

NATIONAL INTEGRATED MINERAL EXPLORATION PROJECT (NIMEP)

BARYTE (INDUSTRIAL MINERALS) Projects



FEDERAL REPUBLIC OF NIGERIA
MINISTRY OF MINES AND STEEL DEVELOPMENT
and the
NIGERIAN GEOLOGICAL SURVEY AGENCY



The LOT A4 Project Area - BARYTE (INDUSTRIAL MINERALS)

The Federal Government via the Federal Ministry of Mines and steel Development conceptualized a programme of exploration under the National Integrated Mineral exploration Project (NIMEP) to develop preliminary data in some mineral commodities, among them Barytes in a format to attract possible further local and foreign direct investment .

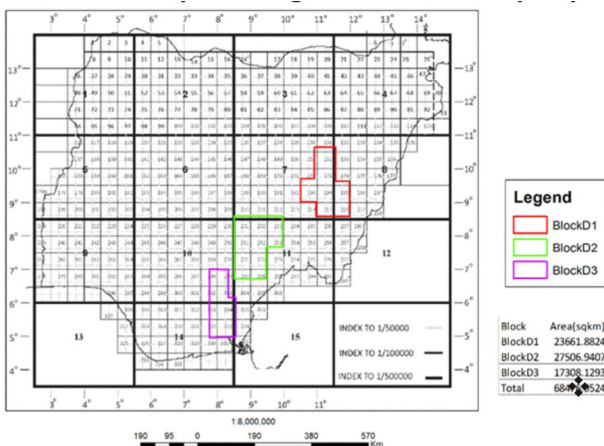
The goal is to collect sufficient data to characterize the known occurrences (brown field) and to locate and quantify the new finds (green field)

Block 01, 02 and 03 within the Benue Trough of Nigeria covering total area of 68477km' covering parts of Gombe, Taraba,

Nassarawa, Benue, Plateau, Ebonyi and Cross River States

Barytes is a non metallic mineral with a very high specific gravity (very dense/heavy). The specific gravity ranges between 2.5 -4.5 g/cm³.

NGSA Index map showing location of the 3 prospective Barytes Blocks



The 3 major blocks were chosen for geological surveys covering 64,500km' occupying the lower, middle and upper segments

D 1 - 23661.88km'

D2 - 27506.94km'

D3 - 17,308.12km'

- Analysis and interpretation of secondary data for the 3 blocks were able to deduce the fractures and fissures that give the lead for the investigation of the Barytes deposits.
- Series of NE - SW trending lineaments were observed.
- In line with the disposition of the mineralization of the Baryte deposits, our target was the systematic studying of the structures (fissures) as indicated from the interpretation of the Airborne data.
- It was immediately apparent that brownfield exploration using local knowledge would be most effective means of assessing the area after the desktop studies were completed.
- 10 blocks with clusters and sporadic Baryte/lead occurrences were highlighted as being most prospective.

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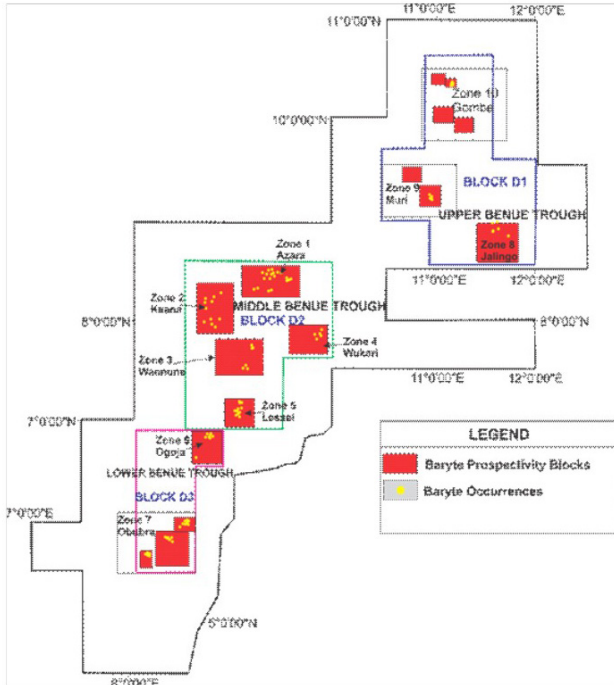
BARYTE (INDUSTRIAL MINERALS)

Based on desk studies and interpretation

- Structures (fissures) of interest were targeted for geophysical survey and interpretation.
- Regional and local geophysical controls on mineralization were emphasized and confined by the airborne magnetic data and other ground surveys.

