

7.0 GEOLOGIC SETTING

7.1 *Regional Geologic Setting*

Southeastern Cameroon lies within a region of metamorphosed Proterozoic rocks ranging in age from 2,500 to 600 million years and extending across parts of several west-central African countries. In southeastern Cameroon, several assemblages of such metamorphic rocks have been mapped and named (Cameroon Direction des Mines et de la Geologie, undated). Due to the metamorphosed nature of the rocks and poor exposures, there is some uncertainty in distinguishing and dating various lithologic units.

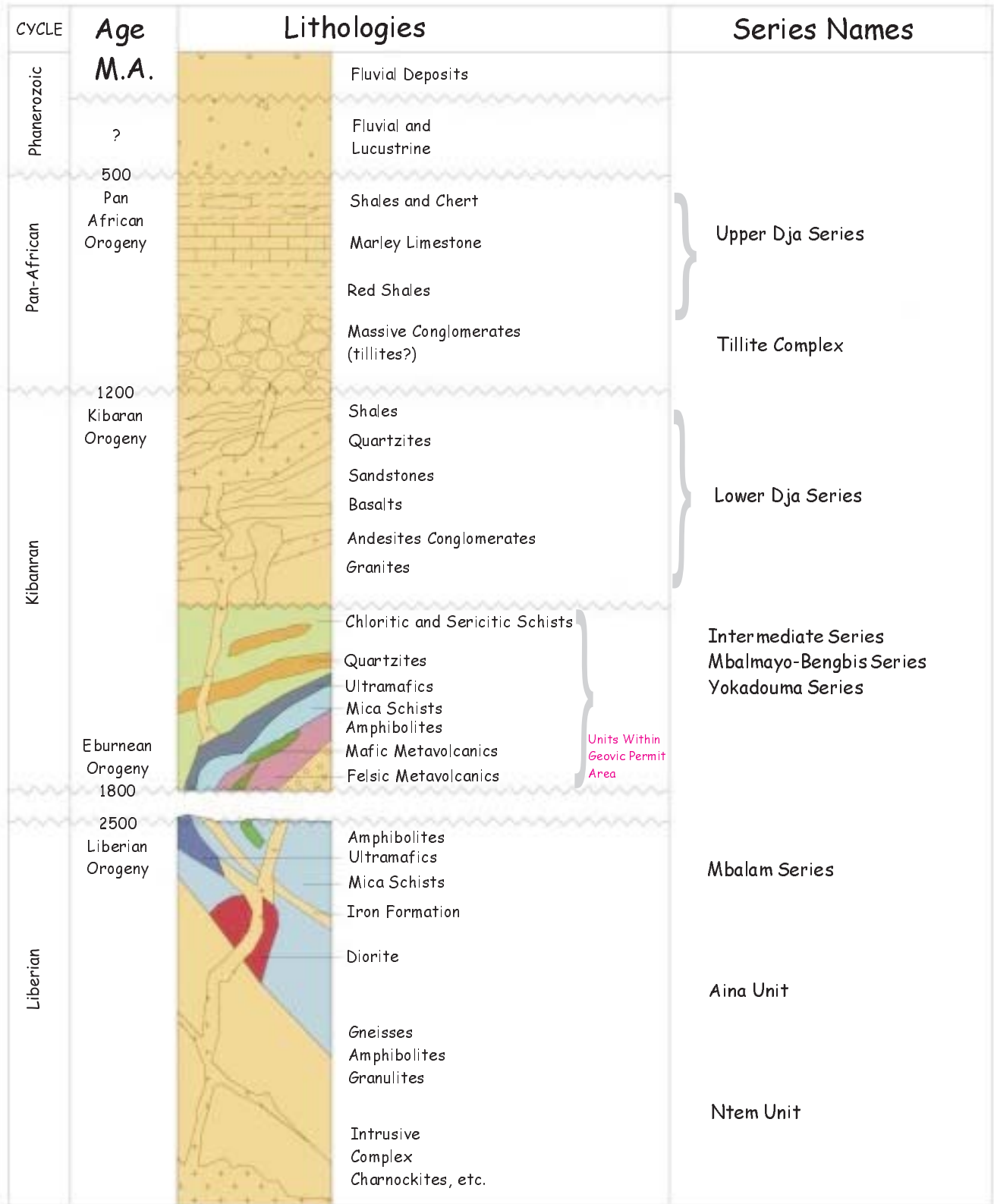
The Geovic project area is mainly underlain by rocks of the Intermediate Series, including the Mbalmayo-Bengbis "Series" or Unit. These rocks are principally chloritic and sericitic schists and quartzites (see Figure 7-1, Regional geology, and Figure 7-2, Regional stratigraphy). Also included in the Intermediate Series are extensive metamorphosed felsic, mafic volcanic and volcanoclastic rocks. These rocks are post-Eburnean (i.e., younger than 1,800 million years) and are cut by basic dikes. The original depositional age of the sediments was probably 1,800 to 1,400 million years, with metamorphism to almandine-amphibolite facies occurring about 1,200 million years ago, likely coincident with the Kibaran Orogeny.

