DESERT MINERALS CO. LTD

EXPLORATION SUMMARY

Block RS-64D, Red Sea State, Sudan

KHARTOUM 2021

Contents

1. INTRODUCTION

Desert Minerals Co LTD (DM) has obtained a concession license for the block RS-64D on 20/12/2018, based on preliminary geological study DM conducted on October 2018.

The concession block is located in Red Sea state and has area of 222 sq.km. The coordinates of the corners of the RS-64D block are presented in the table 1.1. below.

Table 1.1. Coordinates of the concession block RS-64D

Point	Latitude	Longitude
A	17°51'40.50"	35°25'05.00"
B	17°51'40.50"	35°35'13.00"
C	17°45'00.00"	35°35'13.00"
D	17°45'00.00"	35°25'05.00"

The program for the first year was approved on 27/01/2019 and DM has started the exploration activities in February 2019. Since that date DM conducted Remote Sensing Study, Ground Magnetic survey and soil geochemistry for the whole block. Based on this 10 prospective areas (Zones) are distinguished for further exploration. IP survey, Trenching, RC and Diamond drilling are done within prospective zones during the last 2 years.

The summary of prospecting and exploration activities are presented in this report.

2. PROJECT LOCATION AND DESCRIPTION

The RS-64D block is located in the Red Sea State of Sudan (Fig 2.1). The property is connected with the Atbara-Port Sudan highway by a 100km long desert road which is in a good condition almost all the time, some difficulties appear on rainy seasons during August-September period (Fig 2.2). The distance from the property to Atbara city and to Port Sudan is about 200km and 450km respectively.

Fig 2.1. Location of the Concession of Desert Minerals Co LTD (DM)

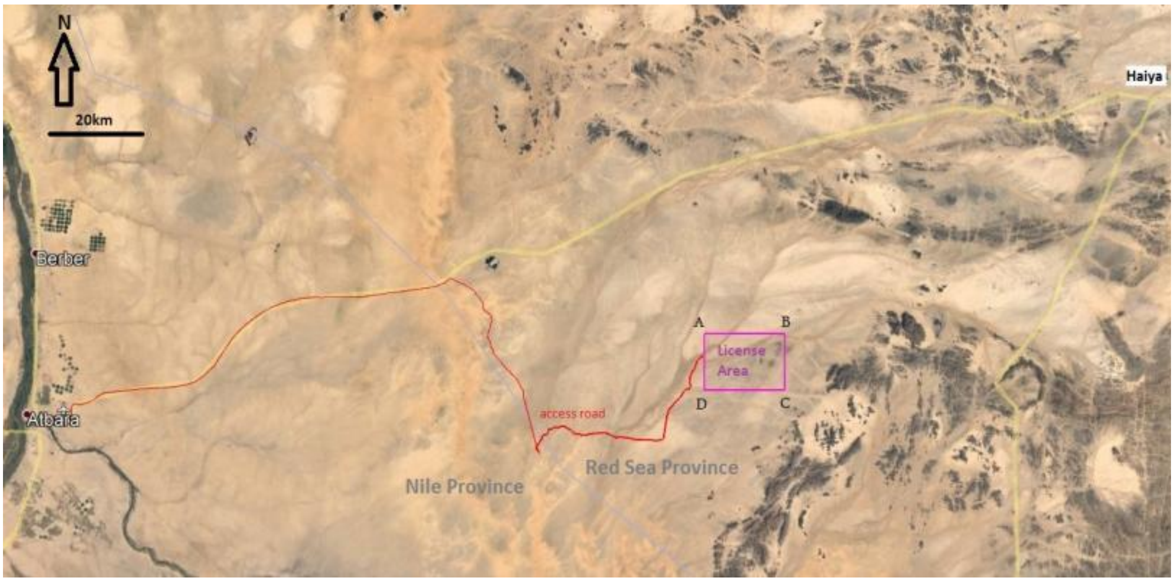

Fig 2.2. Access road from Atbara to RS-64D block.

The climate is arid with a very hot season from June to September during which the maximum temperatures range from 45 to 55 °C and rainstorms may occur. The coolest period is during the months of January and February with daytime temperatures of 30 degrees and cool nights ranging from 10-15 degrees. The dominant winds depend on the season: mainly from the west or northwest during the hot period, and from the north or northeast during the rest of the year.

The area of the Block lies in a semi flat area characterized by low degree of out cropping. The Quaternary to Recent deposits obscure the geology of the area and cover most parts of it. The area of Block 64 is characterized by chains of hills separated by sandy valleys that collectively form the main basin, joining major Khors and Wadies. Vegetation dominantly consists of sparse thorny shrubs and dry grasses in the valleys. Grasses cover the valleys for several months after heavy rains, serving as grazing ground for sheep, goats and camels.

The whole Red Sea region is sparsely populated and dominated by Amarer, Bisharian, Hadandwa, Atmans, and Bani-Amer (Bija tribes). The inhabitants are mainly nomads breeding camels, goats and sheep. Some of them pursue seasonal agricultural activities in the Wadis depending on the scarce rainfall to grow sorghum (Dura), and recently some of them pursue artisanal mining activities.

3. GEOLOGY AND MINERALIZATION

3.1. Regional geology

The project area is underlain by basement rocks of the Arabian Nubian Shield. This is an accreted assemblage of metasediments and metavolcanics from island arc and back-arc settings with associated intrusive rocks dating from Pan-African times at 800-600 ma.
In the north of the area - because of the partial coverage of recent aeolian deposits - the basement rocks are not mapped on the regional map but rather the area is included in a partially covered undifferentiated basement unit (Px). In the southern part of the area the regional map shows basement gneisses with a fold structure truncated by a large regional fault at its northern limb (Fig 3.1.).

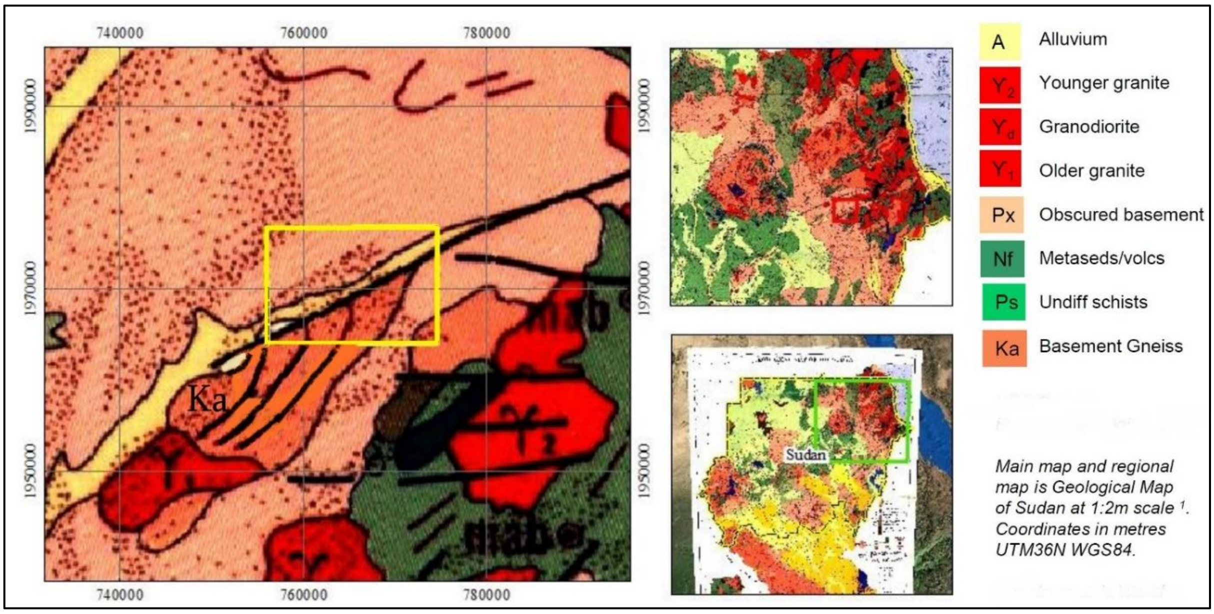

Fig. 3.1. Regional geological maps of the area of interest.

3.2. Geology and mineralization of the area of interest.

Geological studies initiated by DM in the area provide detailed information that allows us to redefine the geological mapping much more accurately.

A large near-isoclinal fold structure is apparent with a SW-NE trending fold axis and a fold closure in the NE. The fold is interpreted to be bounded and truncated on its NW side by a large fault structure. Frequent minor faults / fractures predominantly trend E-W or NNW-SSE. Major faults trend N-S or NNW-SSE. Sinistral offsets have been observed (Fig 3.2.). A series of dykes predominantly trend E-W or NE-SW and occasionally N-S in the East of the study area. A number of these are extensive, extending across the width of the AOI.

Sand cover obscures the underlying bedrock in the North of the area. The central part of the exploration area is occupied by a large near-isoclinal fold structure with a SW-NE trending fold axis and a fold closure in the NE. The fold is interpreted to be bounded and truncated on its NW side by a large fault structure. The folded rocks are dominated by CPS Mineral Mapping signatures. These are probably mainly chlorite bearing metavolcanics. Some felsic metavolcanics with argillic signatures are probably also present. There are also number of E-W trending felsic dykes intruded into the folded meta-volcanics – these also have argillic signatures. The areas to the NW and SE of this structure is largely covered by recent deposits with very little bedrock exposure. There appears to be no significant spectral information on the nature of the underlying basement rocks.

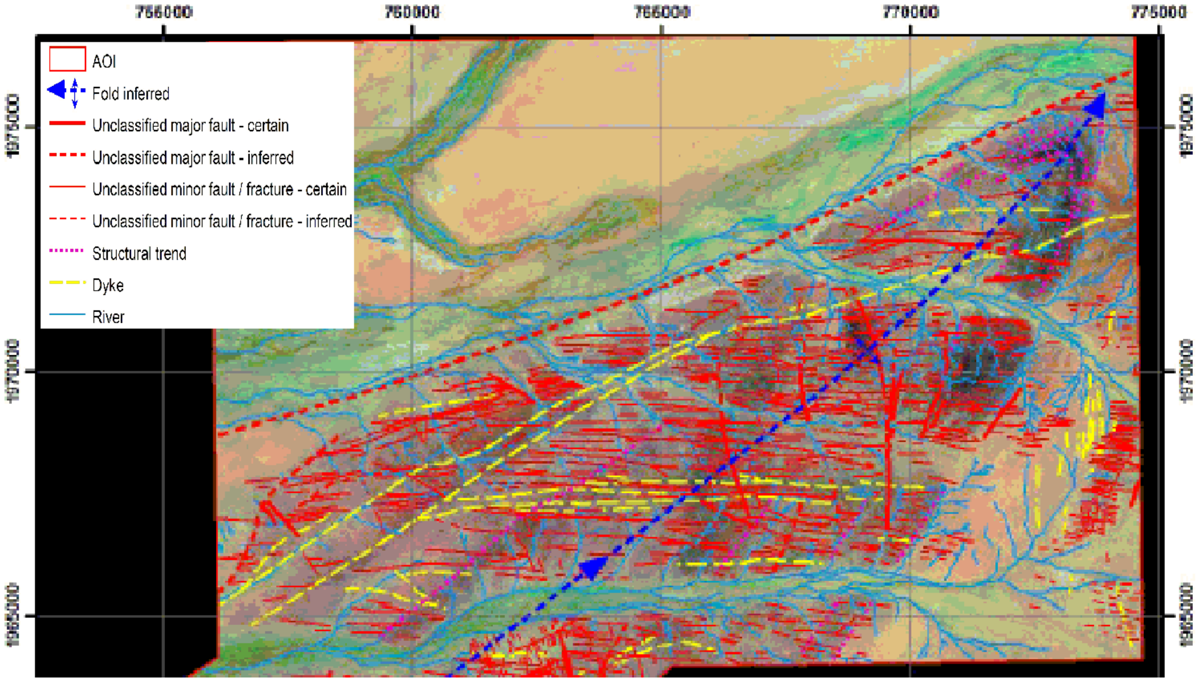

Fig 3.2. Structural map of the block RS-64D.

Hyperspectral Mineral Mapping of dolomite has revealed a “marker horizon” bearing dolomite-like spectral profiles and can be seen in both limbs of the fold structure as well as mapping out the fold nose in the NE. If these rocks are dolomite then they may well be exhalative sediments associated with base-metal mineralisation. This signals the possibility of VMS style mineralisation. Re-distribution of metal sulphides during deformation also raises the possibility of the development of saddle reefs in the region of the fold nose in the NW. There are other possibilities for mineralogy to produce these spectral profiles – an iron rich chlorite for example. Field checking of these spectral features should provide answers. Mineral Mapping of iron oxide rich rocks that include gossans has been carried out using just the VNIR at 1.2m pixel. The areas defined by this are dominantly iron-oxide rich sediments in the wadis but a few small areas of possible gossan have been defined in the bedrock. If bedrock gossans are undisturbed then they will not be mapable using this technique as a thick black desert coating obscures the underlying spectral features.

4. REMOTE SENSING

In order to support mineral exploration with remote sensing in the first quarter of 2019 DM has purchased WorldView-3 - Very High Resolution Imagery with 16 spectral bands and Shuttle Radar Topography Mission (SRTM) elevation model for the area of interest (Block RS-64D). DM had installed 8 ground control points (GCP) that are clearly visible for satellites to get very accurate georeferenced images. SRTM 30m DEM data were obtained and processed. A number of derived products will be produced including shaded relief images and slope maps, in order to assist the interpretation. The SRTM DEM has a vertical accuracy of less than 16m (90% confidence level).

The enhanced and georeferenced hyperspectral images were processed and all the mineralogical, geological and structural interpretations were done in the second quarter of 2019.

4.1. Hyperspectral data

Remote sensing datasets primarily consist of WorldView-3 and Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) data. An outline of the basic specifications are described below.

WorldView-3 imagery (WV-3) consists of 16 band data (8 Visible and Near Infra-Red {VNIR}, 8 Short Wave Infra-Red {SWIR}) plus panchromatic band Acquired 19/04/2019 in three strips

Pre-marked GCP points were used for the orthorectification of the WV3 imagery in conjunction with the SRTM DEM. Image mosaics were produced at 0.3m resolution in addition specific image mosaics were produced, optimised for the mineral mapping.

SRTM DEM has 30m grid spacing.

The purpose of using WV3 Imagery is to be able to carry out Spectral Mapping at high spatial resolution. WV-3 collects 3 separate sets of data at different spectral and spatial resolutions:

- Panchromatic – single band image at 30cm pixel;
- VNIR – 8 bands of spectral data at 120cm pixel;
- SWIR – 8 bands of spectral data at 370cm pixel.

The SWIR is currently only available at 750cm pixel due to US Government regulations so has to be supplied sub-sampled.

The 8 bands of VNIR and 8 bands of SWIR data can be combined into a “super-spectral” 16 band image which allows Spectral Mapping of rocks and soils in the High Resolution realm. Before WV-3 we had ASTER 9-band spectral data and LANDSAT-8 7-band data which allowed Spectral Mapping on a regional scale.

WV-3 data allows us to perform Spectral Mapping in high spatial resolution. VNIR-SWIR data are analysed at 750cm pixel. The results of Spectral Mapping are presented in colour on a topographic base derived from the Panchromatic data at 300cm pixel.

