ▶ The high melting point and oxidation resistance lead to the use of the metal in the production of vacuum furnace parts
- ▶ Tantalum is extremely inert and is therefore formed into a variety of corrosion resistant parts, such as thermo-wells, valve bodies, and tantalum fasteners



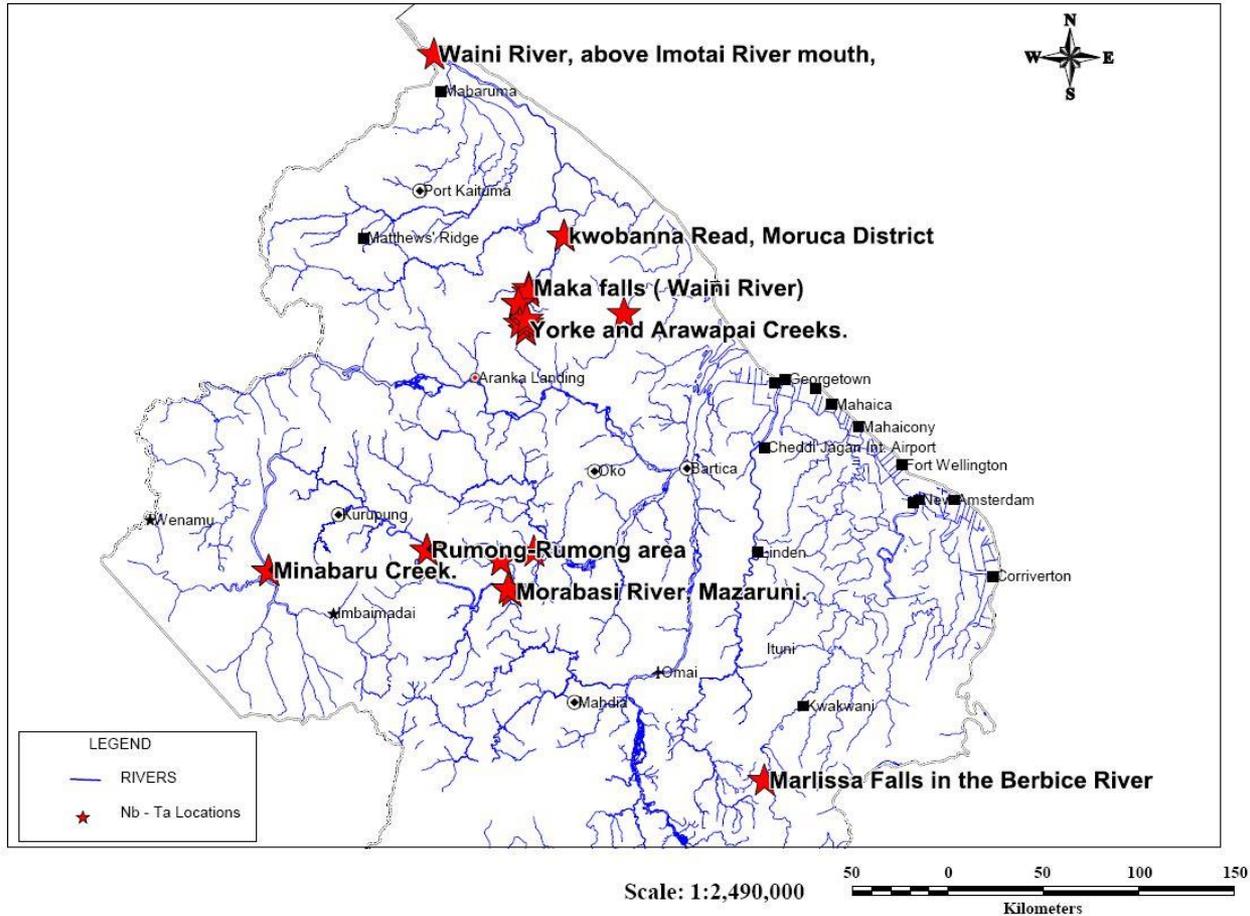
NIOBIUM – TANTALUM USES



Nb – Ta minerals are found
in most cell phones and
electronics



NIOBIUM TANTALUM OCCURRENCE IN GUYANA





HEMATITE



HEMATITE ORE



HEMATITE USES AND FACTS

- ▶ Hematite is used commonly as iron ore
- ▶ it is used as ornamental jewellery
- ▶ it also has uses in paint ore and pigments
- ▶ The colour of most red and brown rock, such as sandstone, is caused by small amounts of Hematite

