MINERAL EXPLORATION TECHNIQUES

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Outlines

- Introduction
- Exploration Techniques

  - ✓ Desktop Study
  - ✓ Prospecting and regional Geology
  - ✓ Stream Sediment geochemistry
  - ✓ Soil sampling
  - ✓ Geophysical Survey
  - ✓ Detailed Mapping and Trenching
  - ✓ Drilling and Evaluation
  - ✓ Technical report.
  - ✓ Feasibility study
  - ✓ EIA

Introduction

Mineral exploration is a sequential process of information gathering that assesses the mineral potential of a given area. It starts with an idea or geologic model that identifies lands worthy of further exploration up to evaluation and feasibility studies.

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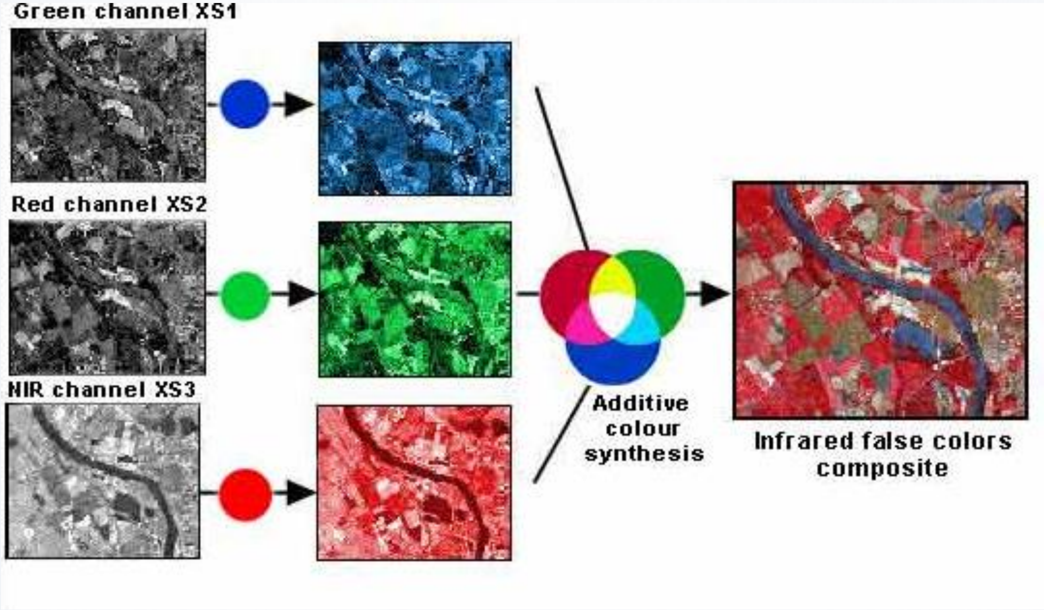
1.Desktop Study

- Data gathering (Previous Work)
- Remote sensing and GIS

Images enhancement techniques , band combination and band rationing on satellite image and Aerial photo can be employed to identify lithological varity and mineralized zones. Directional Filters and STRM images can be used for structural analysis, also systematic structural measurements and documentation of the planar and linear fabrics can be taken .



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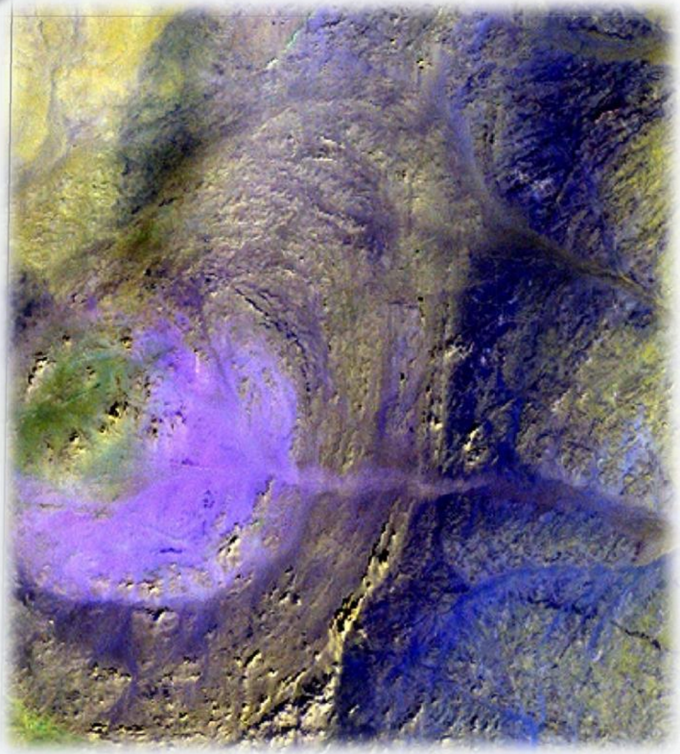
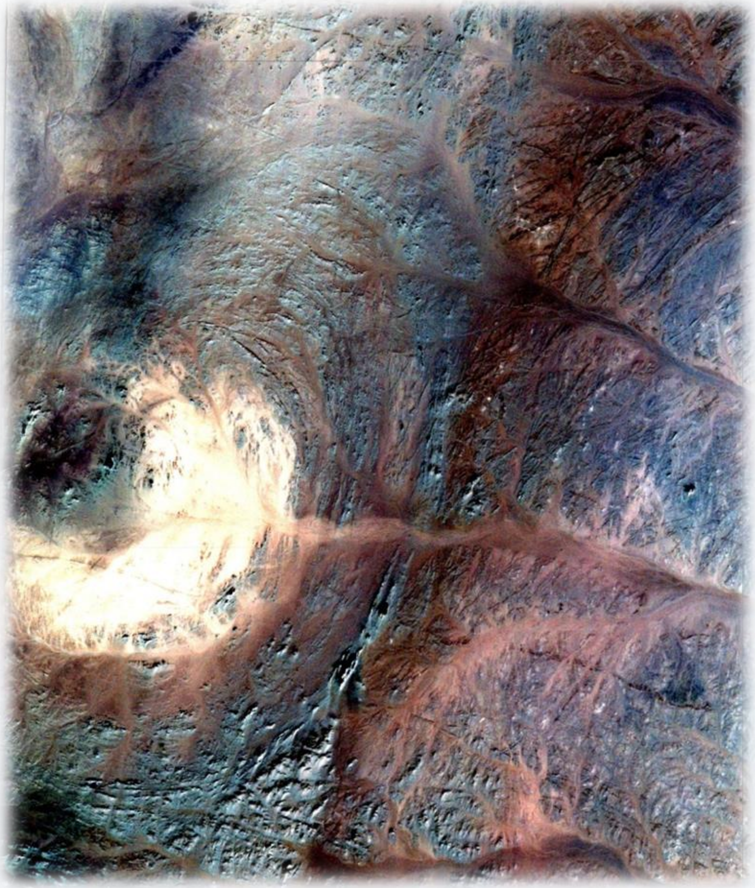
- Remote sensing and GIS