Spectral Profiles of Geological Materials

WV-3 collects 3 sets of co-registrable data at different spatial and spectral resolutions:

- Panchromatic.
- A single band (visible to near infra red) at 30cm pixel. This provides superb detail and can be used to "Pan-sharpen" colour imagery.
- Visible and Near Infra-Red (VNIR)
- Bands 1 - 8 from UV to NIR at 1.2m pixel. Provides simulated true colour (STC) in great detail and maps vegetation, water and iron minerals.
- Short Wave Infra-Red (SWIR).
- Bands 9-16 at 3.6m pixel but currently sub-sampled to 7.5m pixel due to US regulations. Combines with VNIR to produce false colour composites (FCCs) and enables WV-3 Clay/Iron and WV-3 Mineral Mapping processing at unprecedented spatial resolution.

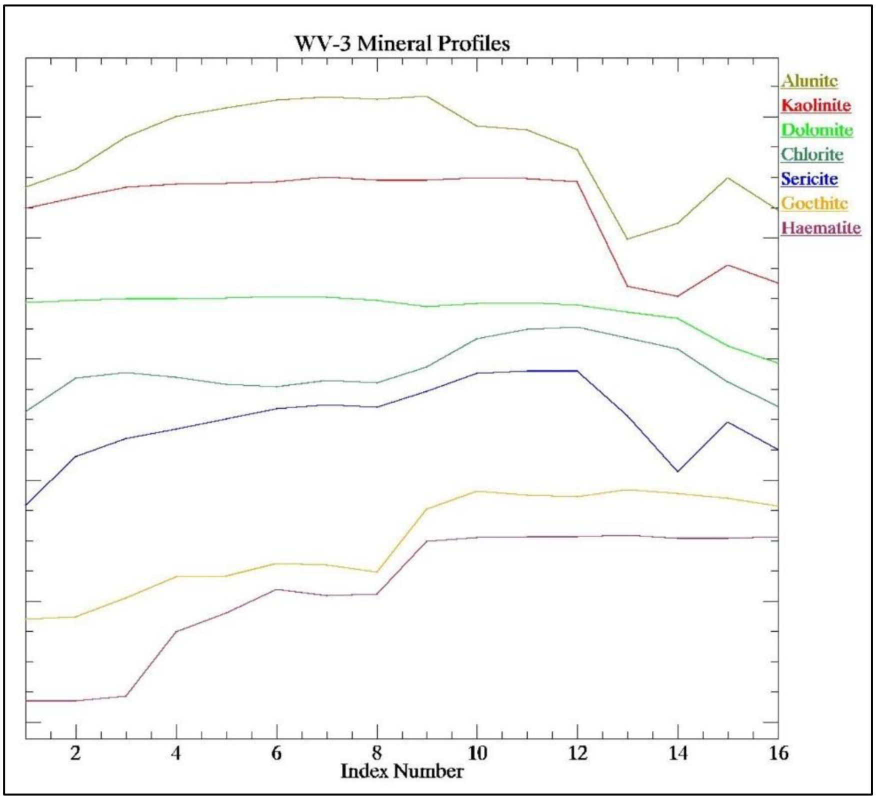

Fig 4.1. *Selected mineral spectra from the USGS Spectral Library re-sampled to the bands of WV-3. The mineral profiles are shown in "band-space" rather than wavelength on the x-axis where the Index Number is the WV-3 Band Number.*

The Super-Spectral resolution of WV-3 enables us to map and distinguish 4 mineral groups – Iron oxides/Hydroxides (Hae & Goe), Argillic minerals (Arg), Carbonates, Propylites and Serpentinites (CPS) and Phyllites (Phyll).

Hae & Goe: Haematite and Goethite. These are characterised by an absorption feature at B8 and also by an absorption at B2. To distinguish between them we use the slope of the profile between B5 and B3 which is shallower for Goethite and Steeper for Haematite.

Argillic: Minerals like alunite and kaolinite that have characteristic absorption features at B13 and B14.

CPS (Carbonate, Propylites, Serpentines): Minerals including calcite and dolomite, epidote and chlorite and serpentines that have a characteristic absorption feature at B16.

Phyllic: Minerals such as sericites and smectite clays that have a characteristic absorption feature at B14.

Visible and Near Infra-Red (VNIR) at 120 cm pixel
The VNIR from WV3 is collected at very high resolution (VHR) in the spatial domain with a 120 cm pixel. This allows simulated true colour (STC) false colour composites (FCCs) to be made as well as the classic False Colour Infra Red familiar from the days of Colour Infra Red aerial photography and early Remote Sensing satellite imagery such as the LANDSAT Multi Spectral Scanner (MSS).

Overviews of the WV-3 VNIR data are shown in Fig 4.2 as FCC753 in RGB – equivalent to the Infra-Red False Colour imagery from MSS and Aerial Photography. Note the orange-brown colours in the wadi drainage. These are areas of scrubby desert vegetation that are confined to the wadis where the roots can access water in the substrate.

The rocks in the central fold structure are represented in various subtle shades of blue-grey. The surrounding partially sand covered desert surface shows in a lighter blue-grey. Note the lighter colours over the western side of the central strip. It looks like this part of the imagery may have been collected when there was minor haze cover.

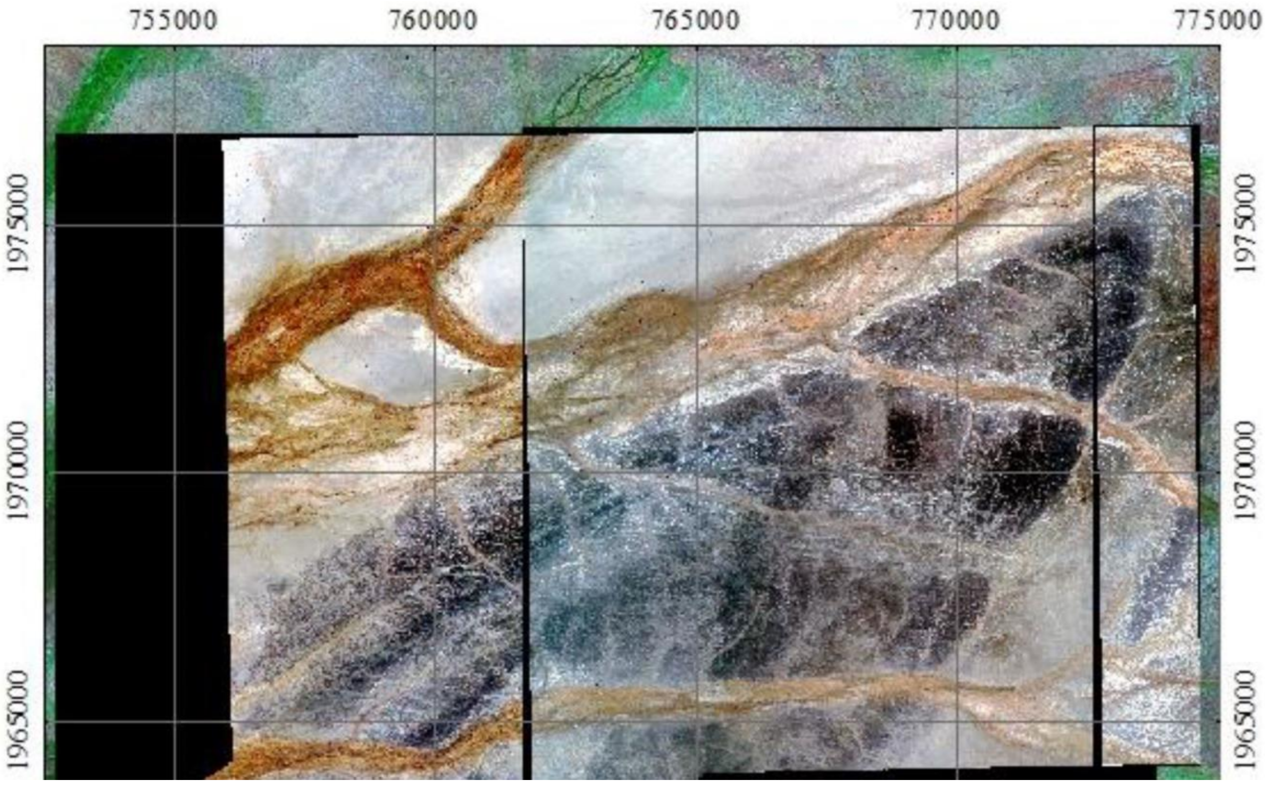

Fig 4.2. *WV3 VNIR data presented as FCC753 Image over the project area. Note that the full area coverage consists of 3 separate images. This is because the survey area is wider than 2x the maximum swath width of WV-3. The swaths were collected on the same date - 19th April 2019. (Coordinates in metres UTM36N WGS84. Grid spacing is 5km. Background imagery is LANDSAT ETM+ Millennium Tiles © NASA.)*

Short Wave Infra-Red (SWIR) at 750 cm pixel

The SWIR data of WV-3 is collected at 370cm pixel but it is not currently available at this resolution because of US regulations and is delivered to users at 750cm. The 8 bands of WV3 SWIR cover regions of the spectrum where diagnostic absorption features of major mineral groups occur. Combination of the SWIR data with co-registered VNIR data (sub-sampled to 750m pixel) constitutes a “Super-Spectral” array and enables Spectral Mapping of these major mineral groups to provide mineralogical information way beyond the scope of any of the 3 band combinations we normally see.

The overviews of the WV-3 SWIR data are shown in Fig 4.3 as FCC16 12 9 in RGB. This is just an arbitrary 3 band display. We get some different colours to the other combinations we have seen so far but the significance of the colours is difficult to interpret when you just choose 3 bands from a 16 band array. This is the reason for using many of the available bands to characterise our mineral profiles in the data and to give each spectral type a standard colour so that we have a much clearer idea of the type of rocks that are present.

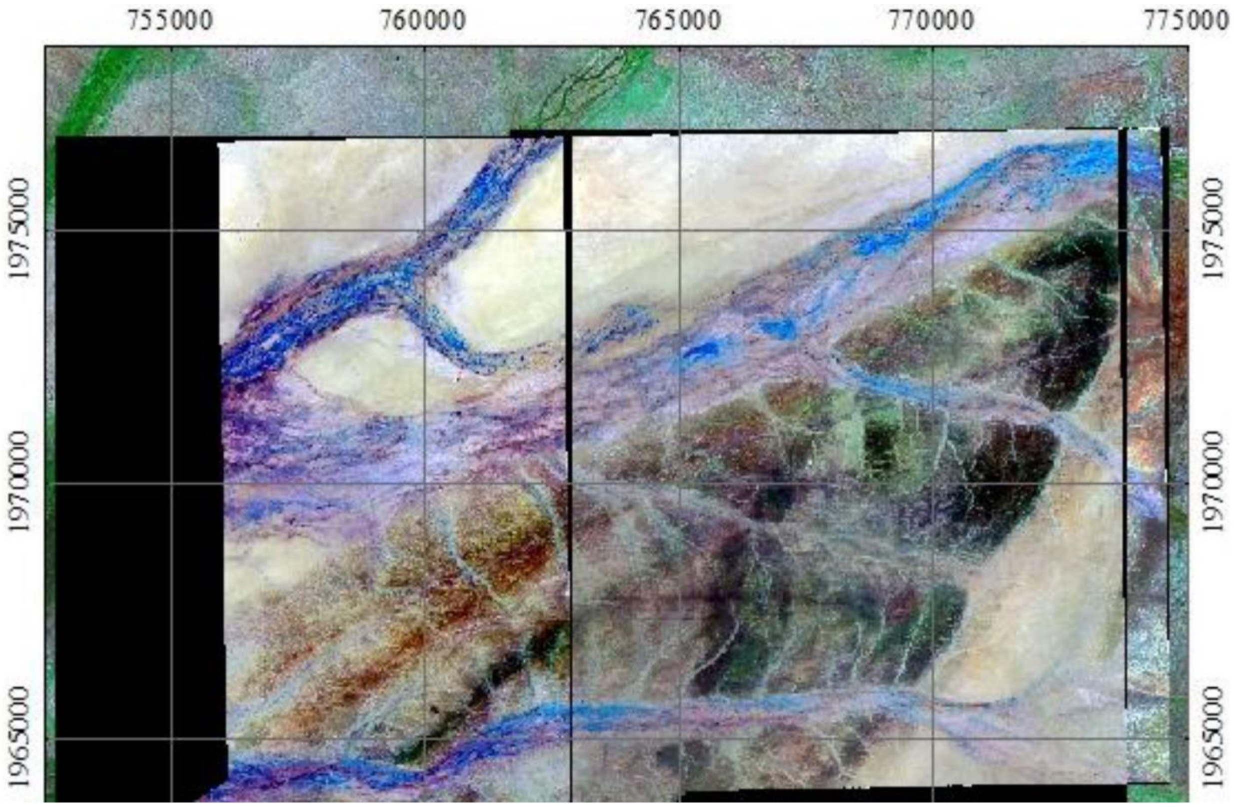

Fig 4.3. *WV3 SWIR data presented as FCC16 12 9 Image over the project area. Note that the full area coverage consists of 3 separate images. This is because the survey area is slightly wider than 2x the swath width of WV-3. The 3 swaths were collected on the same date - 19th April 2019 (Coordinates in metres UTM36N WGS84. Grid spacing is 5km. Background imagery is LANDSAT ETM+ Millennium Tiles © NASA.).*

WV-3 Simulated True Colour

This is the WV-3 SimulatedTrue Colour (STC) equivalent of the imagery we see on Google Earth. The quality of the WV-3 data with a 1.2m pixel is apparent, even in this zoomed out image. We can see some excavation and trenching along linear zones.

The desert surface is represented in various shades of grey in the STC image (Fig 4.4). There is a darker grey-green zone trending SW-NE on the eastern side. Desert tracks are very high reflectance in all 3 bands and appear white. Drainage channels appear as light orange or browns. The orange-brown colour could be due to iron oxides / hydroxides but, it is likely this is the visible colour of the scrubby vegetation that is restricted to the wadis where there is sub-surface water closer to the surface.

In the excavations and trenching we see grey to white to cyan colours – these could be due to the presence of hydrothermally altered rocks related to the metalliferous mineralisation that appears to be being explored for. However – it is difficult to distinguish these areas from other man-made surface disturbances using an STC image.