HEMATITE USES



HEMATITE CRYSTALS

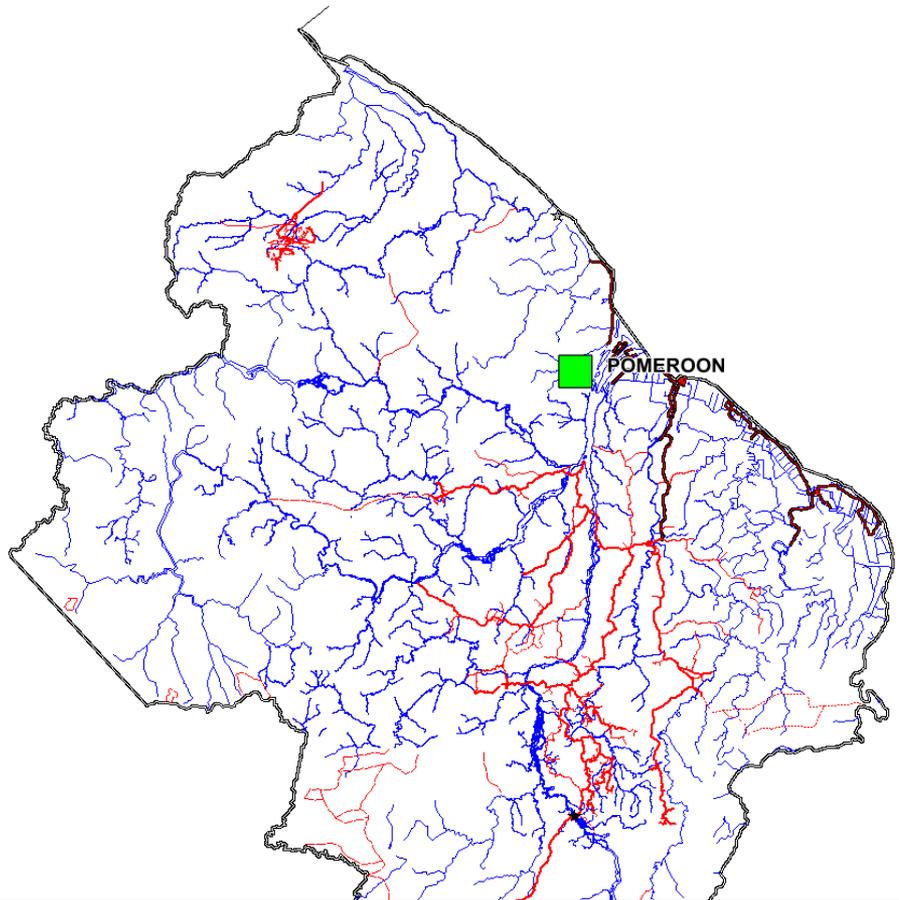
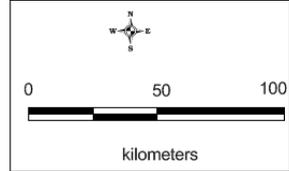


BRACELETS MADE OF
HEMATITE



HEMATITE OCCURRENCE IN GUYANA

LOCATION MAP OF HAEMATITE OCCURRENCE: GUYANA



LEGEND	
	Haematite Occurrence
	Roads
	Rivers



Quartz Crystals Facts and Formation

- ▶ Quartz is an essential constituent of granite and other felsic igneous rocks.
- ▶ It is very common in sedimentary rocks such as sandstone and shale and is also present in variable amounts as an accessory mineral in most carbonate rocks.
- ▶ Known occurrences are found in Karanang, Kako River and Kurupukari



Quartz Crystal – Uses

- ▶ Quartz Crystals is commonly used minerals in the making of jewelry and hard-stone carvings
- ▶ Applications that exploit its piezoelectric property such as high power sources, sensors, actuators, frequency standards and motors.