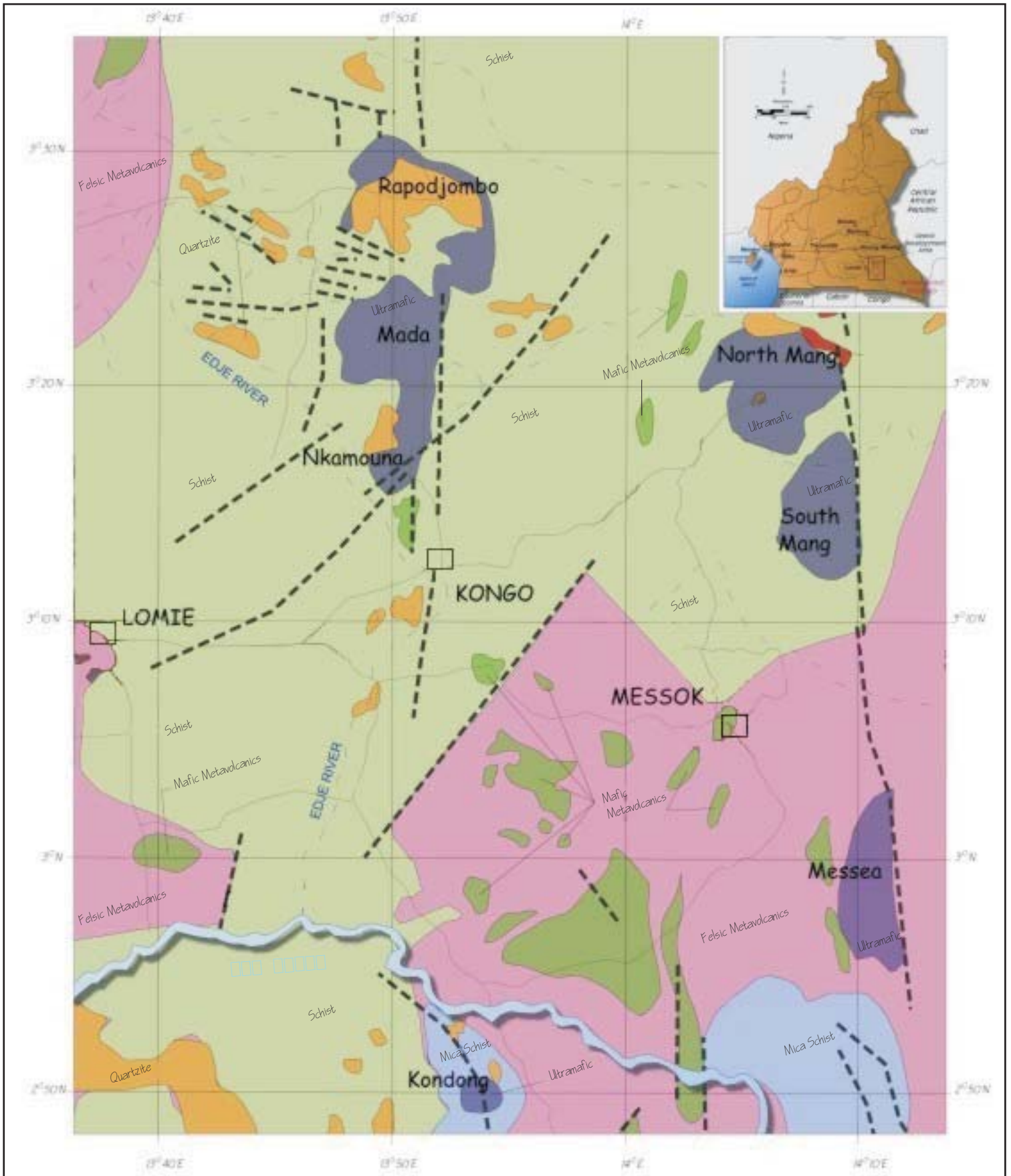
The schists and quartzites contain inliers of ultramafic rock, which were probably emplaced long after deposition of the original sedimentary rocks. Due to poor exposures, the contact relations are unclear, but the ultramafic bodies appear to be emplaced along north-trending regional fractures, which apparently allowed emplacement of ultramafic rocks of deep-seated origin.