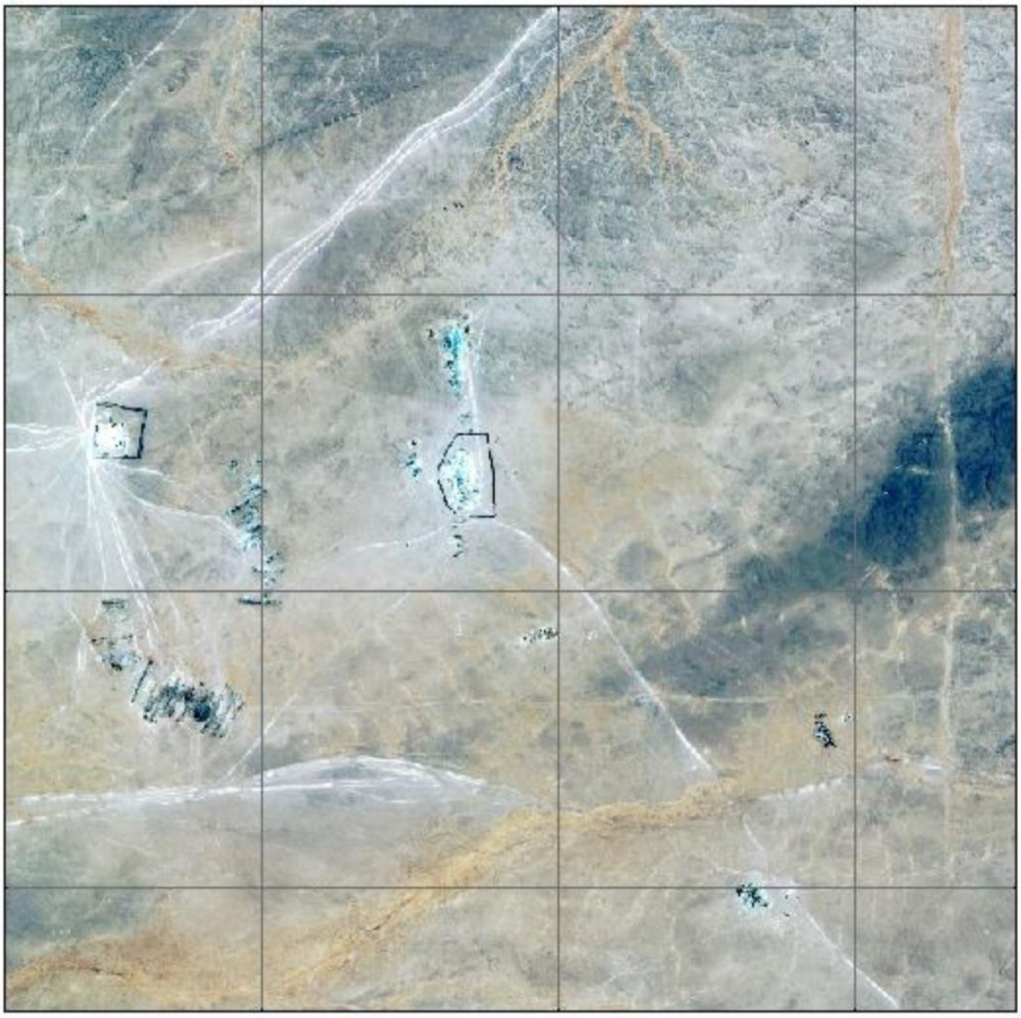

Fig 4.4. *An example of WV3 FCC 532 Simulated True Colour (Grid spacing 1000m).*

FCC 14-7-2

This is a new innovation in the realm of very high resolution (VHR) imagery with LANDSAT – like spectral properties at VHR scales. For the mineral mapping and interpretation PAN sharpening was undertaken at 3m pixel using a sub-sampled product of the 30cm panchromatic data, as using a 30cm product for pan-sharpening of 750cm data can produce artefacts. A separate 30cm pan-sharpened SWIR mosaic image has also been provided as part of the study for general interpretation.

In the FCC14-7-2 image below (Fig 4.5.), in the SW of the project area, the main geological features visible are:

- Pale orange alluvial material in the wadis
- Pale orange yellow surface sand
- Pale Red-brown basement subcrop
- Dark red-brown basement unit
- Green vegetation in the wadis and in the trenches
- Cyan coloured altered rocks in the excavations

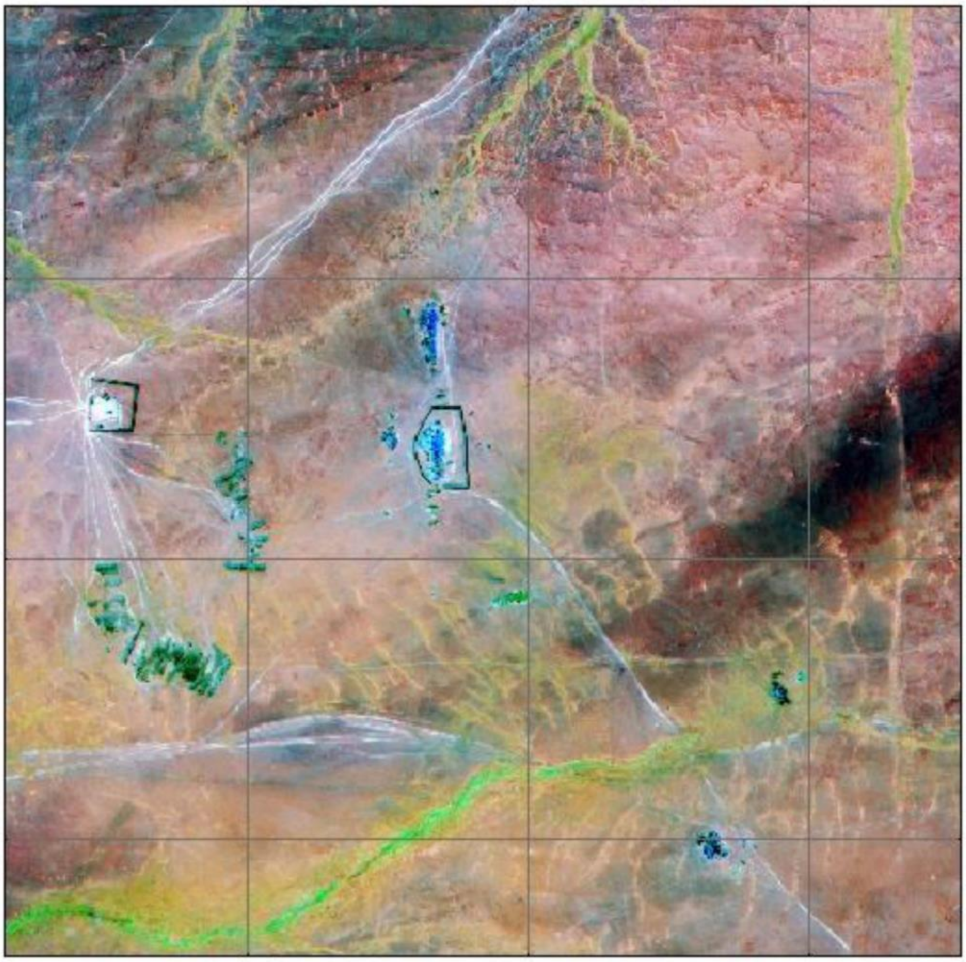

Fig 4.5. *WV3 FCC 14-7-2. This is equivalent to the standard LANDSAT-8 FCC752. This produces "intuitive" False Colour where rocks range in colour from red to brown to blue-green, vegetation is bright green. Grid spacing 1000m*

4.2. Mineral mapping

Mineral Mapping is a technique developed on ASTER imagery. ASTER is a “Super-spectral” regional satellite system that allows Spectral Mapping of rocks on a regional scale with a 30m pixel.

The Mineral Mapping of ASTER is directly translatable to WV-3 which brings Mineral Mapping into the high resolution realm with 16x the spatial resolution of the regional system.

To make the Mineral Mapping imagery we have used Logical Operator expressions to characterise the band profiles in multi-band space. The outputs are bitmaps that can be constructed into a colour image using a selected standard colour palette.

Note that we cannot usually identify individual mineral species with 16 band “super-spectral” resolution. To achieve this we would need hyperspectral (typically 100+ bands over the VNIR-SWIR range).

WV3 mineral profiles

Mean spectral profiles for WV-3 Mineral Mapping for DM project are presented in the Fig 3.6. where X-axis of plot = WV-3 VNIR-SWIR Band Numbers 1 to 16 and Y-axis of plot = DN number in Byte range – stacked values.

Super-spectral resolution has enabled mapping of 6 spectral types: Argillic, CPS*, Dolomite, Goethite, Haematite & Phyllic:

- Argillic – main absorption feature at Band 13 with also absorption in B14. Dolomite – main absorption at B16 with also absorption in B15.
- CPS* - main absorption feature at B16
- Phyllic – main absorption feature at B14
- Goethite – main absorption feature at B7 with –ve slope B5 to B 1 Haematite – main absorption feature at B8 with +ve slope B5 to B1

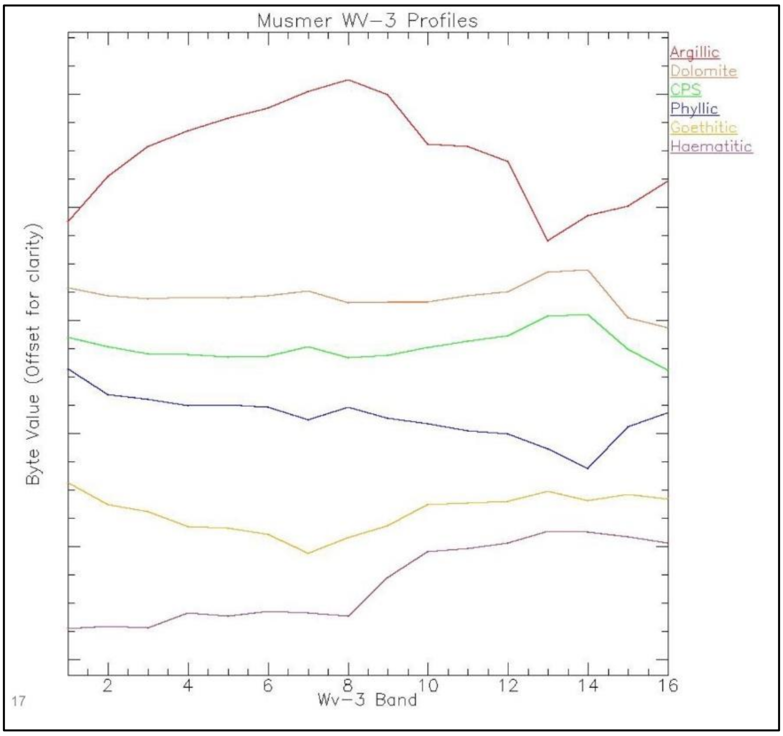

Fig 4.6. Mean spectral profiles for DM project.

Division into these 6 mineral groups enables us to achieve a significant amount of lithological and alteration mapping. For the standard Mineral Mapping image Dolomite is normally not included. It has been included in the mapping here as there ARE significant bodies of dolomite along a possibly mineralised trend. The dolomite mapping is delivered as a vectorised shapefile separate from the WV3 MM11 standard image.

Hydrothermal alteration zones typically contain intensely altered lithologies that combine the lithic types argillic and phyllic – and maybe CPS in skarns – with goethitic or haematitic iron hydroxide / oxide profiles. Therefore to further subdivide our spectral types we could map the coincidence of our 3 lithic types – Arg CPS and Phyll with our two Iron types Goe and Hae to get 6 mixed spectral types presented in Fig 4.7 where X-axis of plot = WV-3 VNIR-SWIR Band Numbers 1 to 16, and Y-axis of plot = DN number in Byte range – tacked values. We can map areas where pixels have both a lithic type profile (arg, CPS* or phyll) combined with an iron type profile (goe or hae). Carbonate, Propylite, Serpentine minerals all main abs at B16.

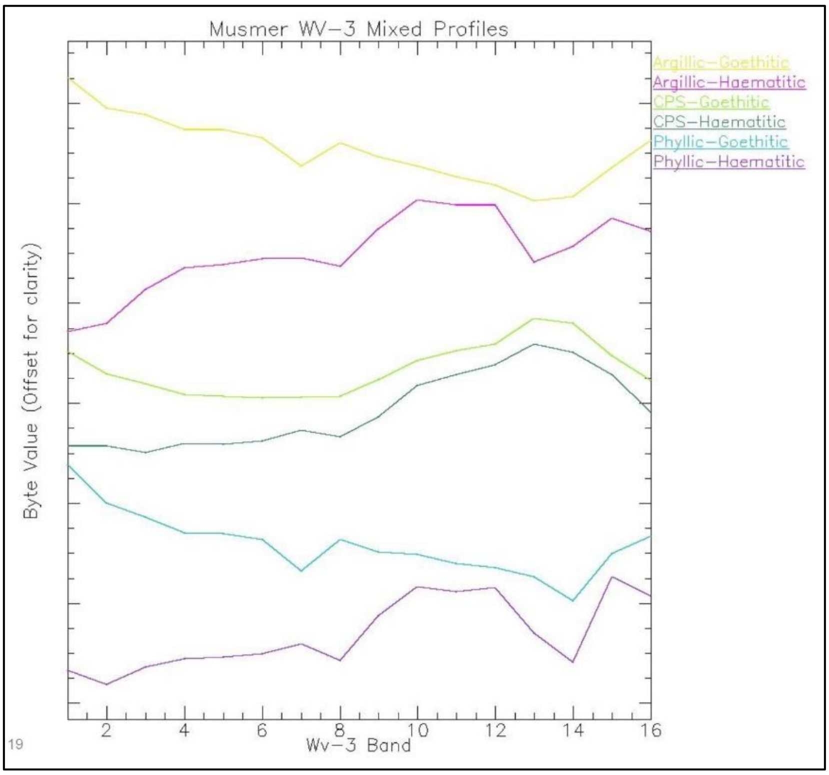

Fig 4.7. Mean mixed spectral profiles for DM Project.

From previous experience in volcanic terranes the mixed spectral types that are mostly indicative of hydrothermal alteration are argillic - goethitic and phyllic -goethitic. These two alteration types can occur in high-sulphidation and low-sulphidation epithermal deposits respectively. These type of hydrothermal alteration systems are normally large and intense enough to be readily detectable using the regional low-cost datasets LANDSAT and ASTER.

In the Arabian Nubian Shield the VMS type mineralised systems are also associated with hydrothermal alteration but these tend to be much smaller and less intense areas of alteration that are usually not detectable using the regional data.

This is where WorldView-3 imagery becomes uniquely useful as it is the only system delivering the “super-spectral” spectral resolution of ASTER at Very High (Spatial) Resolution (VHR) scales.

The 5 main Mineral Mapping units plus the 6 mixed units seen here are combined in a standard colour scheme to compose the WV-3 Mineral Mapping 11 spectral unit image. This colour image is then combined with a Pan topo image at 3m pixel to create the WV3 MM11 Topo Image.

WV3 Clay-Iron Imagery

The Clay-Iron image was first developed on LANDSAT4-5 data in 1987 and further modified in 1995(2). It is still being used on LANDSAT-8 imagery today, 32 years on from its first use.
Inclusion of the SWIR bands in WV3 data – for the first time in VHR satellite data – now enables the use of Clay-Iron processing at unprecedented scales allowing detection of much smaller areas of intense hydrothermal alteration than was previously possible. In the Arabian-Nubian shield, where intense hydrothermal alteration associated with VMS style mineralisation can be very localised, WV3 can bring Clay-Iron processing into play.

In a Clay-Iron image the target zones of intense hydrothermal alteration are bright red. None of the other colours really matter for targeting purposes although they can be useful for geological mapping in some cases. Here “clay” is used sensu lato meaning any minerals that produce a strong absorption feature at Band 7 of LANDSAT and Band 14 of WV3 centred on 2200nm. These can be clays such as kaolinites or smectites but also includes micas/sericites alunite and pyrophyllite. Some of these ONLY occur in hydrothermally altered rocks but others can be present in unaltered rocks or in low temperature weathering. Therefore it is important to recognise that all that is bright red is not necessarily hydrothermal alteration. On the other hand, if there is sufficient extent of intense hydrothermally altered rocks they WILL be a strong red colour on the WV3 Clay-Iron Image.