Soapstone(Talc) Facts and Formation

- ▶ Talc is a common metamorphic mineral in metamorphic belts which contain ultramafic rocks, such as soapstone (a high-talc rock), and within white-schist and blue-schist metamorphic terrains.
- ▶ Known occurrence is found in Kauramembu Mountains



Soapstone (Talc) – Uses

- ▶ Talc is used in many industries such as paper making, plastic, paint and coatings, rubber, food, electric cable, pharmaceuticals, cosmetics and ceramics.
- ▶ Talc is often used for surfaces of lab counter tops and electrical switchboards because of its resistance to heat, electricity and acids.
- ▶ Talc is used in baby powder, an astringent powder used for preventing rashes on the area covered by a diaper.
- ▶ Talc is also often used as a drying agent to keep a player's hands moist free and marking chalk.



Soapstone (Talc) – Uses



Beautifying Products



**Soapstone
Countertop**



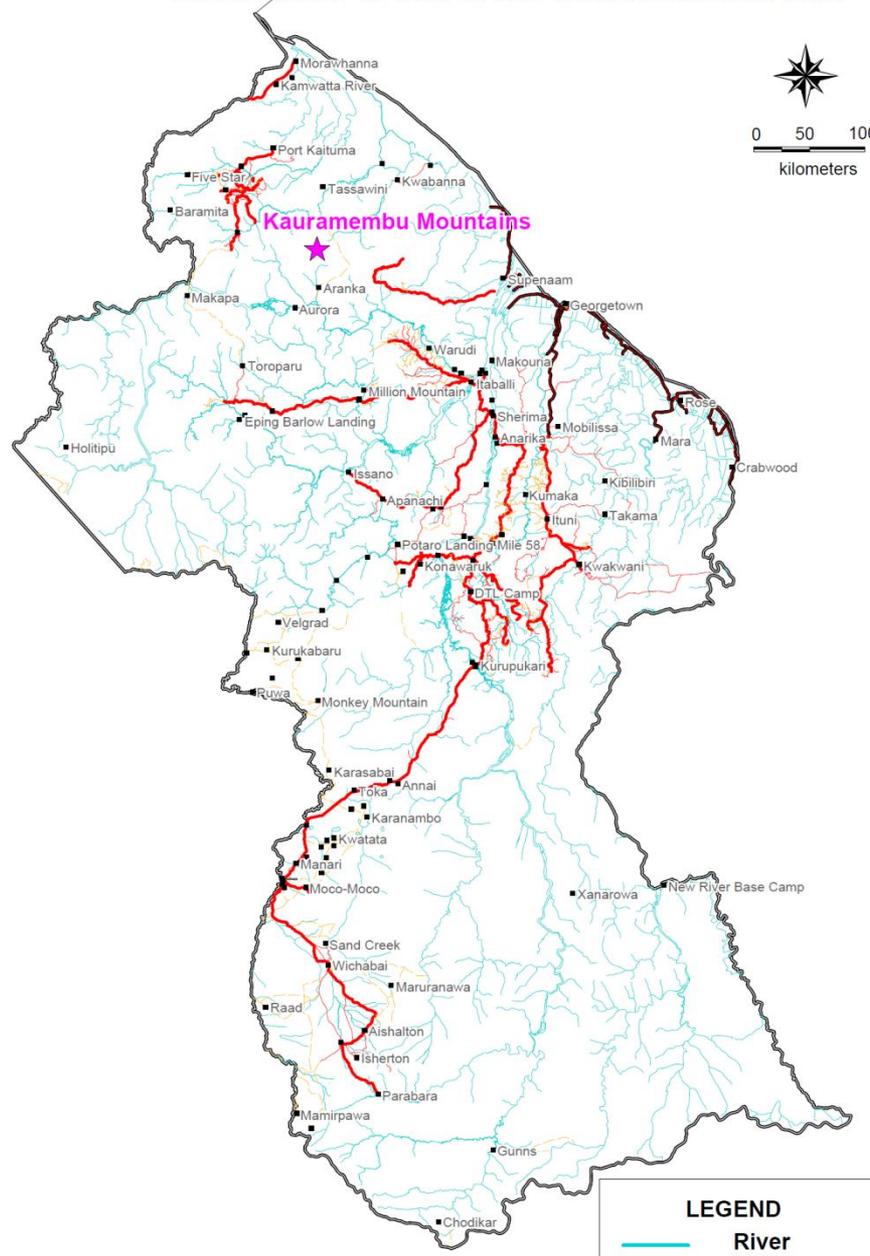
Paper Production