7.2 *Regional Metallogeny*

The region within a 300-km radius of the Geovic Project Area in Cameroon, Gabon, Congo, and Central African Republic has few producing mineral deposits and few with near-term production potential. Most of this region of west-central Africa is underlain by Proterozoic granite-gneiss-schist terrains, broadly similar to the rocks in the Project Area. Within the region, ultramafic rocks, the original source of the cobalt and nickel, are confined to Mada and other parts of the Geovic project area. There has been no previous production of minerals from the project area.

Alluvial gold is exploited on a small scale from stream gravels in various parts of Cameroon, Gabon, Congo, and Central African Republic. Few statistics are available because all production in the region is from artisanal sources. However, the U.S. Geological Survey's 2002 estimate for total gold production from all four countries combined is less than 1,600 kilograms, or less than 50,000 ounces per year. The portion of this yield from within a 300-km radius of the Geovic Project is likely on the order of 20,000 ounces per year, a relatively insignificant amount by international comparisons. In the southwest part of the Central African Republic, alluvial gold is accompanied by small quantities of alluvial diamonds in streams which drain Cretaceous sandstone and conglomerates exposed further east. The Cretaceous formations do not extend into Cameroon.





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**FIGURE 7-2
 REGIONAL GEOLOGY**

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Fig7-2.cdr

Small amounts of alluvial tin and rutile are extracted from streams in the region, also in quantities that are locally important to village economies but are not industrially significant. Artisanal production of sapphire is also locally important.

Deposits of iron ore are reported to exist in south-central Cameroon, north of the Gabon border, but little information is available about these deposits. The UN development program also evaluated several iron ore and limestone deposits. At Belinga in northeast Gabon, a stratiform iron deposit contains several hundred million tonnes of 64 percent Fe, but with high phosphorus content (+0.1% P). This deposit has not been exploited on an appreciable scale.

Limestone deposits occur in the Proterozoic rocks, about 50 km southeast of Lomie. These deposits were drilled by the UNDP in 1981, but they have not been exploited on a large scale.

Building stone, quartzose river sand, clays, flagstone, and pozzolana (volcanic ash), are produced at artisanal scales for local use in Cameroon. Two cement plants are the only sizeable mineral producers.