This is demonstrated here in the SW area where bright red zones in the excavations and around the trenching indicate the possible presence of intense hydrothermal alteration.

WV3 Clay-Iron Image is constructed using an Intensity-Hue-Saturation (IHS) construction. A topographic image is used in the Intensity (I), a “clay” image in the Hue (H) and an “iron” image in the Saturation (S). The end result is that “Clay” and “Iron” rich rocks – typically present in hydrothermal alteration zones – are presented in bright red. All other shades can be interpreted in terms of their Hue (colour) and Saturation (strength of colour) but it is the red "anomalies" that we are targeting. The WV-3 Pan data subsampled to 3m has been used here as (I).

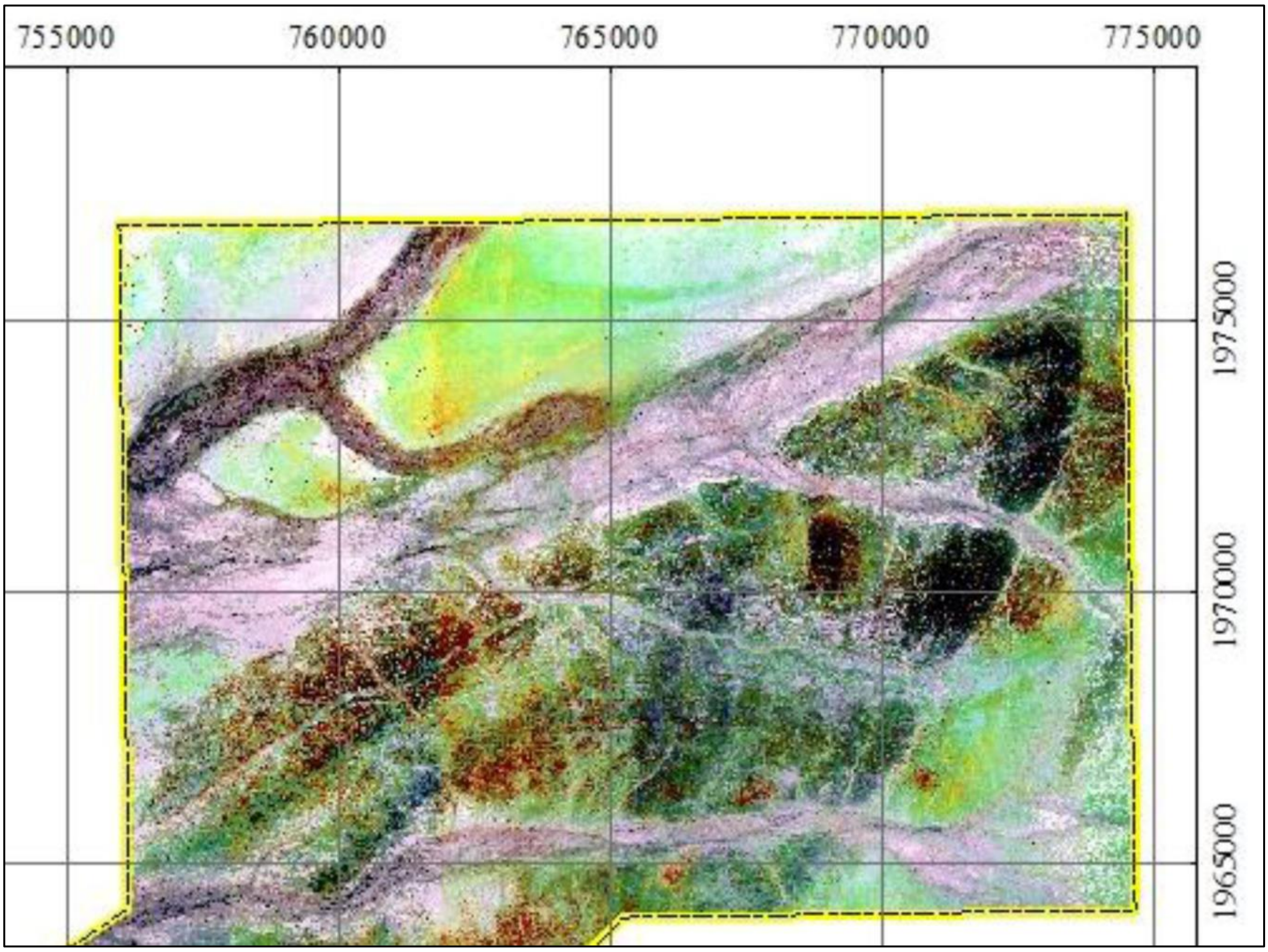

Fig 4.8. *Clay-Iron image of the project area (Mosaic of 3 WV-3 Images. Coordinates in metres UTM36N WGS84. Grid spacing 5000m).*

Note, that there is some vertical striping in this image – presumably due to the different image acquisitions used to cover the whole scene. The central vertical portion in the Clay/Iron image is more green/blue than the sides that are more yellow to orange. This is not easily avoided. It is visually unappealing, but it is important to note that it does not affect the strong Clay-Iron anomalous areas.

The Clay-Iron images from each of the 3 component images for the project area have been joined digitally in a mosaic to create a single image for GIS display purposes. When we look at an overview the vertical banding is immediately apparent, but it does not prevent the stronger anomalies being picked up unhindered. The example from the SW area given on P15, for instance, is in a vertical band of generally lower Clay/Iron values – the blue-green strip between the yellow orange strips in the SW of the area shown here. Despite this – the strong Clay/Iron anomalies that are present there are picked out just as strongly as any other anomalies elsewhere.

WV3 MinMap 11 Topo Image

Construction of this image relies on characterisation of the spectral profile present in each pixel across the 16 WV-3 bands in a VNIR-SWIR composite image at 7.5m pixel – the sub-sampled resolution of the WV-3 SWIR data. The method uses a combination of simple measurements to detect characteristic spectral features of the 3 lithic and 2 iron spectral types. Where both iron and lithic features are present we get one of the 6 mixed spectra types.

This technique was developed on ASTER imagery in 2006(2). It is primarily designed to map hydrothermal alteration systems in geologically recent volcanic terranes but it has also proved to be useful in other geological terranes for geological mapping as well as hydrothermal anomaly detection.

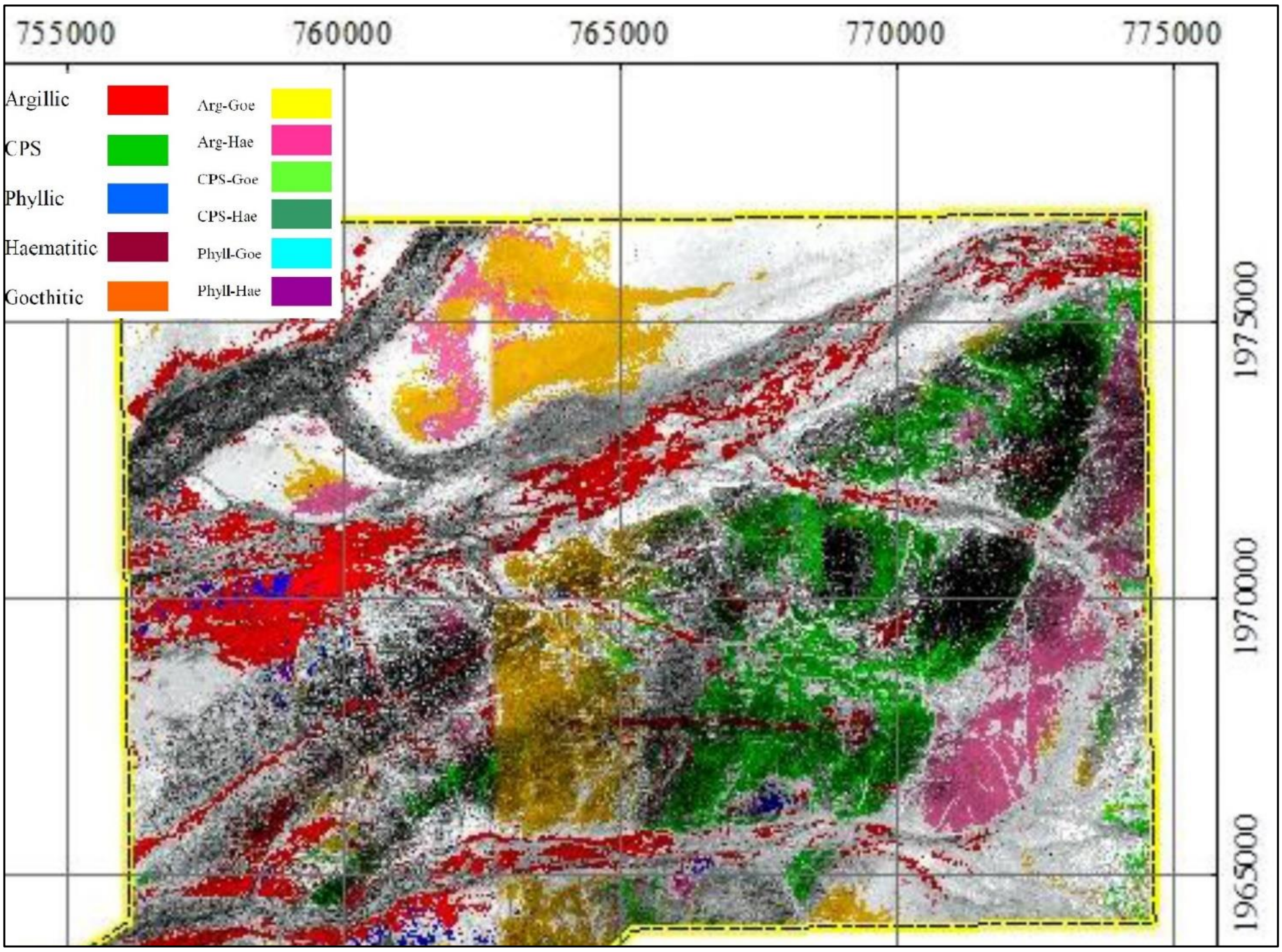

Fig 4.9. *WV3 Mineral Mapping 11 Topo Image. - Mosaic of 3 WV-3 Images Coordinates in metres UTM36N WGS84. Grid spacing 5000m.*

The exposed desert surface in this area is dominated by CPS (green), CPS-goethitic (yellow-green) and CPS-haematitic (sea-green) type profiles. These rocks are likely to be chlorite bearing metasediments or metavolcanics. This seems to be at odds with the 1:2m scale mapping that has this area mapped as gneissic basement. There are argillic (red) signatures in the sinuous wadi in the south but also some argillic areas in the desert rock surface – notably along the SW-NE trending dark unit on the east side of the area. Possible hydrothermal alteration is seen in the central excavated areas where phyllic (blue), goethitic (orange) and mixed phyllic-goethitic (cyan) can be seen. It is these mixed spectral types that we home in on when looking for mineral exploration targets when they coincide with intense alteration indicated by red zones on the WV-3 Clay/Iron imagery.

The vertical banding is also apparent in the WV-3 Minmap11 Imagery. The banding in the SW described in the Clay-Iron imagery is not apparent but the central band manifests itself as an orange strip due to over-mapping of goethitic signatures. It is likely that the haze boosts the reflectance in the shorter wavelengths more than in longer wavelengths. This would explain the goethitic – rather than haematitic – mineral mapping.

Base colours of Mineral Mapping Topo Image shown in the key below. Note that the colours on the image can be a lot darker than on this key depending on the brightness of the rock surface.

Dolomite Vectors

Experience from elsewhere in the Arabian Nubian Shield has shown that dolomitic bodies are commonly associated with VMS style mineralisation. These are interpreted to be exhalative or replacement style volcanogenic-hydrothermal carbonates. As the "super-spectral" resolution of WV-3 allows mapping of dolomite then these small discrete bodies have also been mapped and converted to vector data (pale orange in Fig 4.10.).

We can see that there appear to be linear dolomitic units with a dominant SW-NE trend. Most significantly we see that there is a dolomitic unit that clearly maps a fold nose in the north eastern part of the project area. The dolomite is acting as a marker unit around the fold surface.

This is a significant result as the regional mapping suggests that this fold is truncated by a major fault structure on its NW side. The WV-3 data shows that the fold nose is preserved and this raises prospects of possible "saddle-reef" development in extensional fractures in the fold axis area.

Whilst the spectral profile that has been extracted for these rocks fits dolomite very well it could possibly be due to a few other minerals – perhaps an iron rich chlorite?

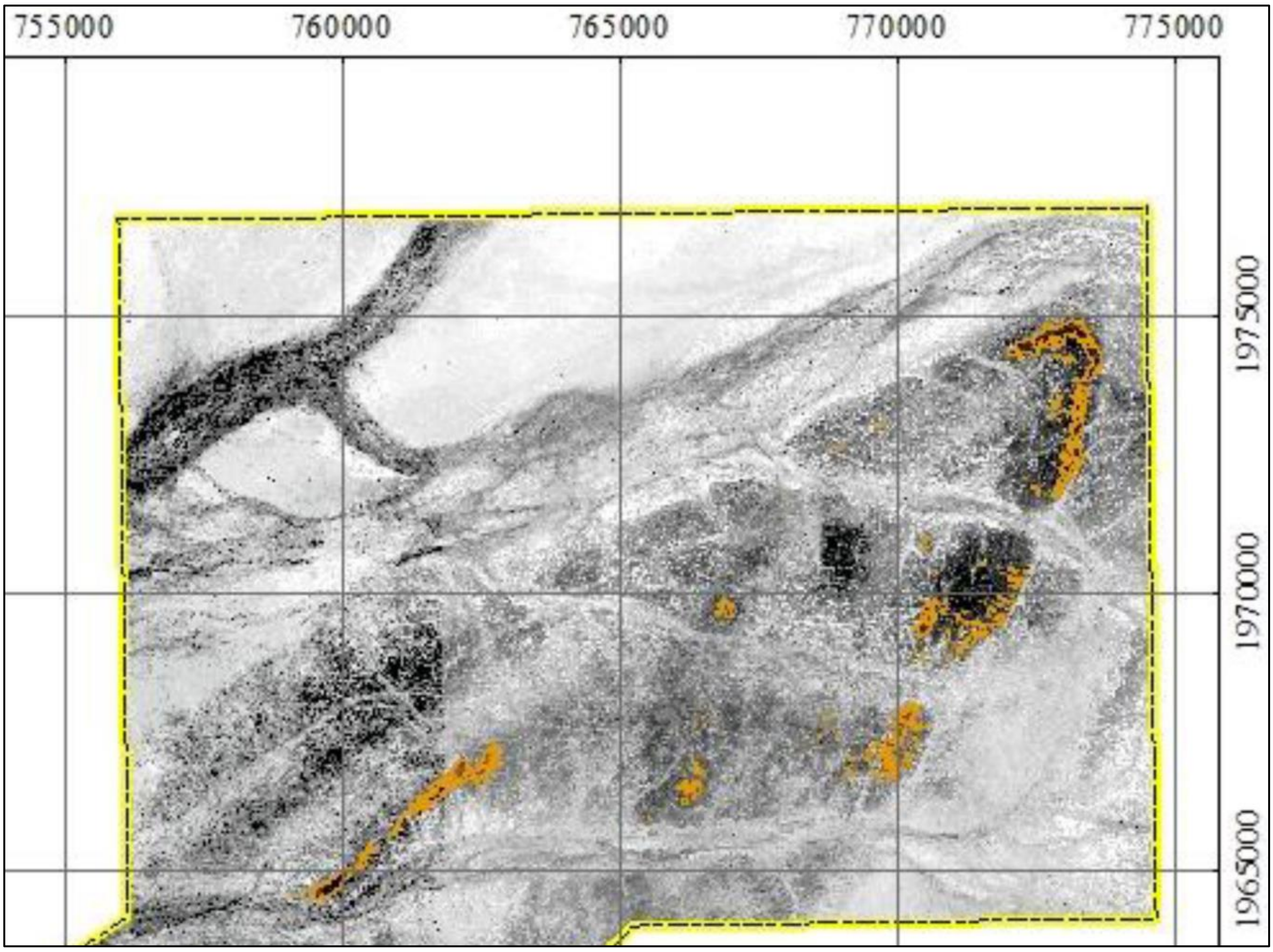

Fig 4.10. *WV3 Dolomite Mineral Mapping vectors overlaid in pale orange outlines on WV3 Pan Topo image at 3m pixel. Coordinates in metres UTM36 WGS84. Grid spacing 5000m.*

4.3. Targeting

A total of 14 field targets have been identified as a result of hyperspectral mineral mapping within the block RS64-D (Fig 4.11).