The deposits tend to:

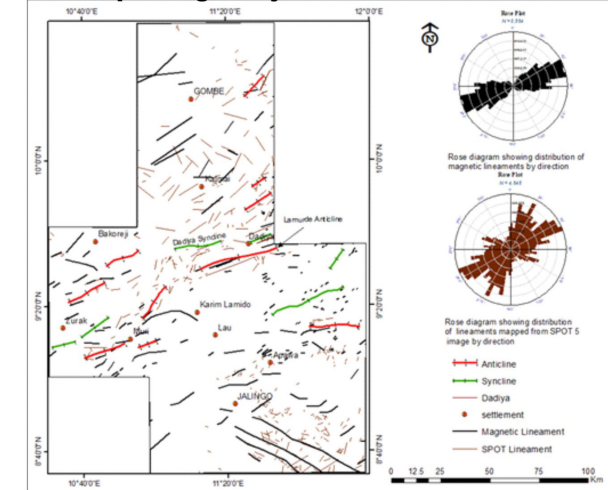
- Cluster in areas NNW - trending faults transecting less obvious NE - SW and easterly trending magnetic lineaments.
- Occur in N - S Tensional arrays.
- Form discrete veins or networks along easterly to ENE orientation. parallel to structural lineaments and in both tensional and compressional faults.
- Associated with structures forming the boundaries to fault-bound Basement blocks within the Trough where there was greater heat flow.
- They all occur on open space fracture filling.
- At the least, 176 veins (excluding splays and small parallel lobes) have been catalogued. with many other mineralized zones and areas of interest nearby not surveyed and excluded due to security concern.



Jimilari 2 new barytes working showing Fe-rich vein

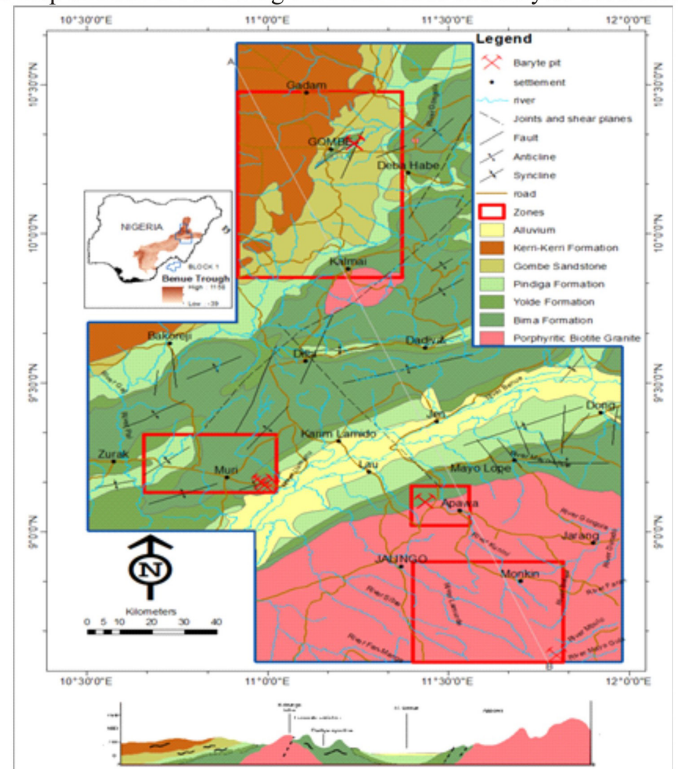


D1 Block map showing the major structures and their orientations

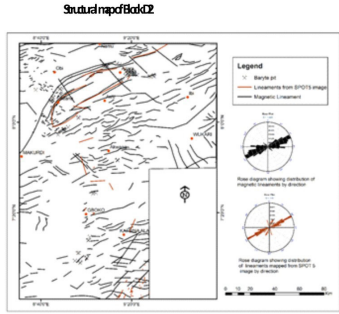
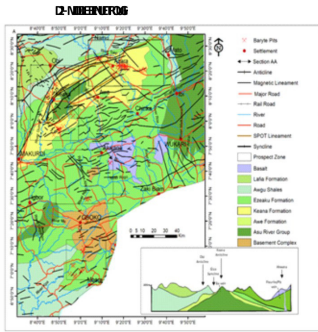


D1 Upper Benue Trough

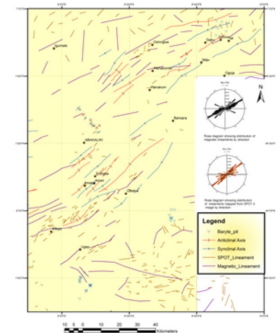
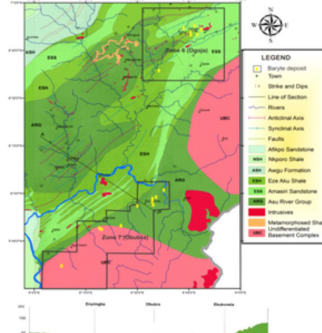
Geologic map of Zone D1 showing the main zones and barytes occurrences