ETM+ Color Composite
(Spatial Resolution 30m)

- Remote sensing and GIS



Color Composite (Aster)
(Spatial Resolution 15m)

- Remote sensing and GIS

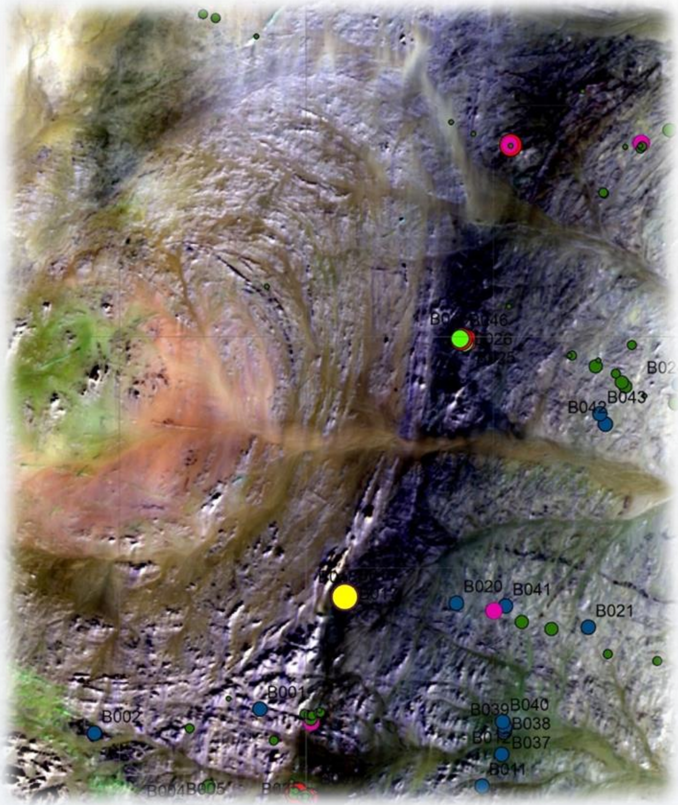
Sentinel -2
(Spatial Resolution 10m)

- Remote sensing and GIS

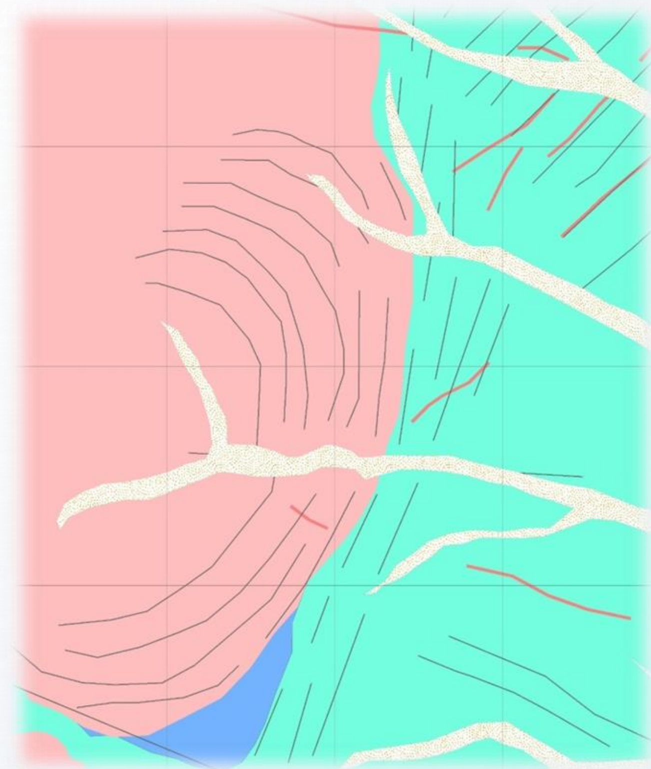
Filter maps
(Generated from ETM+)