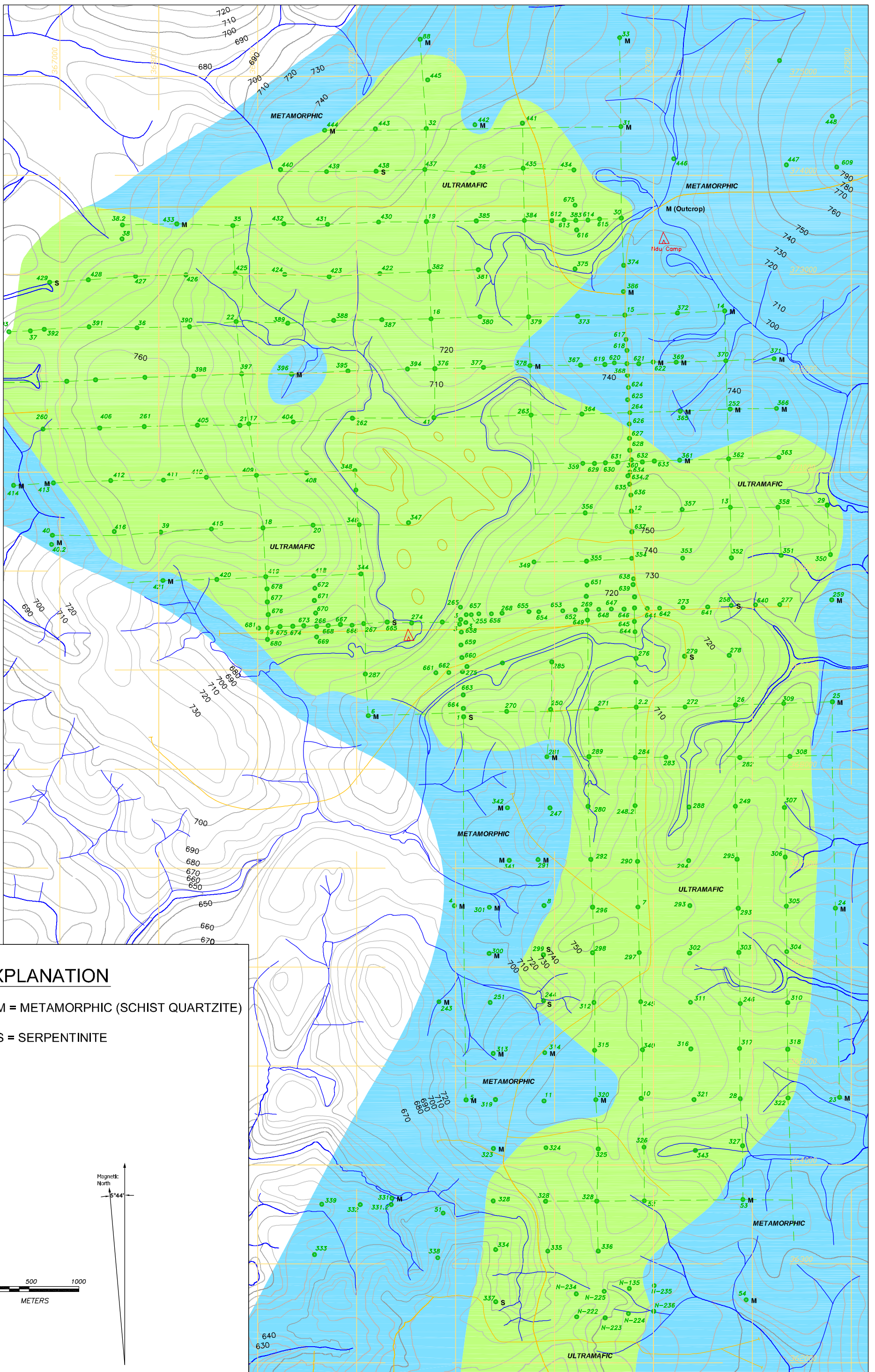
Otherwise, the mining of non-fuel minerals in Cameroon is in its infancy. Occurrences or resources of bauxite occur in northern and western Cameroon, but an aluminum smelter near Douala processes only imported alumina. There is little in the way of a mining culture or infrastructure in the country at present.

7.3 *Deposit Geology*

The cobalt-nickel deposits are hosted in residual laterites which have formed by prolonged tropical weathering of serpentinites. Large areas of mineralized laterite, each several square kilometers in extent, have been preserved on low-relief mesas or plateaus that stand above the surrounding dissected lowlands. Mada is one such plateau, which is nearly connected to the Nkamouna plateau. Most of the plateaus are underlain by ultramafic rocks, with some areas of schist, phyllite, and quartzite. The surrounding lowlands are underlain by schists, phyllites, quartzites and meta-volcanics of the Intermediate Series.

The bedrock geology at Mada was mapped by Geovic geologists through a combination of natural exposures, soil mapping, and, most importantly, observation of weathered or fresh rock encountered in pits (Figure 7-3). Mapping of detailed structures, attitudes of foliation or fractures, etc. is generally not practical except in the deeper pits. Rock from pits and rare exposures indicate that the fresh underlying rock at Mada is sheared serpentinite, with inliers of schist, phyllite, and quartzite.

Most serpentinites form from parental ultramafic rocks, as a result of hydration and shearing at moderate temperatures, either during emplacement of the ultramafic or during post-emplacement tectonism. Minor amounts of chrysotile asbestos, a common accessory mineral in serpentinites, are reported from one pit in the Mada area located beneath the mineralized zone. Metasedimentary rocks (quartz-muscovite schist, phyllite, and quartzite) occupy the borders of the serpentinite, and also occur as inliers within the serpentinites. Locally, lateritic soils with schist fragments overlie serpentinite bedrock, due to the gravity-induced creep of soils down-slope. Figure 7-4 shows the deposit stratigraphy.



EXPLANATION

- M = METAMORPHIC (SCHIST QUARTZITE)
- S = SERPENTINITE

0 100 500 1000
METERS

Magnetic North
5°44'