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D3 – LOWER BENUE TROUGH
Geologic map of the Lower Benue Trough and Block D3 (Barytes locations)

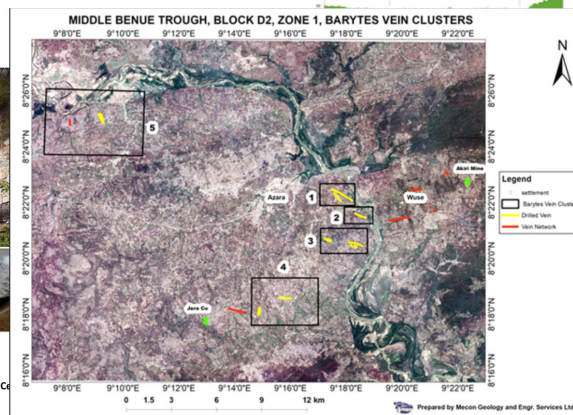


Block D3 Eborá (Iyamitete mine)



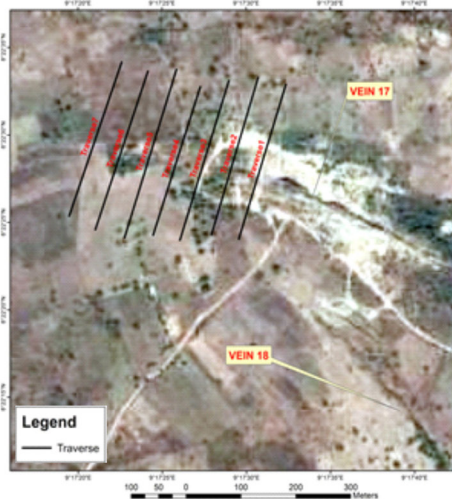
Altered and mineralised fault breccia

Galena on quartz and barytes



AZARA CLUSTERS
Given the large deposit clusters throughout Benue Trough, and also given the production history, logistics, access, size and prospective geology, follow-up focused on the area, immediately, east of Azara in Nassarawa State where 5 clusters were identified.

Ogba-Lessel area; steeply west-dipping barytes vein in altered sandstone



Area of ground magnetic traverses, Vein 17, Azara

GROUND GEOPHYSICS

Ground geophysical surveys were carried out. Several orientation, surveys were carried out, even beyond the scope of the study.

- Ground magnetics
- VLF
- Electromagnetics
- Gravimetric methods

The Structural controls were delineated accordingly for further targeted investigation



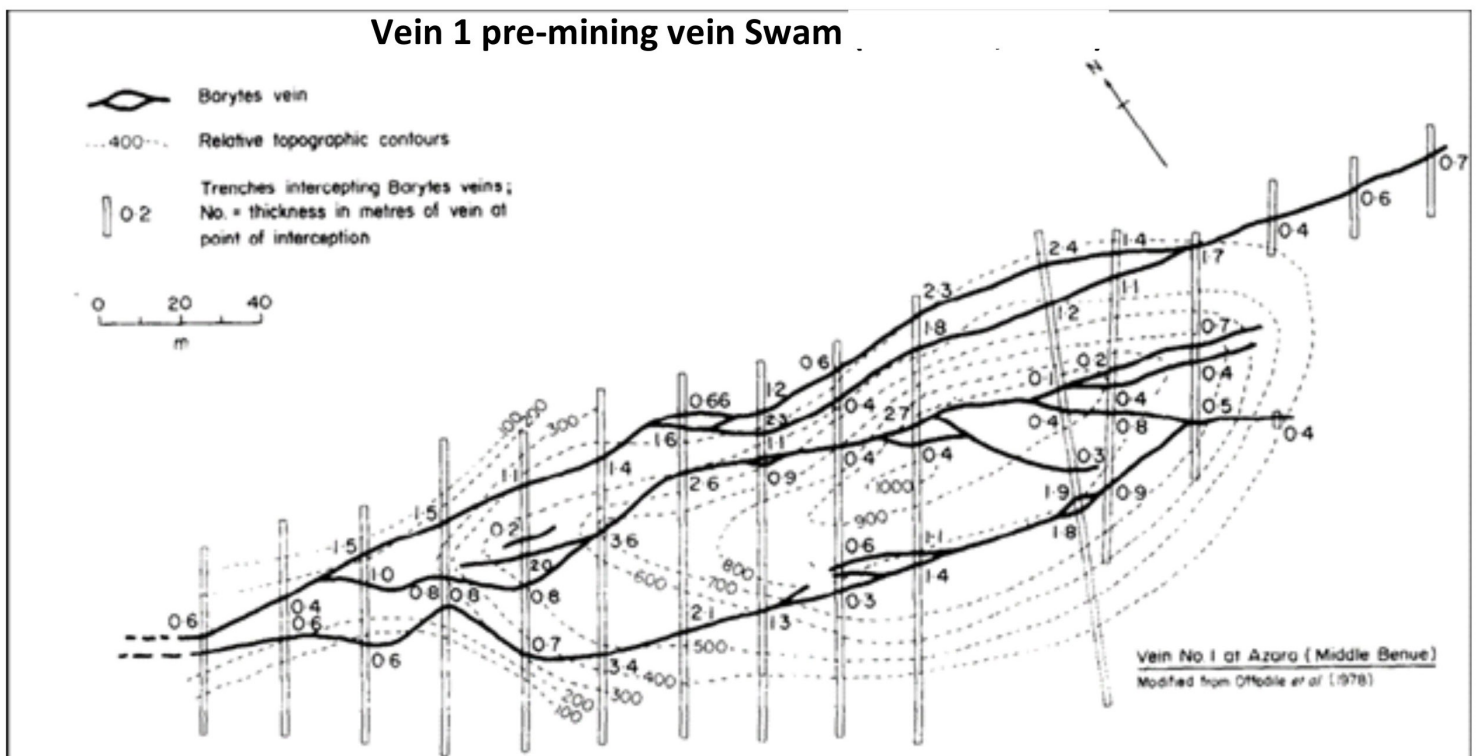
BARYTE (INDUSTRIAL MINERALS)