These are graded from 1 to 4 in terms of size and priority based on their spectral characteristics and a perceived likelihood that they might be related to mineralization.

The criteria that have been used to pick these areas as possible sites of mineralisation are:

1. Significant size and intensity – anomalies seen on both WV-3 Clay/Iron and WV-3 MM11 Topo image.
2. Smaller areas where anomalies seen on both WV-3 Clay/Iron and WV-3 MM11 Topo image and / or dolomite zones are associated with structure and/or WV-3 VNIR Iron Oxide anomalies indicate possible gossans.
3. Smaller areas where anomalies occur in WV-3 Clay/Iron or WV-3 MM11 Topo but not both.
4. Areas where interesting features occur that may be of geological interest but not necessarily of exploration interest.

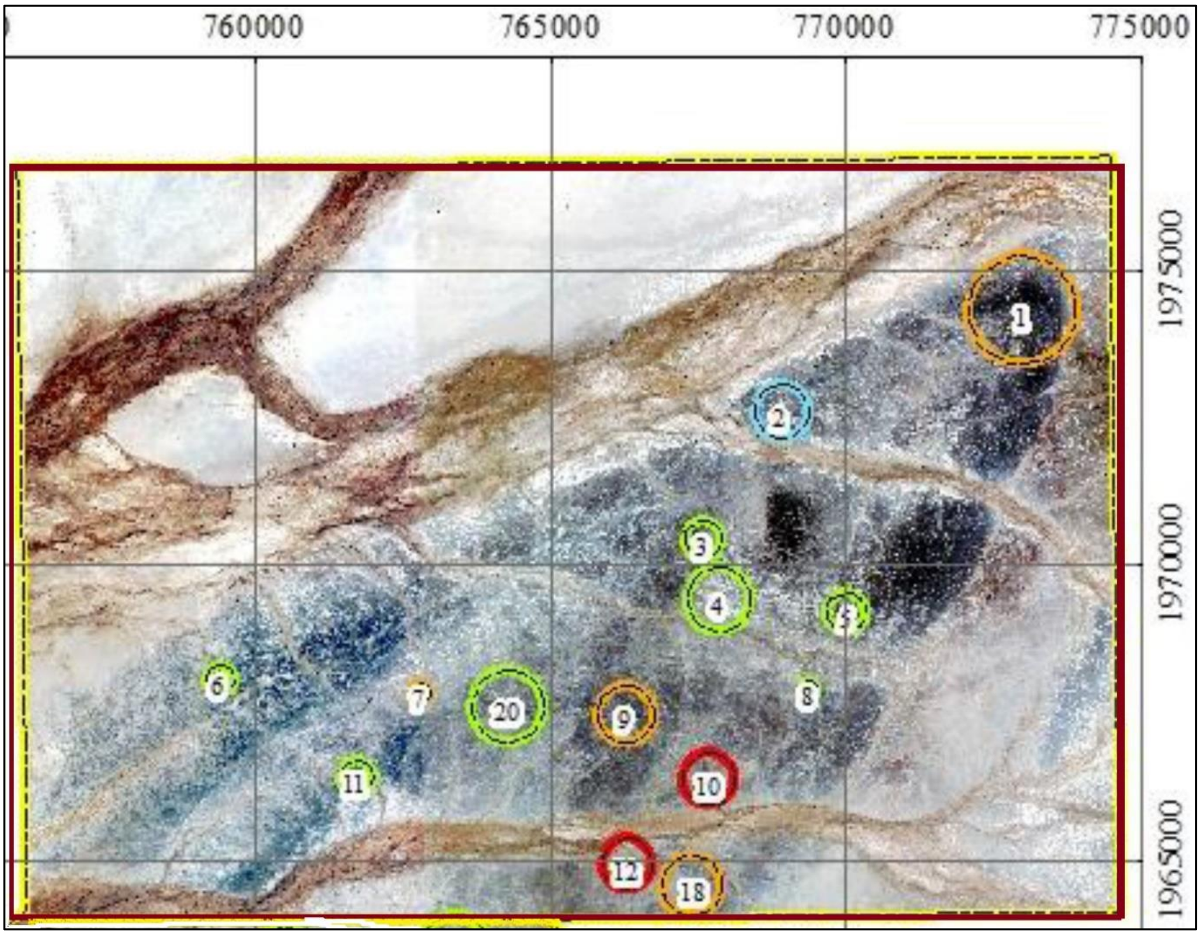

Fig 4.11. *WV3 FCC532 Image with 22 Target Areas. Target areas have been selected on the basis of their WV-3 spectral properties and Graded 1-4 based on size and spectral parameters. Grades: 1 = Red, 2 = Orange, 3 = Green and 4 = Cyan. Coordinates in metres UTM36N WGS84. Grid spacing 5000m.*

We have selected 3 targets as a priority for field check and exploration. Those are Target 1, Target 10 and Target 12. Characteristics of priority targets are presented below.

Target 1

Here we can see the dolomite unit is a subset of the CPS unit – shown in green on the MM11Topo Image (Fig 4.12 and Fig 4.13). This is consistent with the observation from the extracted profiles that the dolomites have a dominant B16 absorption, in common with the other candidates for CPS (carbonates, propylites and serpentinites). Dolomite is, of course, a carbonate itself, except that it also has a Band15 feature (see WV-3 profiles). The dolomite marker horizon picks out a fold nose in the CPS unit which is probably dominantly chlorite bearing metavolcanics into which the exhalative dolomite bodies have been introduced. If there was base metal VMS type mineralisation accompanying this, then re-mobilisation during tectonism may have produced saddle reefs in this area.

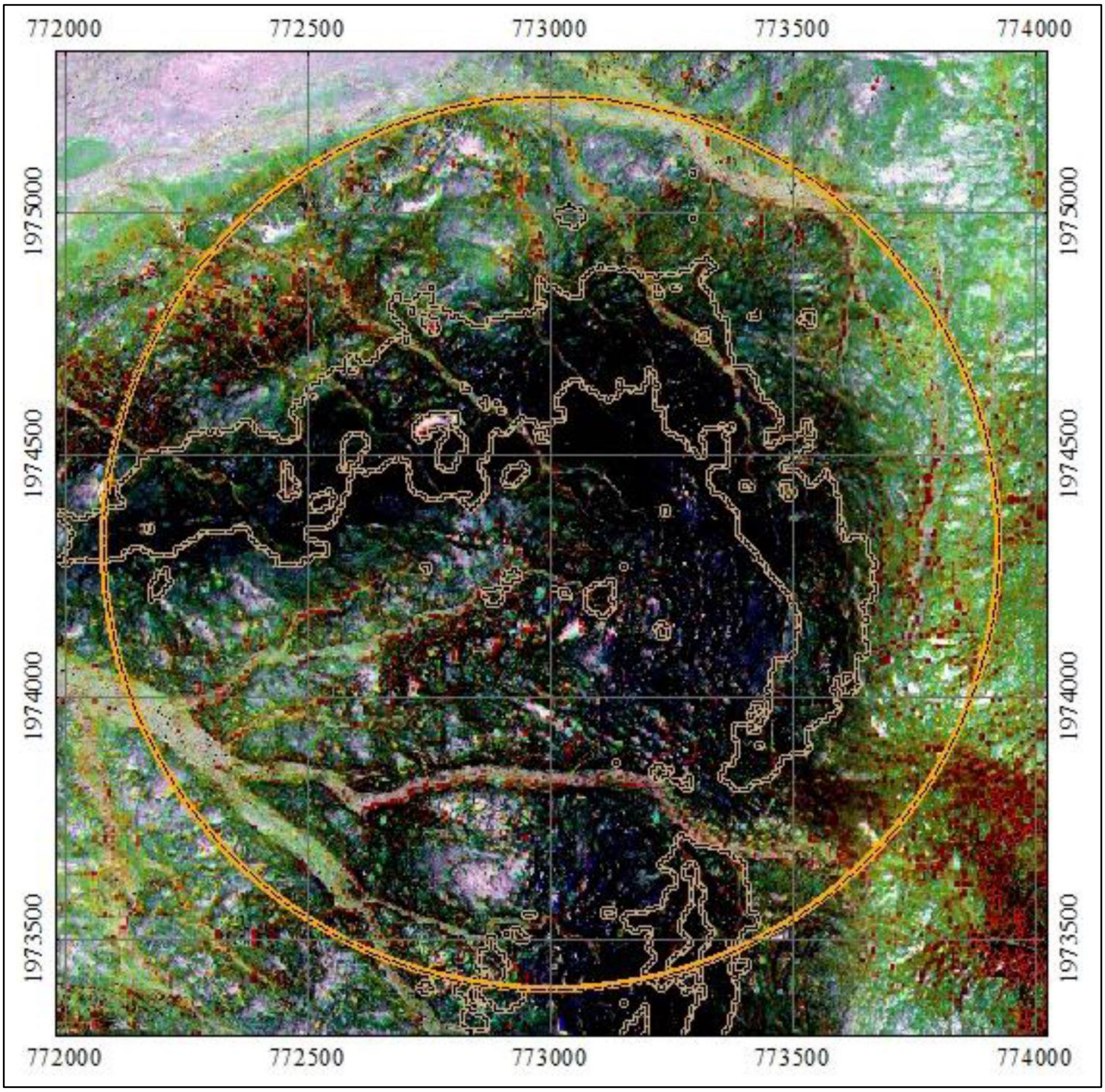

Fig 4.12. *WV3 Clay-Iron Image. VNIR-SWIR processed at 7.5m pan-sharpened to 3m. Imagery shows strong reds indicating possible alteration. Coordinates in meters UTM36N WGS84 with grid spacing 500m.*

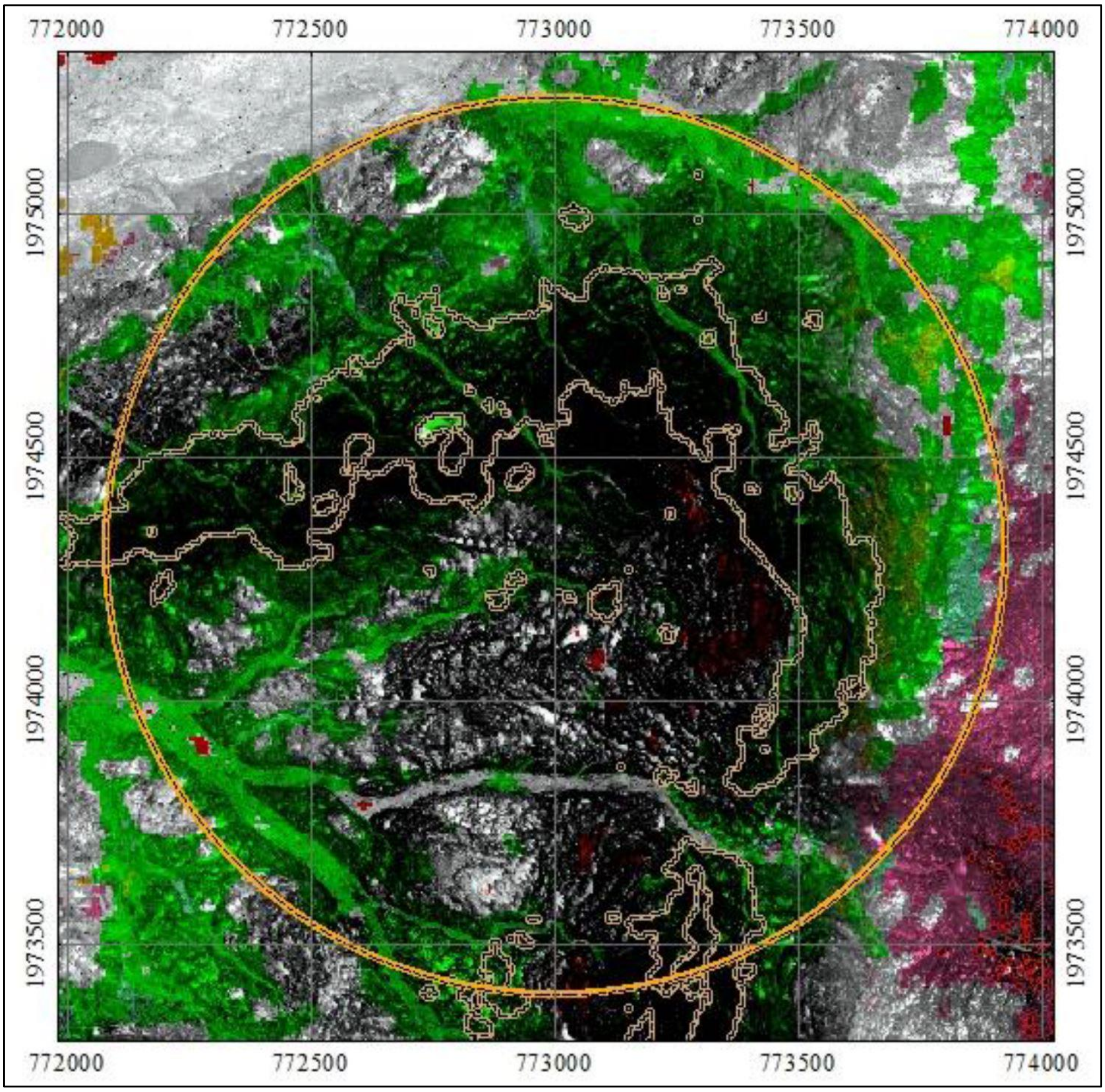

Fig 4.13. *WV3 Minmap11-Topo Image. Dolomite areas displayed in beige coloured outlines. Coordinates in metres UTM36N WGS84 with grid spacing 500m. See legends on the Fig 3.9.*

Target 10

This is a large Clay-Iron anomaly associated with Phyllic, Haematitic and Phyllic-Haematitic signatures in the Mineral Map image (Fig 4.14 and Fig 4.15).