2.Prospecting and Regional Geology

Anomaly Explanation , Field relations



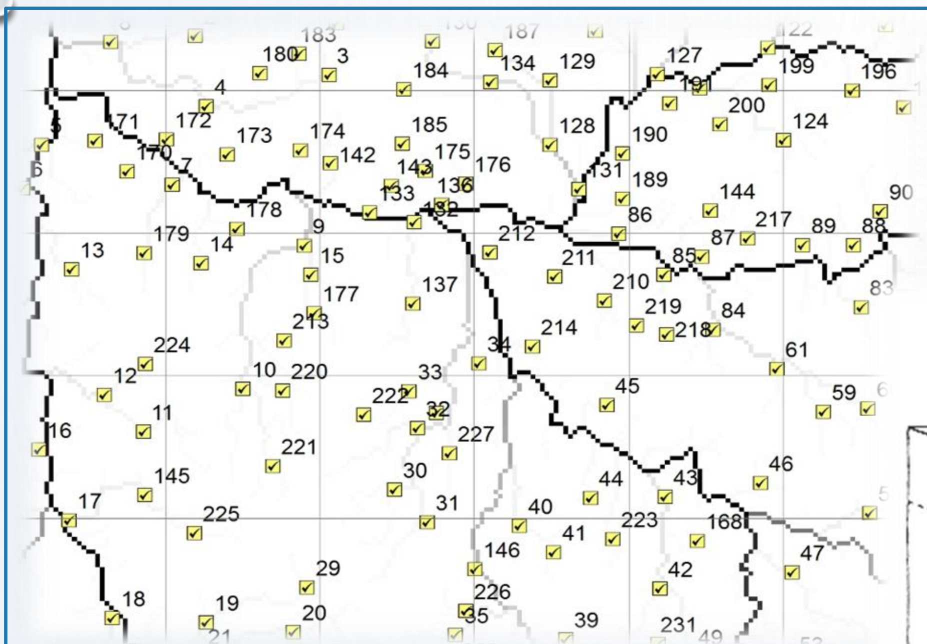
Anomaly map

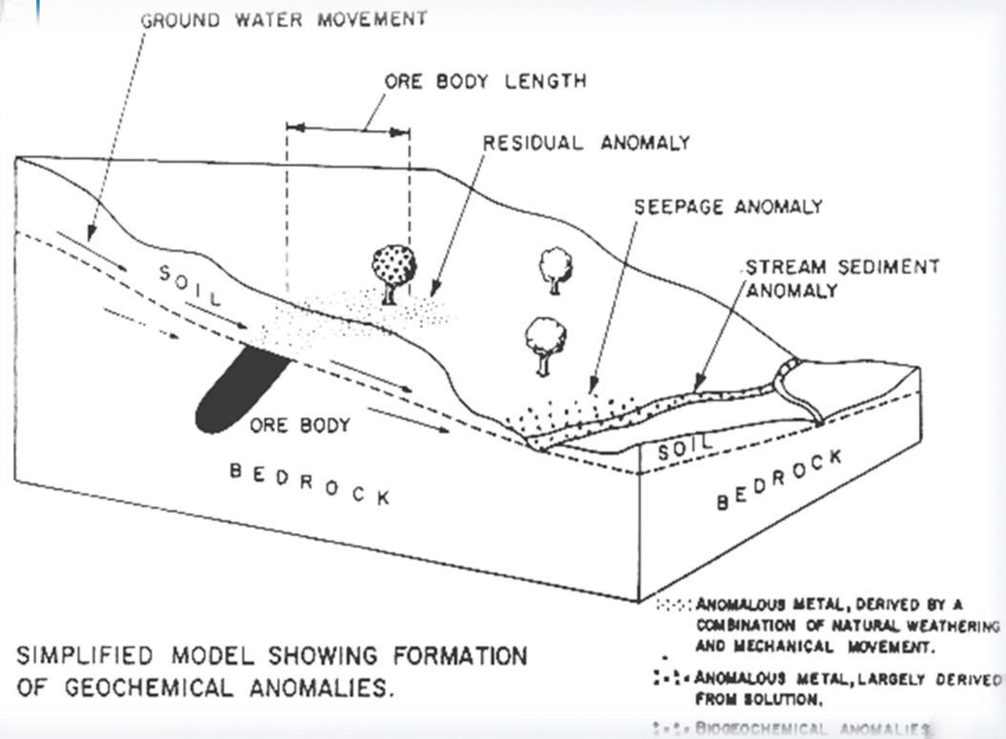


Geological map

3.Stream Sediments Geochemical Survey

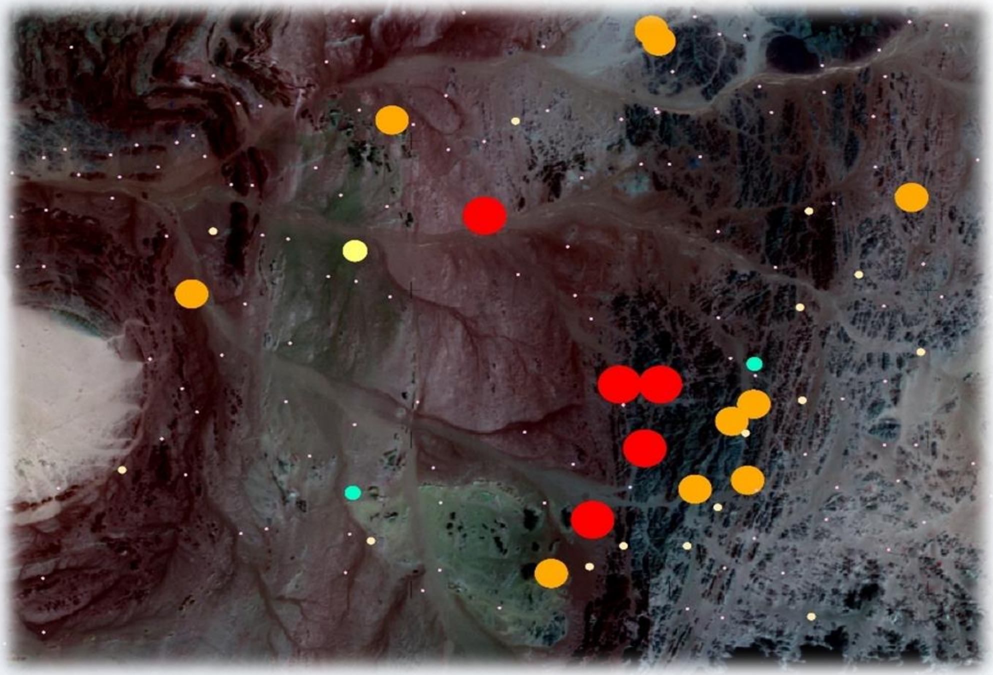
Samples Location, Catchment area , Sieving ,QAQC