Trench Data

| Site | Trench Name | TRENCHING DATA 2019 BLOCK D3, AZARA | | | | Length sampled | Samples taken | Samples Analysed | Comments - sample distribution |
|------------------------------|-------------|-------------------------------------|---------|---------|---------|----------------|---------------|------------------|--|
| | | Start | | End | | | | | |
| | | X (UTM) | Y (UTM) | X (UTM) | Y (UTM) | | | | |
| Vein 17 | V17W | 531972 | 925708 | 531968 | 925735 | 26 | 46 | 15 | Continuous; all -1m depth |
| Vein 17 | V17-18 | 532255 | 925486 | 532306 | 925572 | 103 | 228 | 7 | Every 5m starting from N end for 30m; -1m depth |
| Vein 17 | V17N | 532333 | 925634 | 532336 | 925643 | 11 | 16 | 11 | Continuous, All -0.5m depth |
| Vein 17 | V17P | 532713 | 925371 | 532765 | 925447 | 22 | 52 | 11 | Continuous, 5 @ -0.5m depth; 6 @ 1m depth |
| Vein 17 | V17PE | 533073 | 925084 | 533089 | 925099 | 21 | 52 | 16 | Continuous; all -1m depth |
| Vein 1 (west) | V1W | 531603 | 922440 | 531615 | 922478 | 36 | 94 | 8 | Every 5m, -1.5m depth |
| Vein 1 | V1E | 532021 | 922343 | 532017 | 922324 | 24 | 68 | 6 | Every 5m, -1.5m depth |
| Vein 2 (west) | V2W | 533468 | 924144 | 533471 | 924162 | 20 | 52 | 10 | Continuous; all -1m depth |
| Vein 2 | V2E | 533983 | 923940 | 534009 | 924000 | 22 | 58 | 12 | Continuous; 2 @ -1.5m S side, 5 @ -0.5m centre, 6 @ -1.5m N side |
| Vein 6 (far east) | V6E | 534111 | 921942 | 534111 | 921963 | 22 | 40 | 10 | Every second sample @ -1m depth |
| Vein 6 (west) | V6C | 533360 | 922053 | 533370 | 922070 | 21 | 56 | 0 | Not sampled - away from main vein |
| Vein 6 (S central) | V6W | 533099 | 922214 | 533101 | 922234 | 21 | 63 | 11 | Every 2nd sample along complete length @ -1.5m |
| Sohon Rami South Vein (west) | SRW | 528604 | 918585 | 528608 | 918605 | 21 | 63 | 12 | Mostly every 2nd sample but continuous over 4m central section, all at -1.5m |
| Sohon Rami South Vein (east) | SRE | 529414 | 918515 | 529410 | 915538 | 24 | 61 | 15 | Every 2nd sample @ -1.5m depth at ends but continuous over 9m @ -1m in central section |
| Sauni Sarki (south) | SSS | 527180 | 917474 | 527427 | 917463 | 26 | 38 | 0 | Too much potential contamination and too distant from former vein outcrop |
| Sauni Sarki (central) | SSC | 527279 | 918025 | 527339 | 918024 | 25 | 62 | 11 | Continuous; all -1m depth |
| Sauni Sarki (north) | SSN | 527334 | 918666 | 527389 | 918666 | 26 | 52 | 12 | Continuous; all -1.5m depth |