This combination of haematitic and phyllic signatures has been seen elsewhere in the Arabian-Nubian shield where gossans are associated with underlying VMS mineralisation. No gossans have been detected here. This may be due to masking by dark surface crusts if the gossans have not been disturbed. The size of the feature and combination of Clay-Iron and mixed signatures in the Mineral Map qualify this as a Grade 1 anomaly. This area should be visited in the field as a priority with field observations and geochemical sampling if favourable signs of mineralisation are encountered.

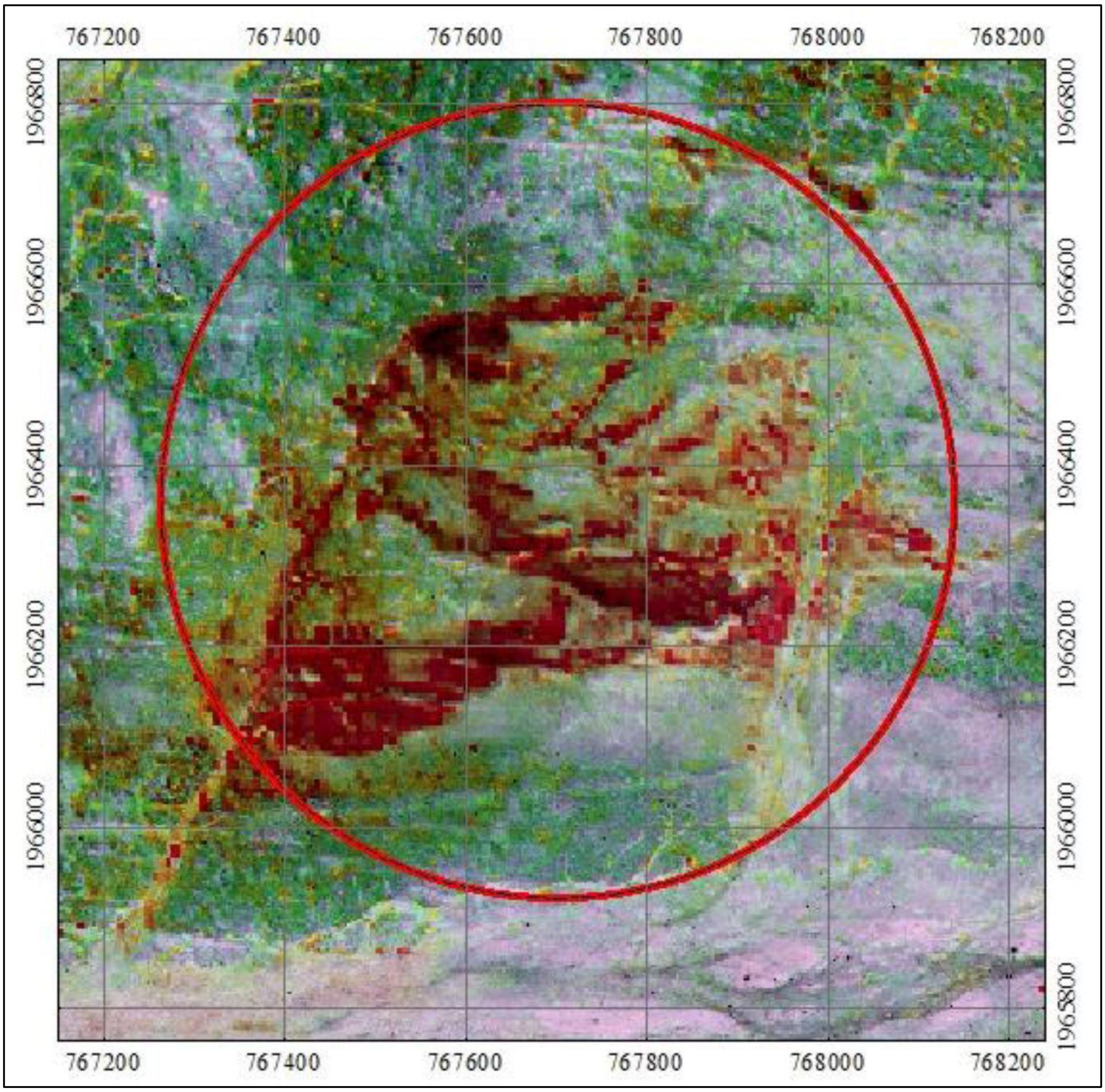

Fig 4.14. *WV3 Clay-Iron Image. VNIR-SWIR processed at 7.5m pan-sharpened to 3m. Imagery shows strong reds indicating possible alteration. Coordinates in metres UTM36N WGS84 with grid spacing 200m.*

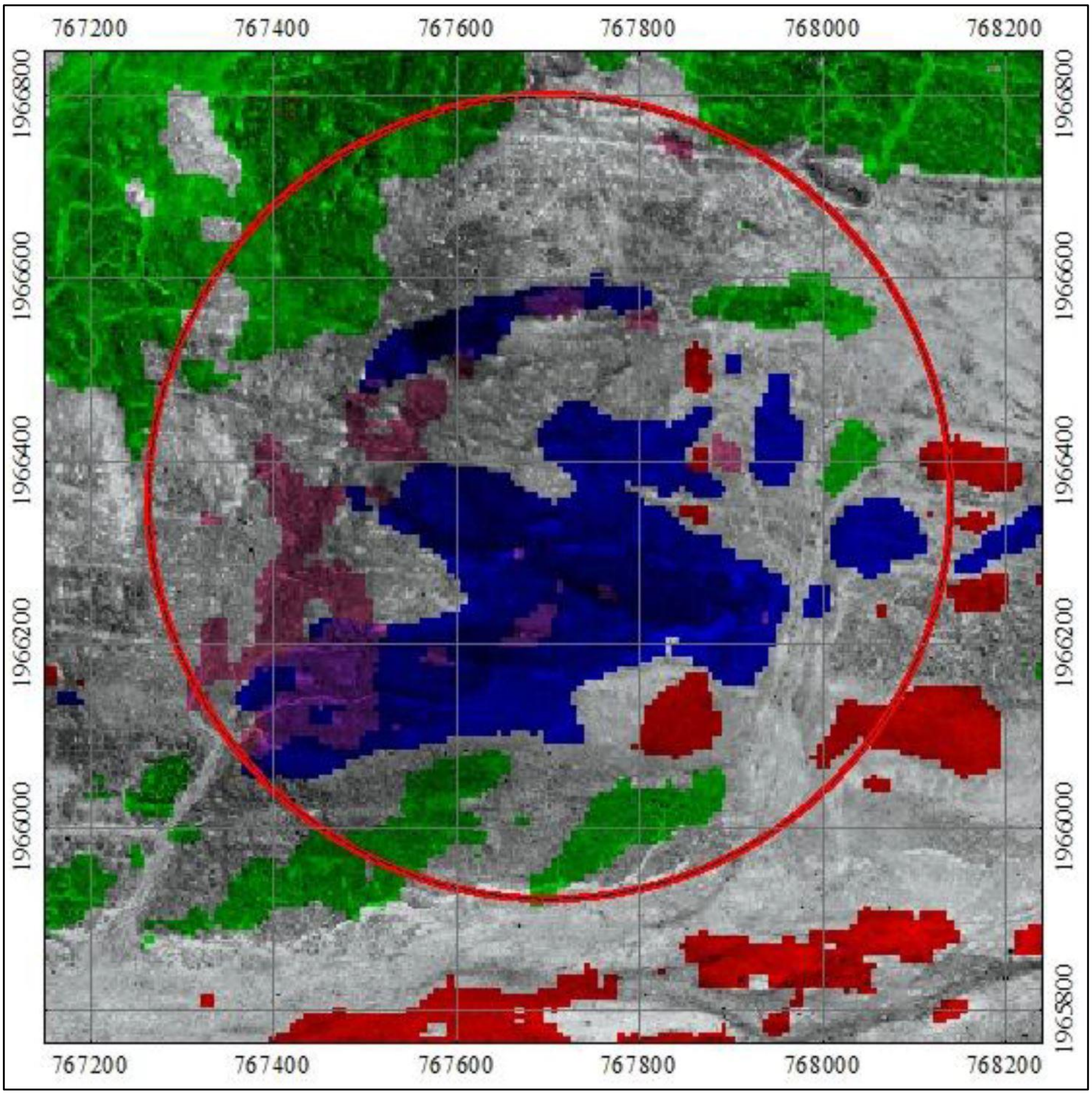

Fig 4.15. *WV3 Minmap11-Topo Image. Colour code in key above. Coordinates in metres UTM36N WGS84 with grid spacing 200m. See legends on the Fig 3.9.*

Target 12

A large rectangular area containing Clay-Iron anomalies associated with Haematitic, Phyllic and mixed Phyllic-Haematitic signatures (Fig 4.16 and Fig 4.17). This is very similar to the feature seen at Target 10 and these two may be part of the same feature lying on a SW-NE trend separated by a large East to West flowing wadi. This area should be visited as a priority in conjunction with Target 10.

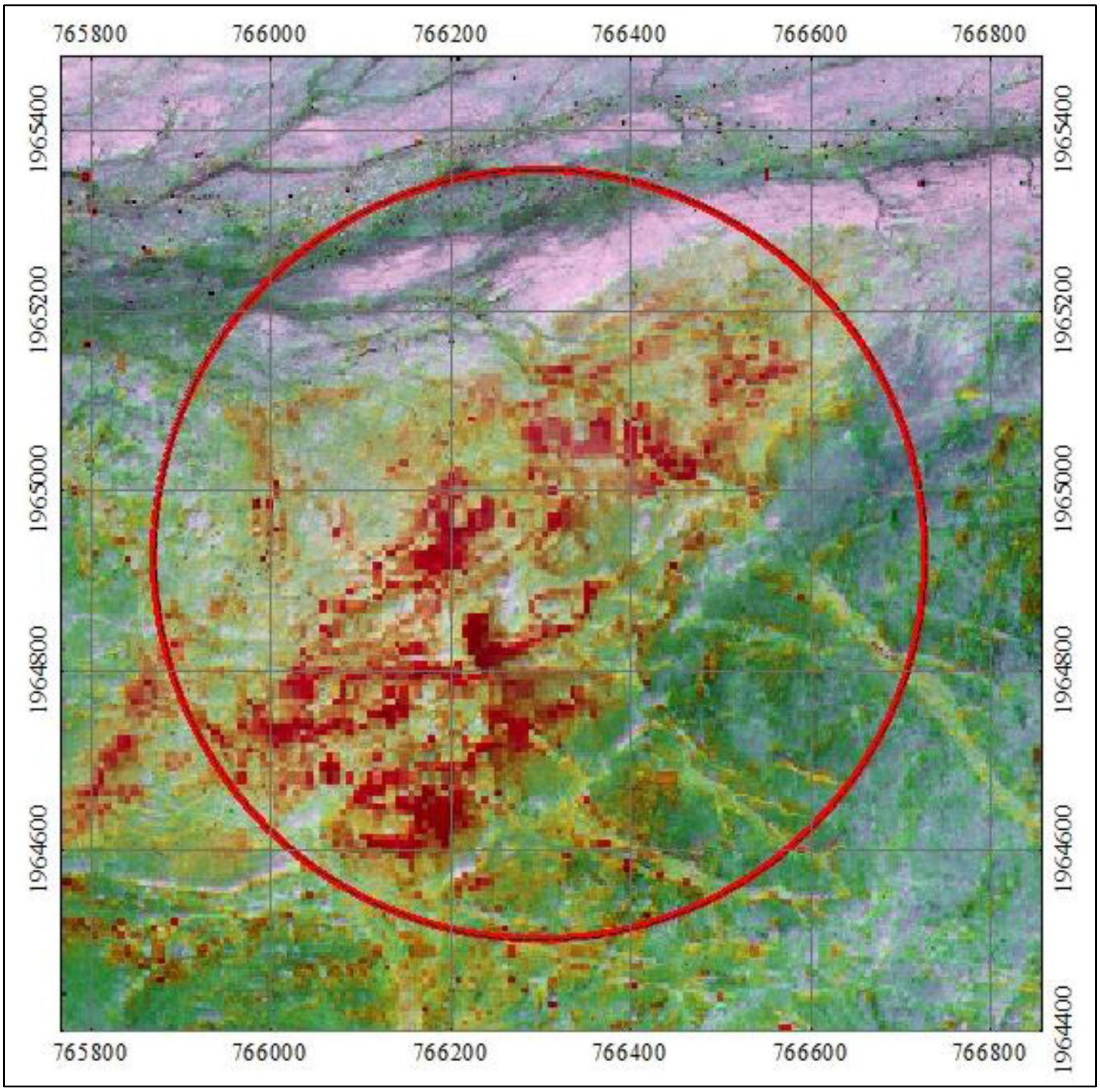

Fig 4.16. *WV3 Clay-Iron Image. VNIR-SWIR processed at 7.5m pan-sharpened to 3m. Imagery shows strong reds indicating possible alteration. Coordinates in metres UTM36N WGS84 with grid spacing 200m.*

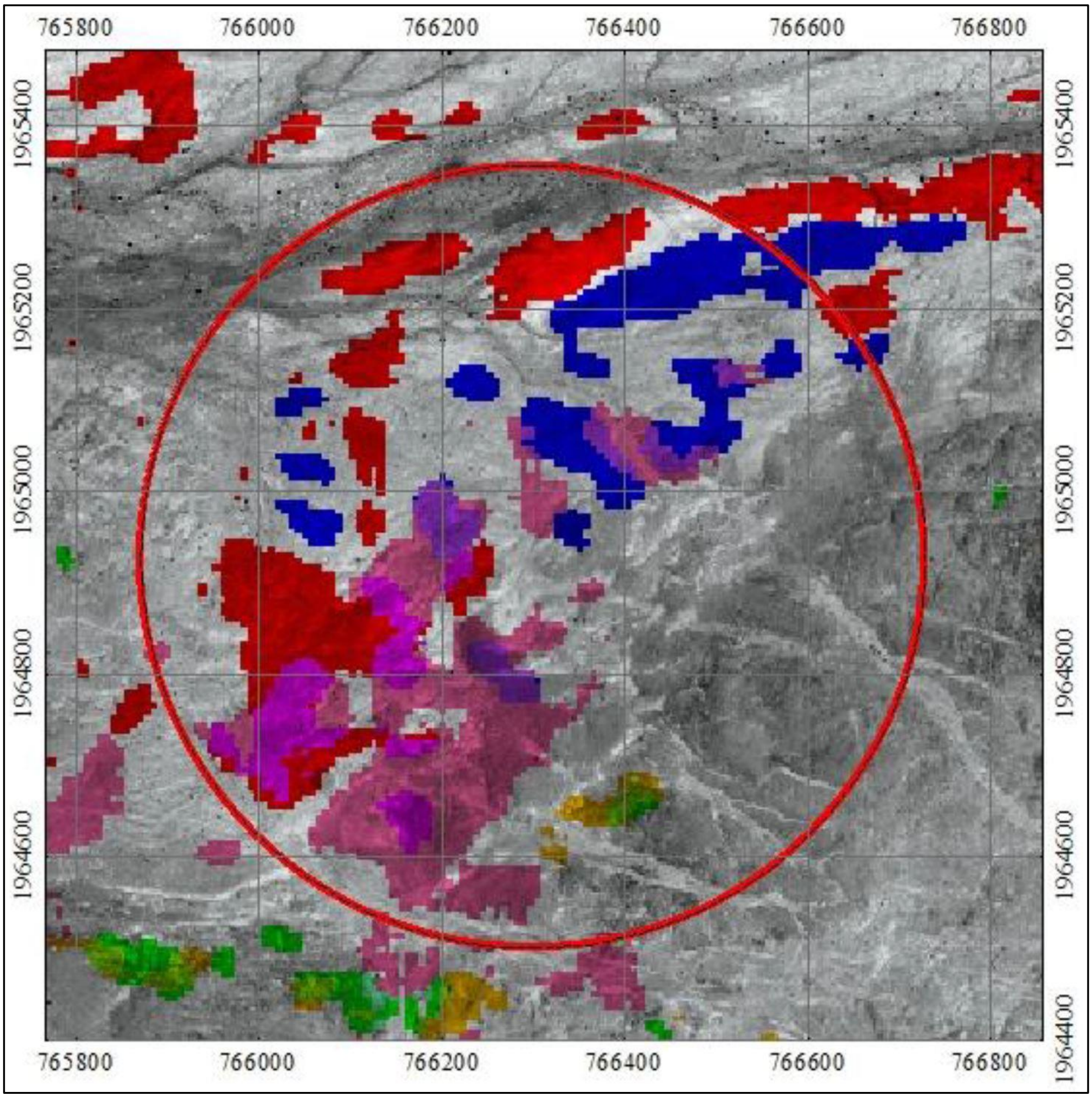

Fig 4.17. *WV3 Minmap11-Topo Image. Colour code in key above. Coordinates in metres UTM36N WGS84 with grid spacing 200m. See legends on the Fig 3.9.*

5. SOIL GEOCHEMISTRY

Totally 16,136 soil samples were collected within the concession block. The whole area of the block was covered by a sampling pattern 100x100m except the streams.