Stream Sediment Sample Location and Anomalies

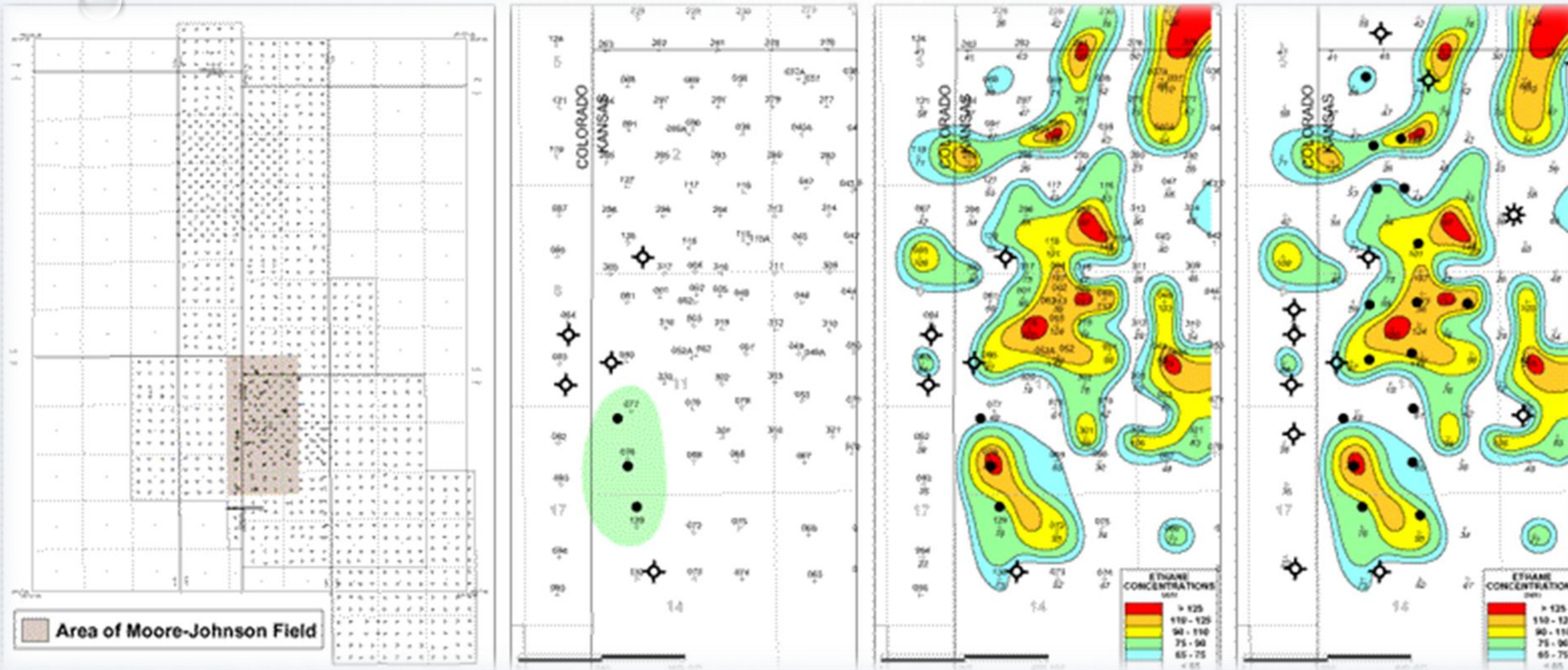
3.Stream Sediments Geochemical Survey



Samples Location, Catchment area , Sieving ,QAQC

Stream Sediment Sample Location and Anomalies

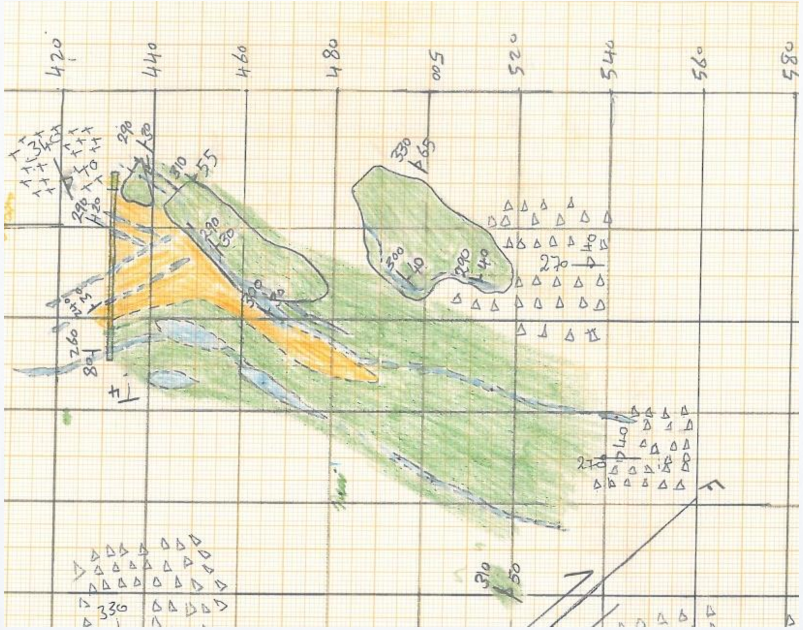
4.Soil Samples



Samples location , Grid , Depth

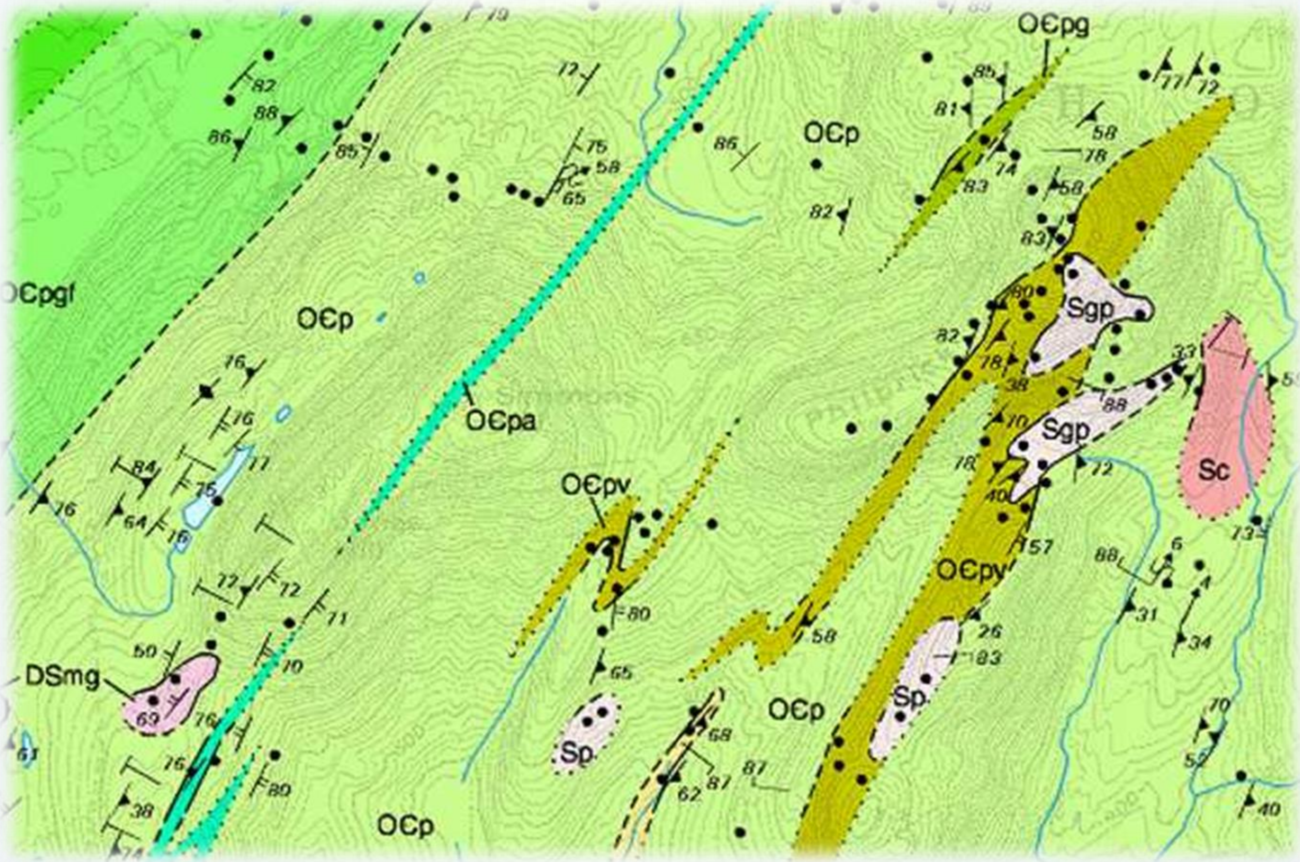
5. Detailed Mapping

Based on high resolution image/Arial photos/Graph and trace paper detailed geological and structural mapping should cover the target areas.



Structural measurement, Boundary, Scale

5. Detailed Mapping



Structural measurements, Boundaries, Scale

6. Geophysical Survey

Types of ores, Properties

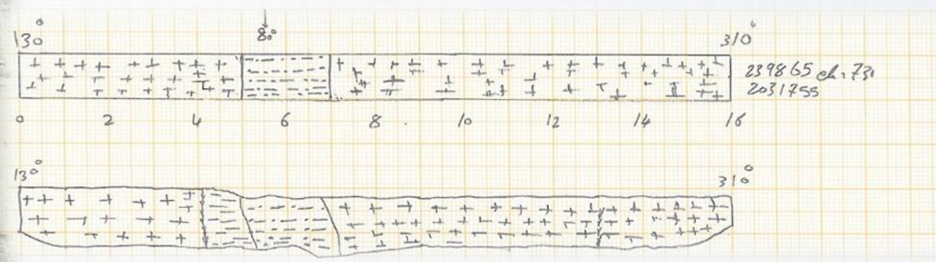
Natural Force Methods (little or no depth control: receiver only required)	Man-Made Methods (excellent depth control. need both transmitter and receiver)
ELECTRIC ground self potential magneto-telluric MAGNETIC airborne proton magnetometer rubidium magnetometer ground suspension wire magnetometer fluxgate magnetometer proton drillhole 3-component fluxgate NUCLEAR airborne spectrometer ground spectrometer scintillometer emanometer drillhole spectrometer scintillometer GRAVITY airborne marine ground gravimeter THERMAL ground drillhole thermistor probe	ELECTROMAGNETIC airborne moving source/moving receiver infinite fixed source/moving receiver ground fixed source/moving receiver moving source/moving receiver infinite fixed source/moving receiver drillhole fixed source/moving receiver ELECTRIC airborne resistivity ground AC or DC resistivity time or frequency domain induced polarization drillhole resistivity induced polarization SEISMIC ground reflection refraction vibration drillhole velocity logging NUCLEAR ground x-ray fluorescence analysis drillhole neutron activitation analysis