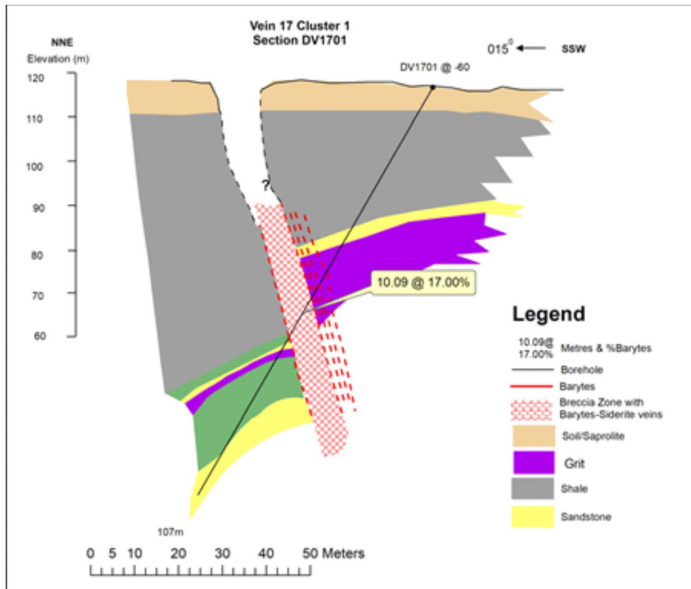
TYPICAL TRELLISED DISPOSITION OF BARYTES MINERALS DEPOSITS

Vein 1 pre-mining vein Swam

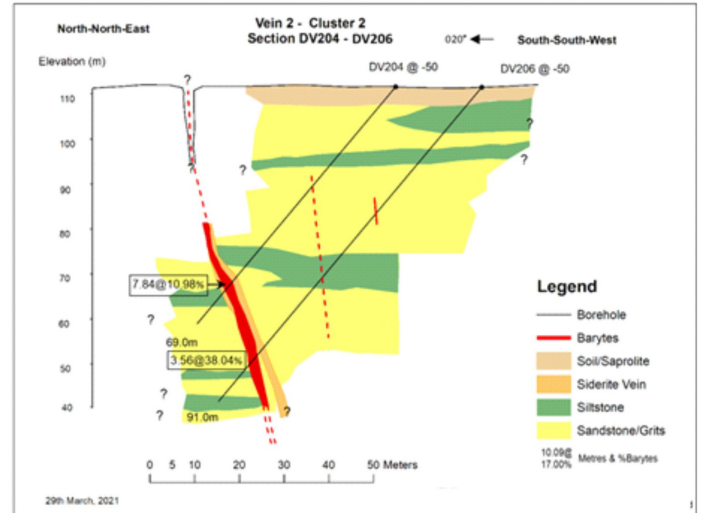


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Vein 17 Cluster 1, DV1701

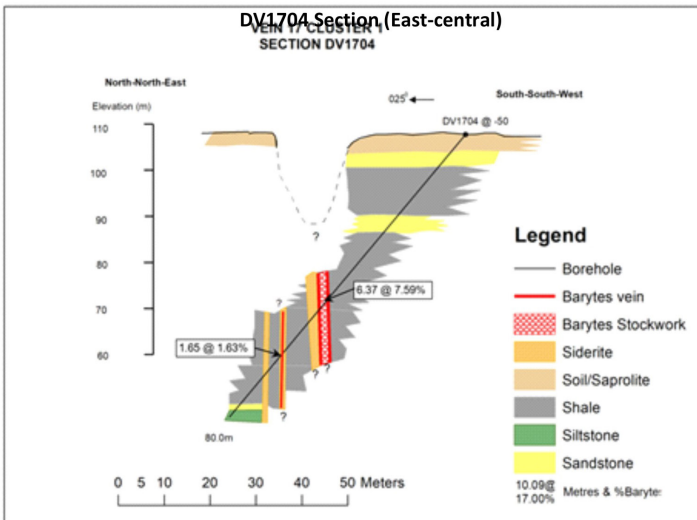


Vein 2 – Cluster 2 Section DV204 – DV206

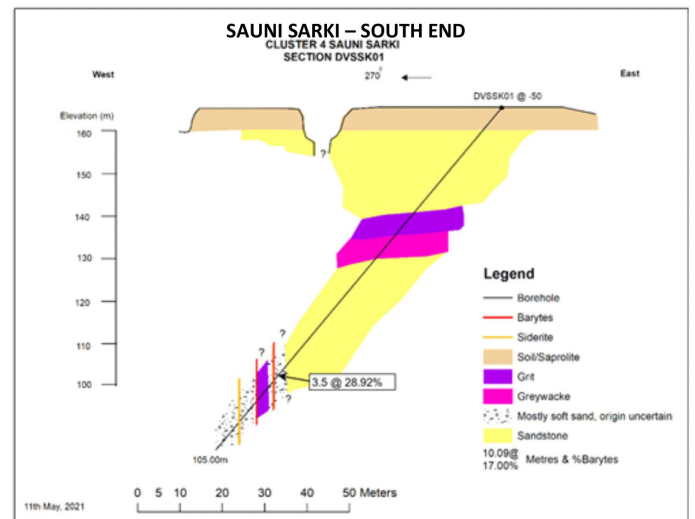


- Initial reconnaissance grab sample of barytes indicated S.G value from the Middle Benue to range between 3.1 and 4.1, whereas selected barytes from drill core averaged 3.5 to 4.16 (this excludes samples from vein 6 where barytes is Intimately mixed with gossan and is potentially economical)
- By contrast, 90% of the reconnaissance grab samples from Lower Benue veins returned S.G's of 3.9- 4.45

DV1704 Section (East-central)
Vein 17 Cluster 1
SECTION DV1704

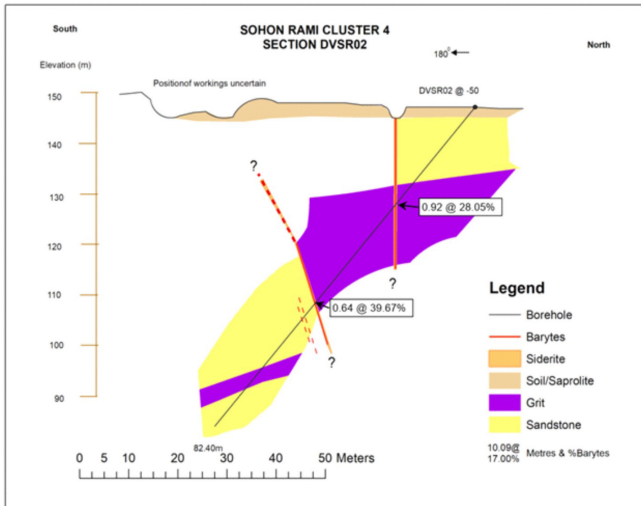


SAUNI SARKI – SOUTH END