Soapstone (Talc) Occurrence in Guyana



LOCATION MAP OF SOAPSTONE OCCURRENCES: GUYANA



LEGEND

- River
- Road
- ★ Soapstone Occurrences



Topaz Facts and Formation

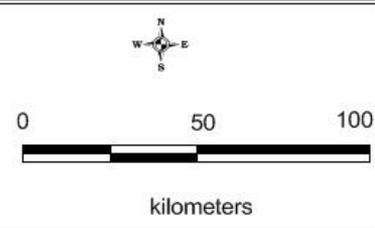
- ▶ Topaz is a silicate mineral most often found in igneous rocks of felsic composition.
- ▶ It is also found in some hydrothermal veins and the hydrothermally altered rocks that surround them.
- ▶ It is a common mineral of pegmatite and also found in the cavities of rhyolite and granite.
- ▶ Known occurrences are found in Eping, Semang–Potaro and Maikawk

Topaz - Uses

Topaz is as a gemstone



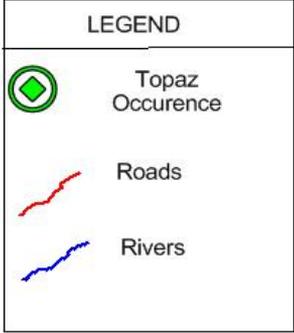
LOCATION MAP OF TOPAZ OCCURRENCE: GUYANA



EPING

SEMANG-POTARO

MIKAWK





Feldspars Facts and Formation

- ▶ Feldspars occur in all classes of rocks.
- ▶ They are widely distributed in igneous rocks, which indicates that they have formed by crystallization from magma.
- ▶ Known occurrences are found in Batavia/Okoro Road and Flat Rock – A & B