Soil layer in the license area are mostly represented by horizons B and C. The thickness of B horizon is 1-2m in most of part of the license area, therefor Ionic Leach method of soil geochemistry was chosen for the project. The method is designed to enhance the most subtle labile geochemical anomalies for a wide range of commodities. It is a static sodium cyanide leach using the chelating agents ammonium chloride, citric acid and EDTA with the leachant buffered at an alkaline pH of 8.5

The Ionic Leach method allows recognition of metal and pathfinder element zonation within and surrounding metal systems and provides ‘footprints’ that can characterize such systems in areas of deep buried mineralization, where the traditional sampling methods cannot work at it is impossible to reach the required soil horizon. While greatly assisting exploration, these indicators are often buried or difficult to identify at the surface.

This method has ability to recognize characteristic multi-element patterns as surface ‘fingerprints’ in overlying soil can greatly enhance effective drill hole positioning to allow access in restricted areas and ensure no drill-dollars are wasted. The list of elements and their limits of detection are presented in the table 5.1.

Table 5.1. Elements ant their LODs acceptable for the Ionic Leach method.

CODE	ANALYTES & DETECTION LIMITS (ppb)								PRICE PER SAMPLE
ME-MS23™	Ag	0.1	Eu	0.1	Nb	0.1	Tb	0.1	$50.10
	As	0.5	Fe	0.1ppm	Nd	0.1	Te	0.5	
	Au	0.02	Ga	0.5	Ni	1	Th	0.02	
	Ba	10	Gd	0.1	Pb	0.1	Ti	5	
	Be	0.2	Ge	0.1	Pd	0.05	Tl	0.05	
	Bi	0.3	Hf	0.05	Pr	0.1	Tm	0.1	
	Br	0.05ppm	Hg	0.1	Pt	0.1	U	0.05	
	Ca	0.2ppm	Ho	0.1	Rb	0.1	V	0.2	
	Cd	0.2	I	0.01ppm	Re	0.01	W	0.1	
	Ce	0.1	In	0.1	Sb	0.5	Y	0.1	
	Co	0.3	La	0.1	Sc	1	Yb	0.1	
	Cr	1	Li	0.2	Se	2	Zn	10	
	Cs	0.1	Lu	0.1	Sm	0.1	Zr	0.1	
	Cu	1	Mg	0.01ppm	Sn	0.2			
	Dy	0.1	Mn	0.01ppm	Sr	1			
	Er	0.1	Mo	0.5	Ta	0.05			

The methods most advantages are:

- ✓ 60 elements analyzed including Au, Pt, Pd, Hg, I, Br
- ✓ Detection levels below natural background levels in soils for commodity and pathfinder elements,
- ✓ Shown effective in defining targets in complex settings and through variable cover sequences,

- ✓ 120g field sample, 50g for analysis, 100-200 times greater than other multi-element trace methods,
- ✓ Multi-species ionic fingerprints can define and rank drill targets reducing wasted drill meters,
- ✓ Sampling is fast and efficient with low impact culturally and environmentally.

Application of the Ionic Leach extractant to soil samples is not complex; however, sampling is a critical component, and while the protocol is simple, its correct application is fundamental in producing meaningful exploration outcomes. The information provided below is specific to ionic partial extraction soil geochemistry and is largely inappropriate for many other geochemical techniques currently available.

The following **sampling protocol** is applied for the new method (Fig 5.1.):

1. Ideally soil samples should be collected at a constant depth, 10-15 cm below the soil surface, regardless of regolith/landform and topographic situations, and the variability in soil profiles,

2. Preferably the first 5-10cm of the soil profile is discarded eliminating surface debris including loose organic matter and any potential contaminants,

3. After discarding the first 5-10cm of soil do not vary the depth of sampling and do not selectively sample specific soil horizons or features of the soil profile (B-horizons, mottled zones etc),

4. Typical organic material including decomposed leaf matter, rootlets and hairs, and other fine organic debris indicates an optimal sampling position and will not adversely affect analyses,

5. Where soil development is minimal and discarding the first 5-10cm is problematical, samples can be collected nearer surface; however, if this soil profile is atypical of the survey area, then these positions should be noted and their influence assessed later during the data interpretation stage,

6. In desert terrains samples should only be collected from swales between active dunes following the same guidelines described in 1,2&3 above,

7. Sampling in landforms with thick organic blankets (e.g. peat), with or without shallow water, additional care is needed and the following protocols should be applied:

a. Excess organic material including loose vegetative debris that is relatively fresh or only partially decomposed should be removed,

b. Samples must be collected from the A soil horizon below any organic material only partially decomposed including remnant twigs, bark and leaves,

c. The A horizon profile in this landform is typically a dark decomposing organic soil without vegetative structure,

d. Once this position has been recognized, remove the first 5-10cm of this soil and then collect the sample between 10 and 20cm below.

8. In skeletal soils with sub-crop/outcrop ionic leach partial extraction geochemistry can provide a geochemical signal, however samples from this type of regolith should be identified for interpretation as they may need to be treated separately from samples from a more conventional soil profile.

<u>Sample Collection</u>

1. Gold and silver jewelry should not be worn by samplers,

2. Sunscreen and insect repellant - see below

3. NO SMOKING over samples – ash contains As and can contaminate samples

4. At each new sample site brush equipment and flush with soil from the new sample site to eliminate residue from the previous sample,

5. Once the optimal sample position has been identified, soil is sieved to remove any larger roots, pebbles or rocks and collected. If samples are damp/wet causing potential cross contamination, the coarse material normally removed by sieving is simply picked out by hand, and the material placed into sample bags,

6. A 120-gram soil sample, sample is collected and placed in a plastic (18 x 17cm) snap seal bag (Ziploc sandwich bags are ideal), do not use calico or brown paper,

7. A reference number is written on the sample bag which is carefully rolled/folded over, removing excess air from the bag, and sealed completely; this first bag is then placed in a second bag which is also folded to remove excess air. Removing air from the bags avoids bursting during transportation and preserves volatile elements (Hg) in the sample.

8. Similarly, moist/wet samples are collected without sieving at each field location and excess water is immediately decanted from the plastic bag at site; samples must not be dried in air or ovens or pulverized in crushers or mills.

Fig 5.1. Soil sampling technique for the new Ionic Leach method applied on DM project.

DM has received assayed results of all soil samples from ALS laboratory by the end of 2020 and has completed statistical analysis of the data. As it is seen clearly on the Fig 5.2. there is a potential on gold mineralization along the SW-NE striking line which is diagonally crosses the whole Concession block. Field observations confirmed that this zone is represented by 20-50m wide shear zone. There is a potential on gold mineralization also in the central part of the block showing S-N striking anomaly where vein DM-01 is located (Fig 5.2).

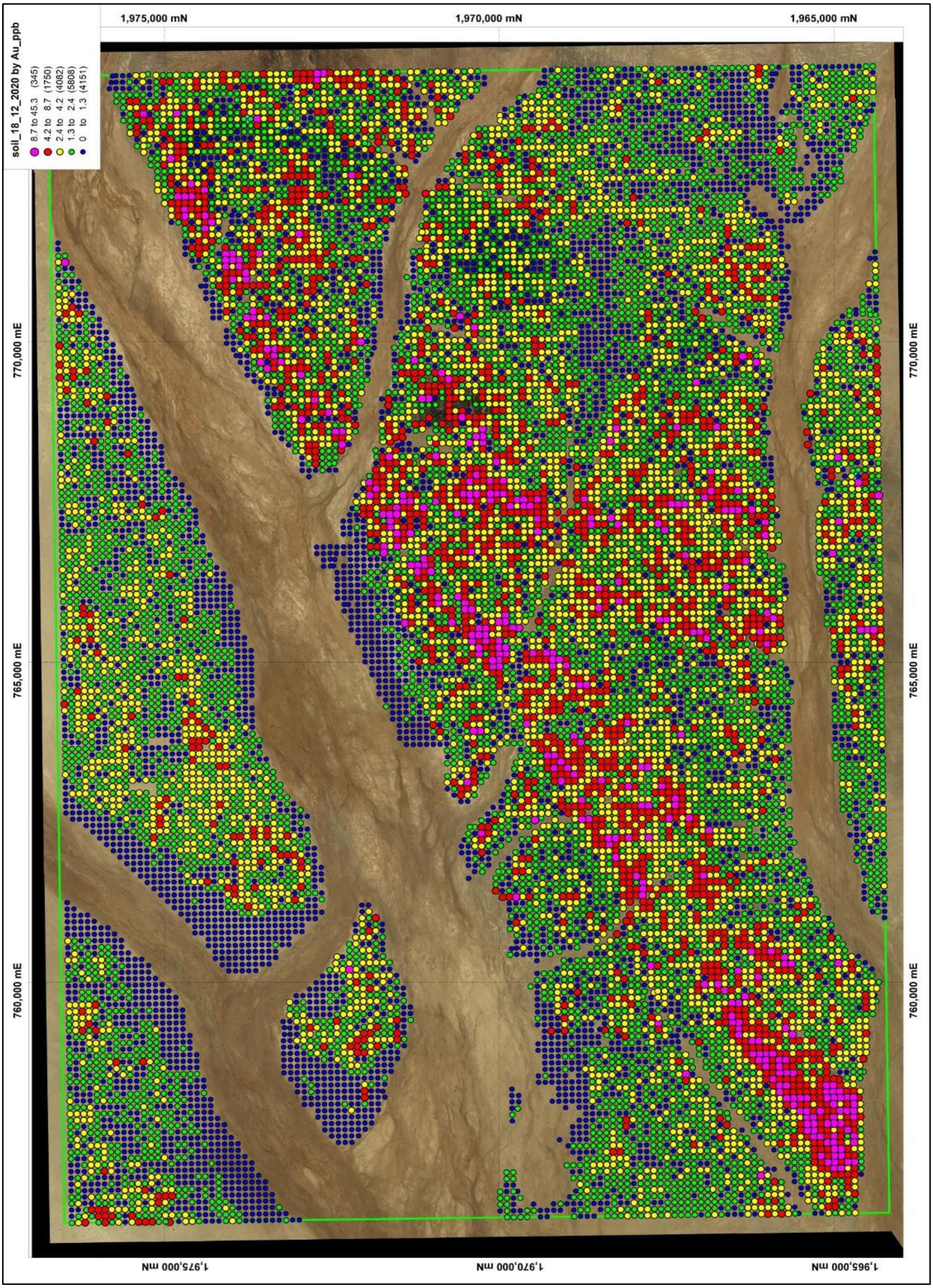

Fig 5.2. Soil geochemistry plot for AU

6. ROCK CHIP SAMPLING

In parallel of soil sampling rock chip samples also were collected by geochemical crews. Rock samples are represented by outcrops and sub crops of mainly quartz veins.

If any outcrop or sub crop of potential mineralization is seen by geologists doing soil sampling, its coordinates are recorded, the surrounding area is photographed and described and the sample is collected, photographed (Fig 6.1) and placed in a calico bag. About once a week rock chip samples are shipped to DM lab in Khartoum, where they were prepared and assayed.

Fig 5.1. Quartz vein outcrop (A) and sample (B) collected from it.

Totally 1605 rock chip samples are collected from the concession block. The plot of the samples by Au grade is presented in Fig 5.2.

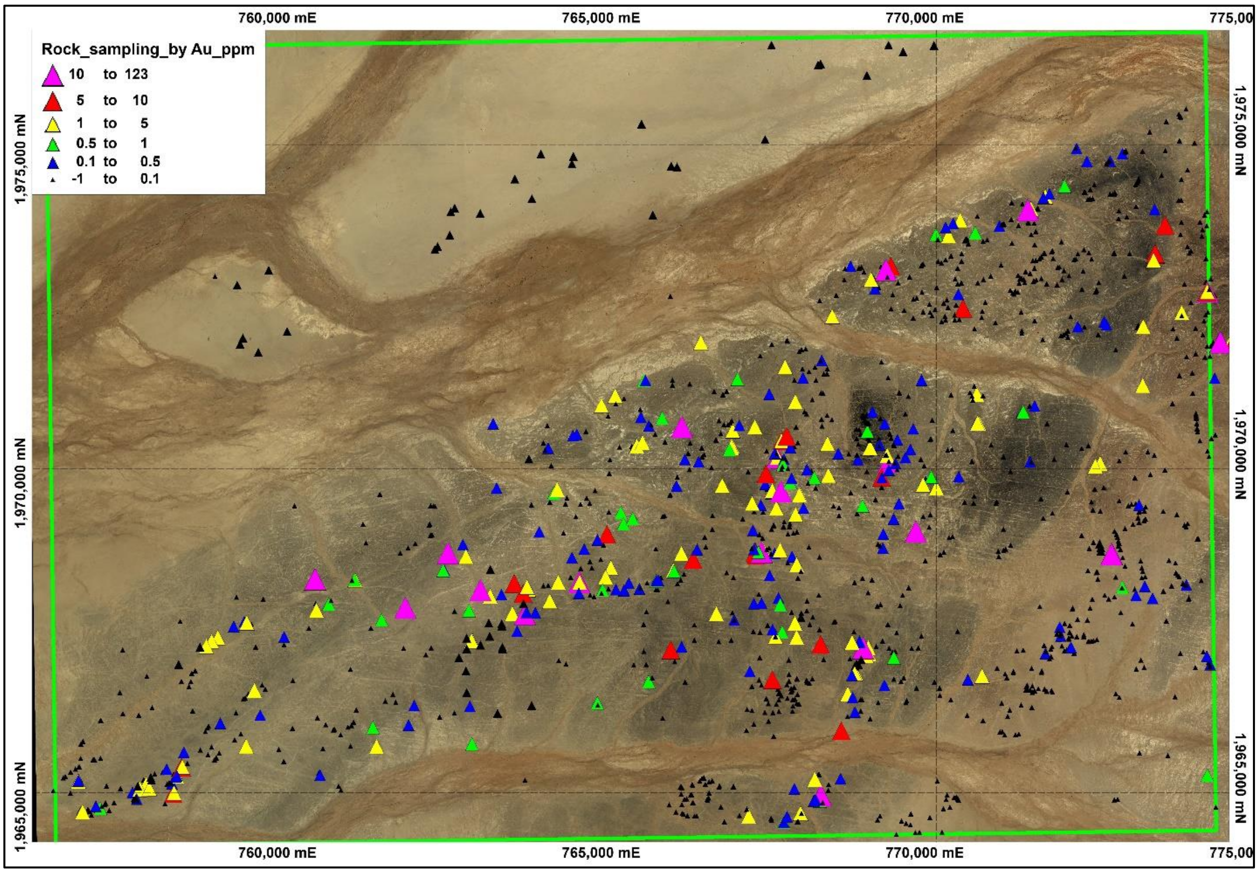

Fig 5.2. Rock chip sample plot in the Concession block by Au content

7. GROUND MAGNETIC SURVEY

Magnetic survey is a key prospecting method for the area, as it can expose main structures like faults and shear zones which can potentially be mineralization controlling. Airborne magnetic surveys are very fast compared to ground methods, but the ground survey method was selected for the project as it is cheaper and the concession area is accessible and very flat so ground survey can be completed in short period of time with low cost.