CLUSTER 4 SAUNI SARKI
SECTION DVSSK01



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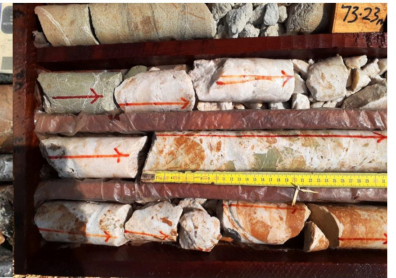
SOHON RAMI Section DVSR02



DV102 69-70m barite vein in gossan



DV204 74-76m Barite in breccia with minor siderite



DENSITY MEASUREMENT Selected Vein Density Result

| AZARA AREA DRILL CORE BARYTES DENSITIES | | | | |
|---|------|-------------|-------------|--------------------------|
| Site | SG | Range | No. samples | Comments |
| Vein 1 | 3,68 | 3,44 - 3,92 | 6 | |
| Vein 2 | 3,55 | 3,22 - 4,22 | 25 | |
| Vein 6 | 2,75 | 2,61 - 2,91 | 3 | Mixed with gossan |
| Vein 17 | 3,55 | 3,04 - 3,96 | 5 | 3,74 grab sample |
| Vein 18 | 4,14 | 4,14 | 1 | 3,92 grab sample |
| Sohon Rami | 3,88 | 3,61 - 4,13 | 1 | |
| Sauni Sarki | 3,52 | 3,52 - 3,92 | 1 | Minor Fe oxide & quartz |
| Gidan Ribbi | 4,16 | 4,11-4,21 | 2 | Archimedes method = 4,69 |



BARYTE (INDUSTRIAL MINERALS)