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Feldspars – Uses



Glass Making



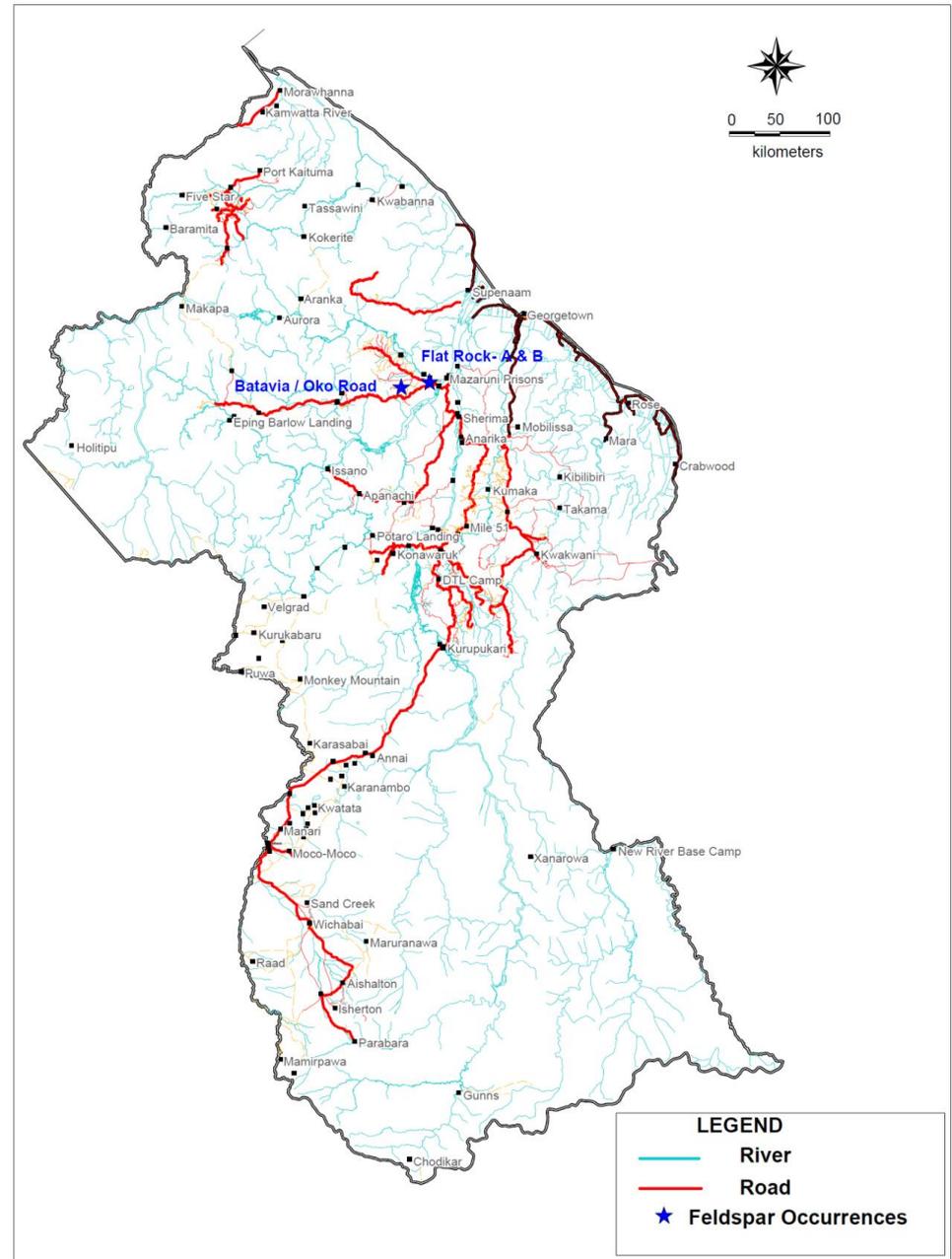
Ceramics



Feldspars Occurrence in Guyana



LOCATION MAP OF FELDSPAR OCCURRENCES: GUYANA





Clays Facts and formation

Clays are formed from weathering of silica rich rocks such as:

- Diorite, Granite, Granite pegmatite and Gabbro

Known occurrences are found in Hope Mines, Topira Mines, Kamakabra, Tumatumar, Kwakwani, Rockstone, Orealla and Warabarabru



Clays – Uses

- ▶ As a building material, it is used in the form of brick, either sun-dried or fired.
- ▶ Clays are also used in the manufacture of tile, porcelain, china, and earthenware, and of pipe for drainage and sewage.
- ▶ Highly absorbent, bentonite is much used in foundry work for facing the molds and preparing the molding sands for casting metals.
- ▶ The less absorbent bentonites are used chiefly in the oil industry, as filtering and deodorizing agents in the refining of petroleum and mixed with other materials, as drilling mud to protect the cutting bit while drilling.
- ▶ Other uses are in the making of fillers, in clarifying water and wine, in purifying sewage, and in the paper, ceramics, plastics, and rubber industries.



Clays – Uses





Clay Occurrences in Guyana