OTHER METHODS USING PHYSICAL MEASURING TECHNIQUES

Drillhole dip and direction
Blasthole length
Drill core orientation
Loose block detection
Drillhole diameter
Drillhole water flow metering

7.Trenching

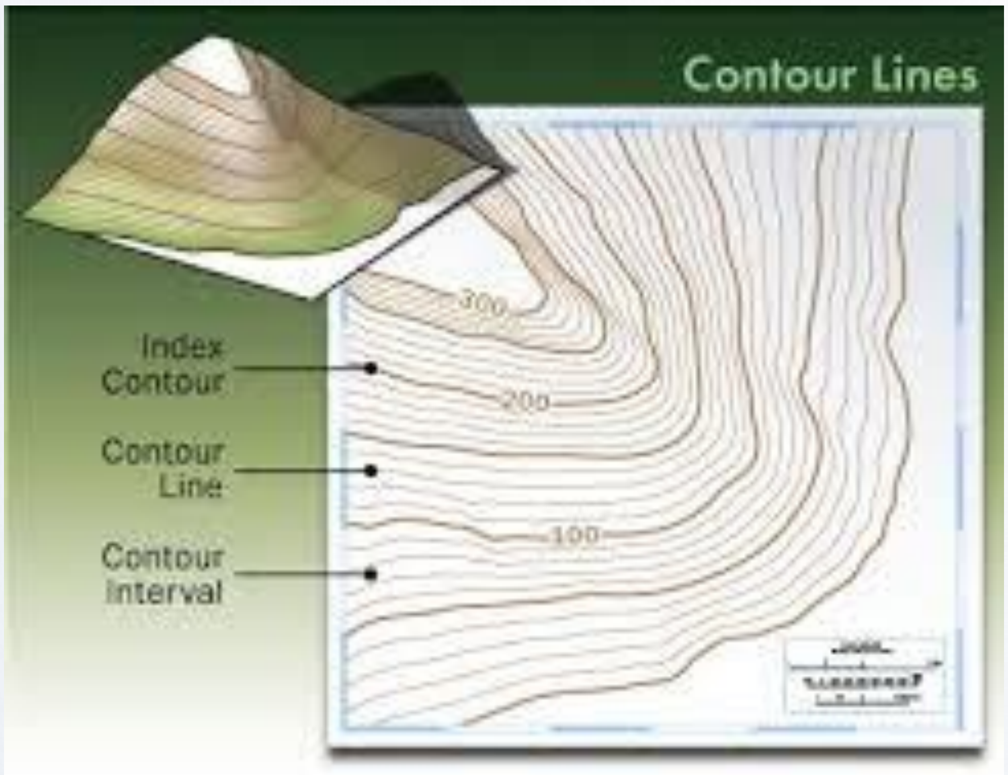
Trenches are usually employed to expose steep dipping bedrock buried below shallow overburden, and are normally excavated across the strike of the rocks or mineralized zone to identify width and extent and take structural measurements.



Facies Samples and Documentation

8. Topographic Surveys (contouring)

The anomaly areas recommended for drilling must be surveyed and contoured in details. This is very necessary to calculate the resource.



Locations, Start and end, interval

9. Drilling/RC/Core.

According to the detailed map, trenching and the chemical results locations of boreholes can be determined and drilled to identify the depth and extents of the ore body. Samples should be taken (as intervals) and analyzed for grade. Geological resource and minable reserves can be measured and feasibility study can be prepared.

Azimuth, Angle , sampling , interval , minor structure …etc.