High grade baryte from the Nkpawogha Mine, Ekukunela cluster



Ensigne Mine Normal fault exploited



Solid Barytes vein with Pb-Zn sulphides



- ❖ In the Azara area, the vein showed very significant zinc assays in 3 holes and 2 other near-by vein not studied in detail (Akiri, Jara-mai Rago) contain several percent copper and might give rise to zone totaling >750m long with significant copper mineralization
- ❖ In the Lower Benue – most barytes veins are separate from the major lead mines, but some veins in clusters around Ekukumela and Iyamitet west of Ikom carry significant galena which may frequently carry over 400g/t silver
- ❖ Very large tracts of the northern part of the Lower, Middle, and some of the Upper Benue Trough have no exposure and a significant proportion of veins have been discovered by activities unrelated to mining exploration or by rudimentary artisanal mining prospecting
- ❖ Hardly any working penetrate below 30m because of the lack of funds and technical skills and equipment of the artisanal miners so Nigeria barytes miners have only just penetrate the surface – literally!
- ❖ Around Azara for 5 or 6 of the veins partly drilled, a conservative resource potential target tonnage of mineralized structures per 100m depth possibly exceed 1M tons but there is too little data to estimate exact barytes reserves – hence the need for systematic resource drilling, that is grid drilling along the veins to establish lateral/areal extent of deposits considering that the above estimate is only on a few drill points.
- ❖ The Lower Benue – veins are typically less than 30cm to almost 2m wide but due to waterlogging rarely are mined below 10 – 20m. Veins are generally above 200m long
- ❖ Upper Benue
 - ❖ - This is less studied but some isolated lengthy veins returned SG's of 3.8 – 4.08
 - ❖ - A very important fact is that Liji Hills –
 - ❖ Kanuel Swam of narrow Ba(F) veins about 8km east of Gombe
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BARYTE (INDUSTRIAL MINERALS)

The Strategic rank is based on 4 things like community support, political and local government support, regional infrastructure and security.

Using a threshold of >70 for the technical rank, as expected, the main concentrations of economically significant veins based on the target ranking exercise are in Block D2, at least 15 prospects, with 7 in D1 and 9 in Block D3

PRINCIPAL TARGET

| Block | Zone, Area | Sites | Technical Score | No. of veins | Comments |
|-------|----------------|-----------------------------------|-----------------|--------------|--|
| D1 | 8, Appawa | Jimilari 1, 3, 4 | 74-79 | 3 | Isolated? Needs mapping |
| D1 | 9, Dungyel | Dungyel 1-2, 3-4 | 80-86 | 2 | Isolated; high purity, long strike |
| D1 | 10, Gombe | Kanuel 3 & 4 | 72-73 | 3 | Narrow; on hill side; many nearby veins |
| D2 | 1, Azara | Vein 17, 1, 2, 6, 18 | 72-98 | >8 | Good logistics, variable widths, mixed grades; large potential |
| D2 | 1, Azara | Sauni Sarki, Sauni Sarki Far West | 70-77 | 4? | Active, good access |
| D2 | 1, Azara | Sohon Rami N & S | 73-75 | 3 | Active, good access; narrow veins? |
| D2 | 1, Azara | Gidan Agana Ribi A & C | 71-77 | 3? | |
| D2 | 1, Azara | Yadin Gaya, Wuse | 75 | 1? | |
| D2 | 1 Kumar | Alkumar cluster | 77 | >6? | >1.6km cluster; logistics poor |
| D2 | 3, Keana | Keana 3B1Z2014 | 73 | +1? | Long, high grade, galena, reasonable access |
| D2 | 5, Lessel | Mbator 4A1Z5017 | 71 | 3 | Among swarm of >5 veins |
| D3 | 6, Ogoja-Osina | Safina 1 | 79 | >1? | |
| D3 | 6, Ogoja-Osina | Gabu 1 | 74 | 1 | Small, some galena; Access? |



BARYTE (INDUSTRIAL MINERALS)

Given the large number of prospects examined, Mecan engaged in a target ranking exercise to assess the technical prospectivity of each deposit based on a score for 14 parameters with maximum scores of 5, 6 or 10, weighted according to their perceived importance. Where no information is available or the outcrops too obscured to provide useful information, the score is 40-50% of the maximum. These parameters are:

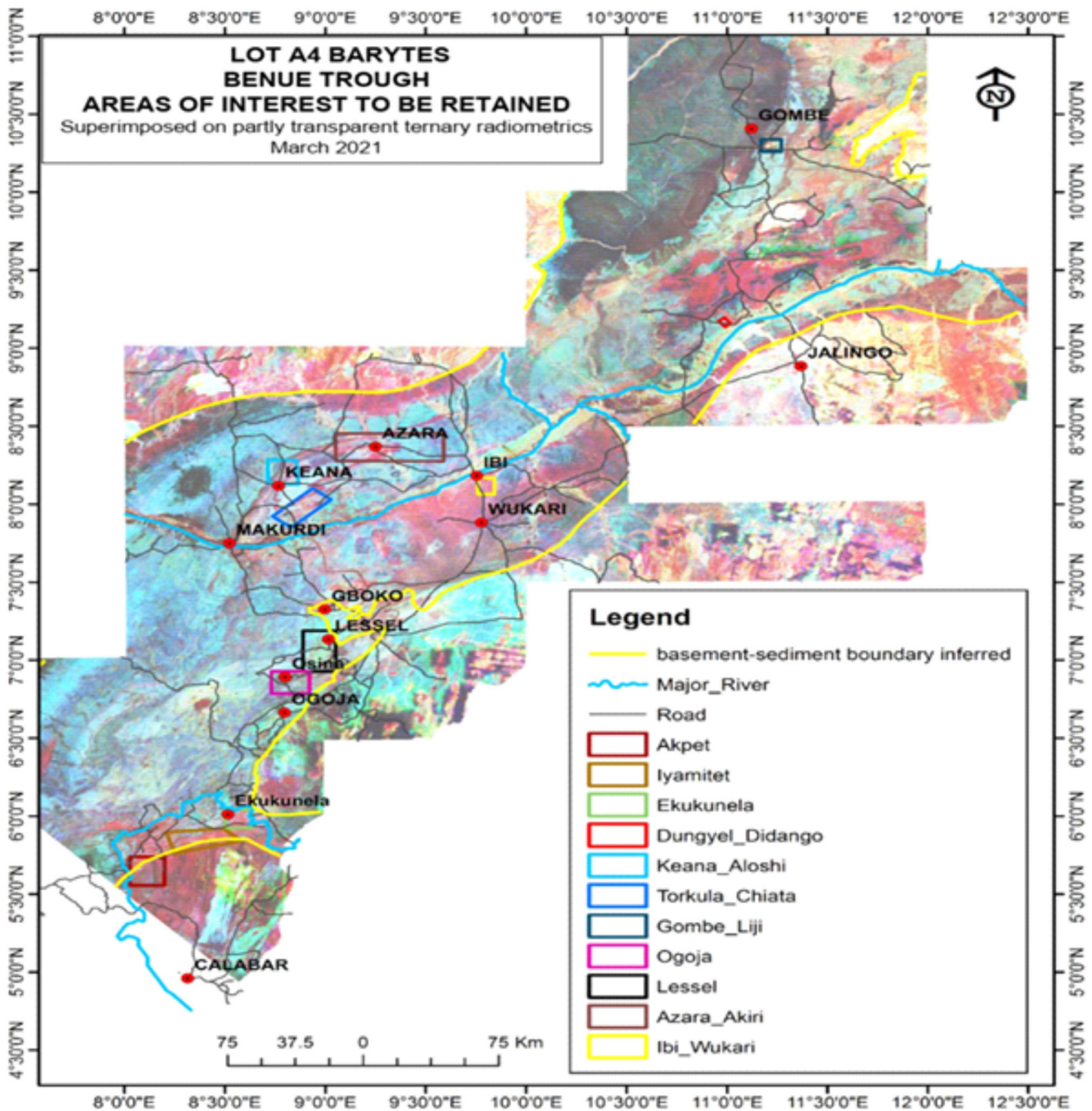
- Barytes mineralisation - whether the mineral is pure, high grade, intimately mixed with gangue or contaminated by Fe oxides and if the fissure is filled with barytes or just a minor constituent.
- Dimensions - primarily based on the length, and if known, the widths.
- Alteration - a higher score is attached if there is more intense alteration and more mineralogical variety.
- Mining - likely possible production, whether abandoned or easily worked in the dry season, or if a working underground mine with infrastructure.



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Recommendations

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- In Block D2, the initial findings suggest that much more comprehensive drilling is justified to fully understand the geological continuity and mineralisation at 2 or 3 of the clusters around Azara, namely veins 17, 2 and Sohon Rami and possibly Vein 1. Veins 2, 17 and 18 deserve foremost attention with drilling initially on 50m and locally, 25m centres, to commence resource definition.
- Also in the Azara-Wuse area, given the added value from copper, the Akiri and Jara - Mai Rago prospects are prime objectives. While they are drill-ready targets, an initial programme of induced polarization combined with closely spaced soil sampling will be prudent to outline mineralised extensions not currently obvious on surface.
- However, knowing the frequency of high grade barytes and absence of any information at greater than 10 - 30m depths, it is advised to examine the Lower Benue region, starting with the Ekukunela cluster in Cross River State to explore at least 3 prospects. Consideration should also be given to mapping and drilling scout holes in the GabuOsina deposits if the community are receptive and logistics are suitable.