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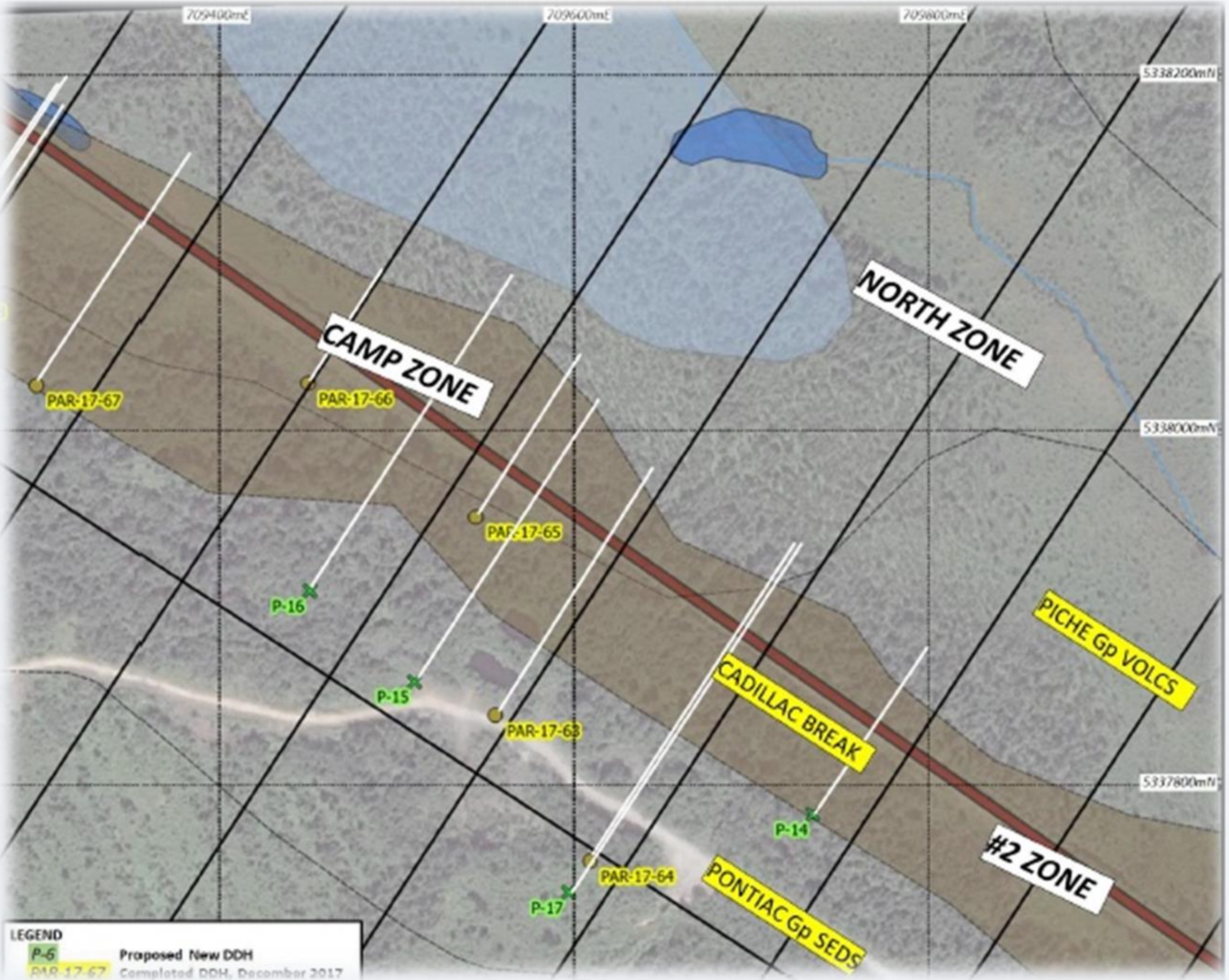
9. Drilling/RC/Core.



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10. Samples Analysis

Samples collected from mineralized zones, chip samples, facies samples, core ore samples, cuttings, soil, and stream sediments should be analyzed in certified geochemical labs.

11. Metallurgical tests

Bulk samples should be taken and prepared for metallurgical tests from the evaluated areas to identify the optimum processing method. This step can also be done in the pre-estimation phases.

Represented Sample, Quantity

12. Reporting

The data obtained should be processed and the results analyzed and reported in a final technical repot .

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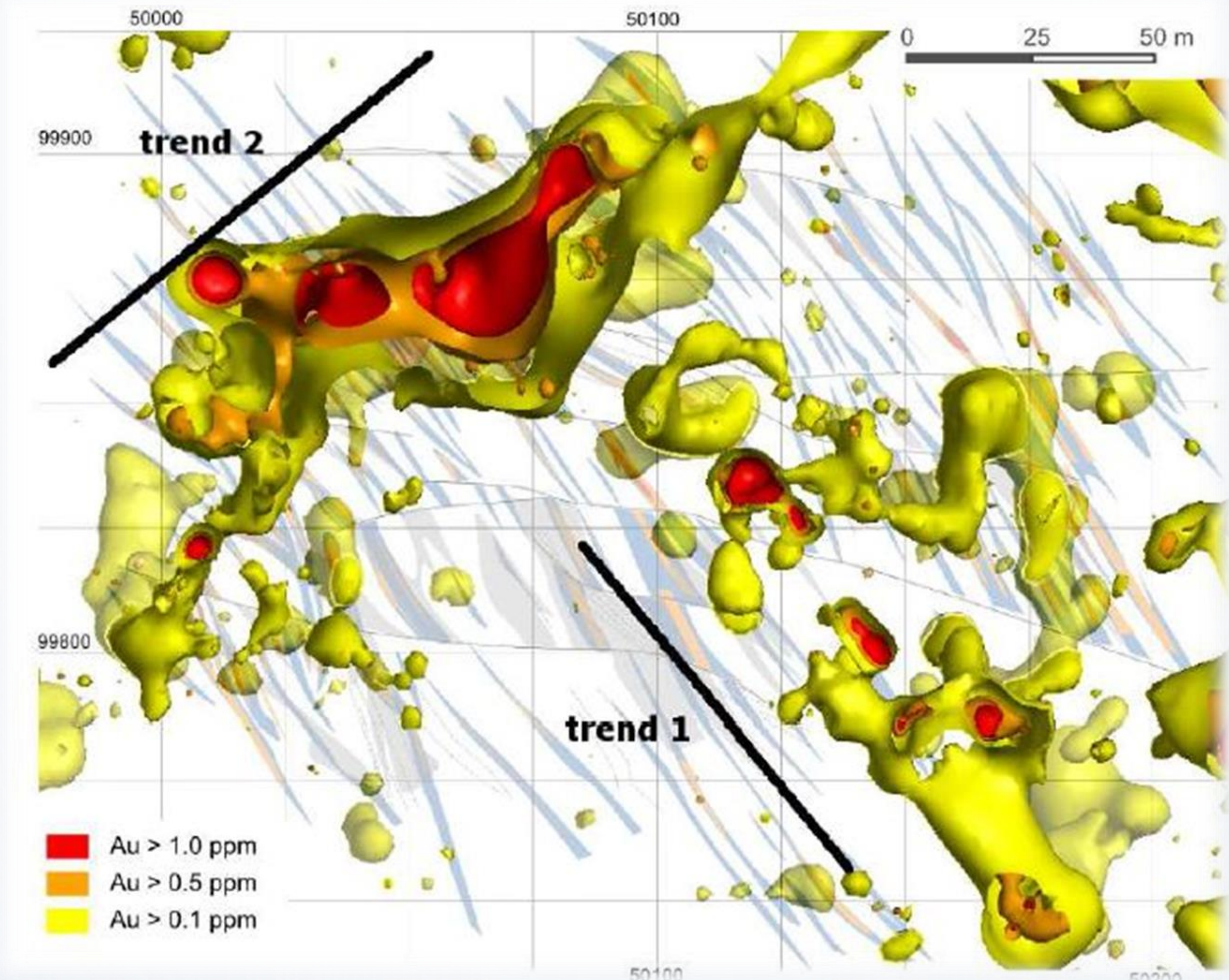
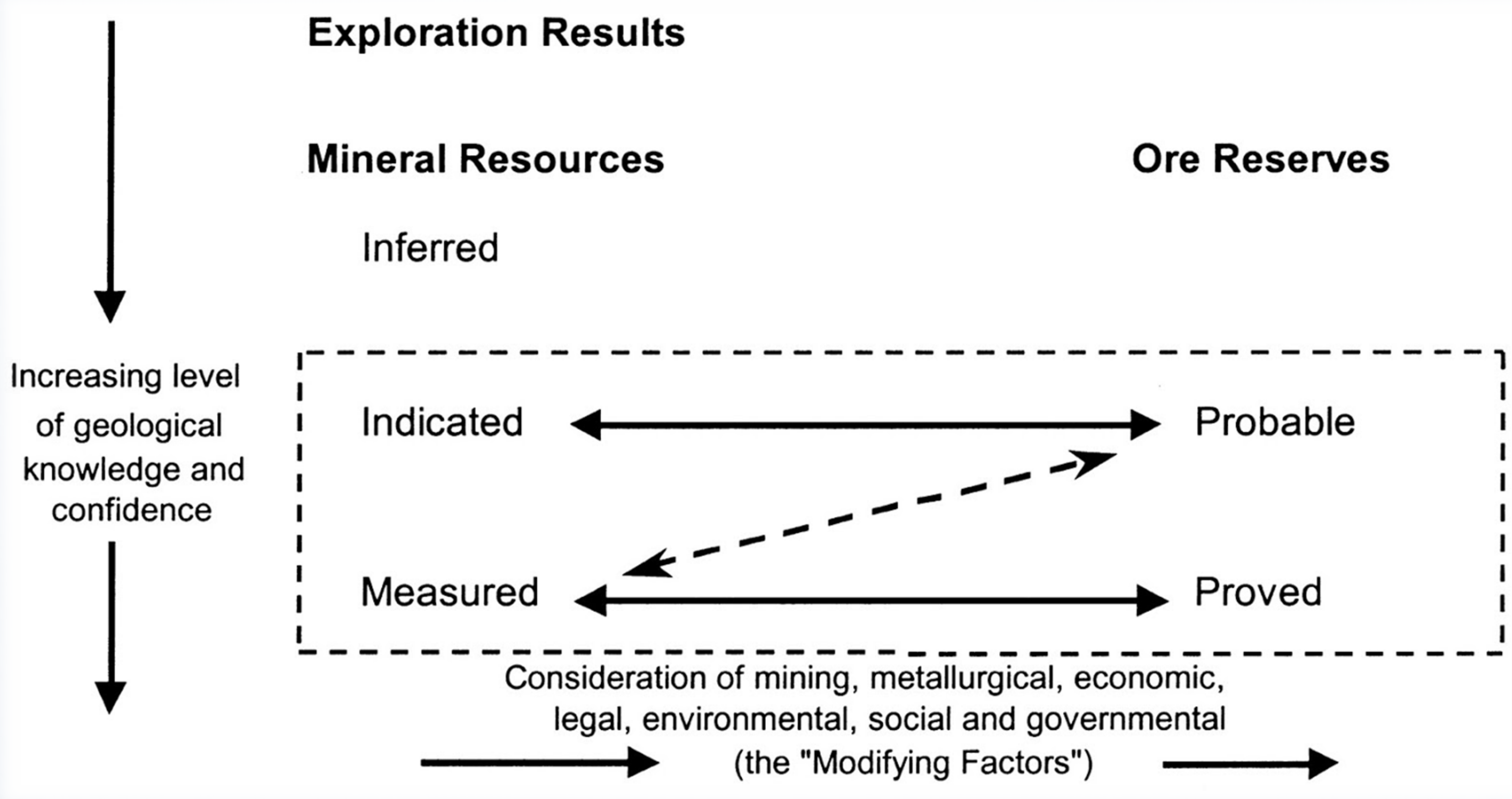
12. Reporting



Modelling

Mineral resource and reserve



Feasibility Study

13.EIA

CONCLUSION

- MINING IS A CAPITAL AND TIME INTENSIVE INVESTMENT.
- TIME IS THE MORE EFFECTIVE FACTOR.
- SEQUENTIAL EXPLORATION SPARES TIME AND REDUCES COST
- QC AND QA SHOULD BE CONSIDERED IN SAMPLES COLLECTION, PREPARATION AND ANALYSIS.
- ANALYSIS SHOULD BE PERFORMED IN ACCREDITED LABS.

Thanks…