2 sets of GSM-19W v7.0 magnetometers are used for the survey with the following spec:

- *Real-time, graphic data display*
- *Interactive menu system*
- *0.022 nT/Ö Hz sensitivity*
- *+/- 0.1 nT absolute accuracy*
- *20,000 - 120,000 nT dynamic range*
- *< 10,000 nT/m gradient tolerance*
- *Reading storage capacity per 32Mb memory module: M – 1,465,623 readings; B – 5,373,951 readings Walk Mag – 2,686,975 readings*
- *RS-232 output with comprehensive software*
- *0.2 sec reading intervals*

Also another magnetometer was set as a base station to correlate survey readings with daily variations of the natural magnetic field. Compared to survey magnetometer base station has only 3sec reading intervals.

During 2019 about 25% of the concession block was covered by ground magnetic survey (Fig 7.1). Totally 540km of traverses were passed by two crew together walking parallel each other almost all the time. The spaces between traverses were 100m. As a result, a detailed magnetic field map was generated. The 0ther 75% of the area was covered during Q1 2020. Keeping the same survey parameters (S-N profile strikes, 100m distance between profiles) 1,658km of traverses were surveyed.

Two surveyors were working parallel to each other during the working day. Magnetic sensors were in 2m above ground surface (Fig 7.3). Measures were taken every 2 seconds. A base station was set in the corner of survey area (coordinates: X=763693.24 Y=1967770.91) (Fig 7.4, Fig 7.5) to record variations of natural magnetic field during the day (Fig 7.6) to do relevant corrections on survey measurements.

To do a Quality Control of the survey control measurements were done on few control points at the end of each working day. Control readings were compared with original readings, and the maximum deviation was only 15nT (Fig 4.38).

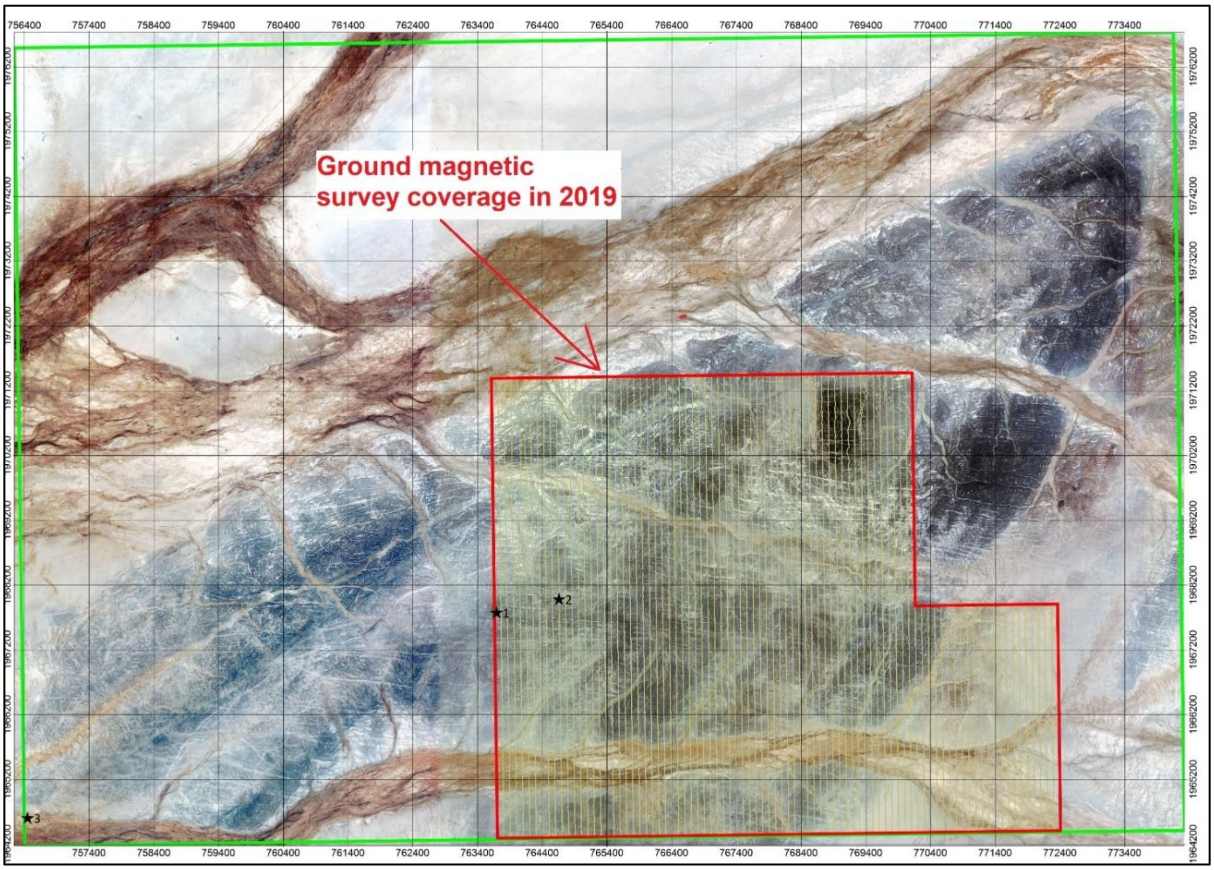

Fig 7.1. Ground Magnetic survey coverage during 2019.

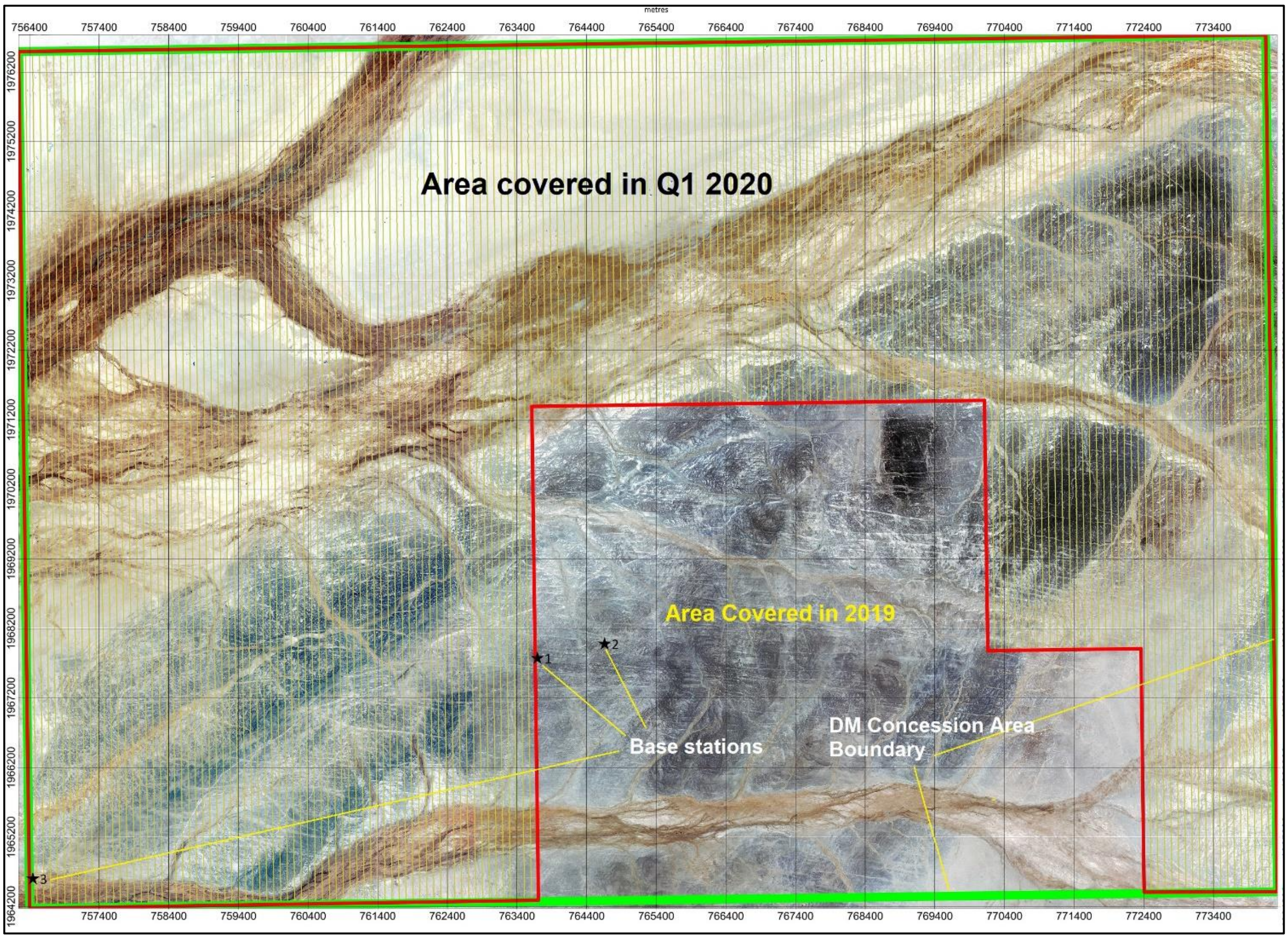

Fig 7.2. Ground magnetic survey coverage for Q1 2020

Fig 7.3. Surveyor equipped with GSM-19W magnetometer during the field work.

Survey data corrections for daily variations was done in GEMLink-5.4 software. Anomal field identification and data visualizations are done in Surfer-16. Statistic run shows that for the priority 1 area the mean value of the mag field is 38513nT and anomaly values vary from -600nT to +1500nT.

Survey results are presented as a map of vectors of magnetic field anomalies (Fig 7.7). Which identifies SW-NE major shear zone in the area as well as E-W striking felsic dikes with lower magnetic field features. Also S-N strike faults are identified by tectonic movements- displacements of minor faults in two sides of S-N faults.

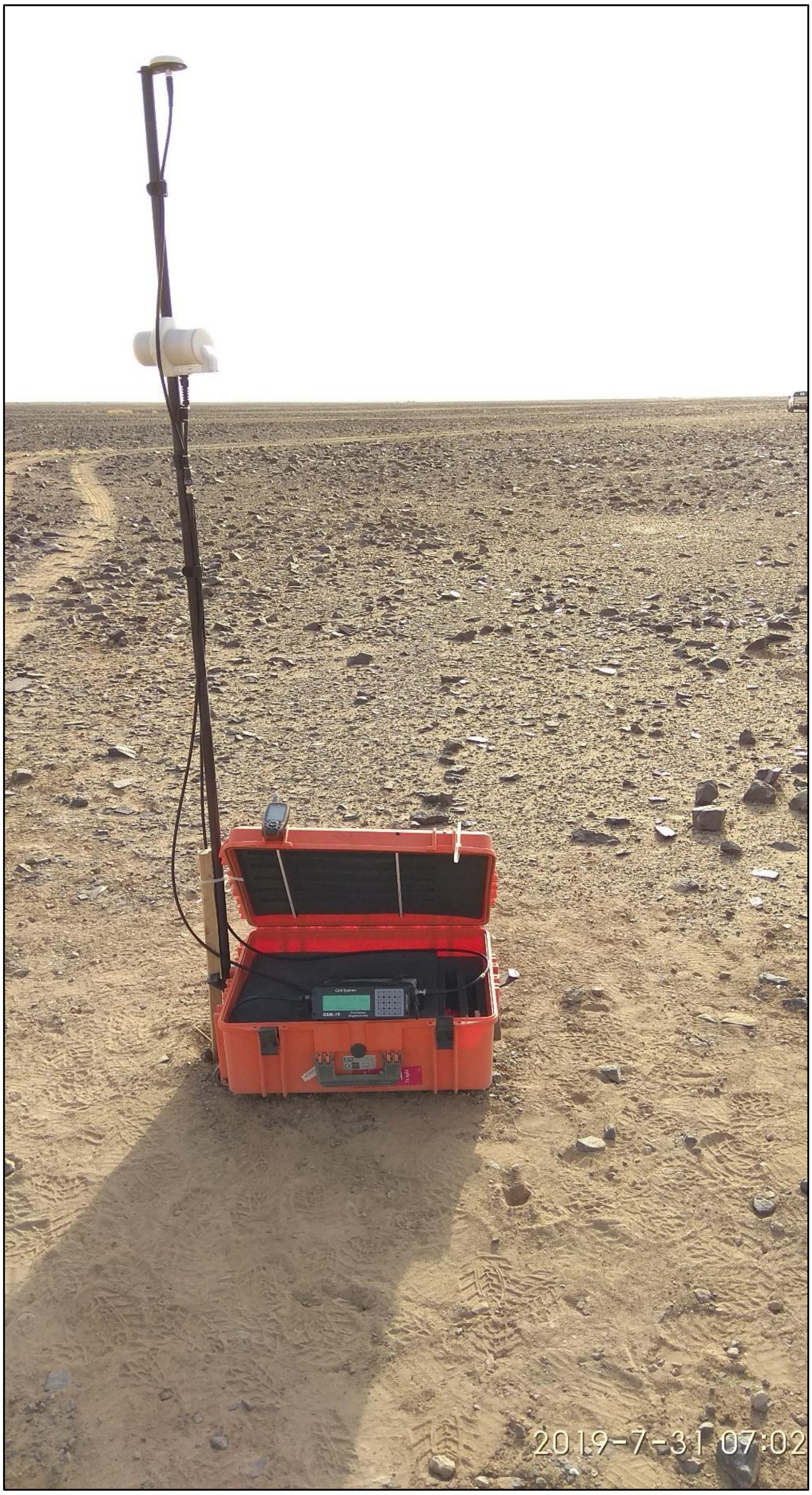

Fig 7.4. Base station in working position.

Fig 7.5. *Variation curve of natural magnetic field on Base Station Magnetometer display.*

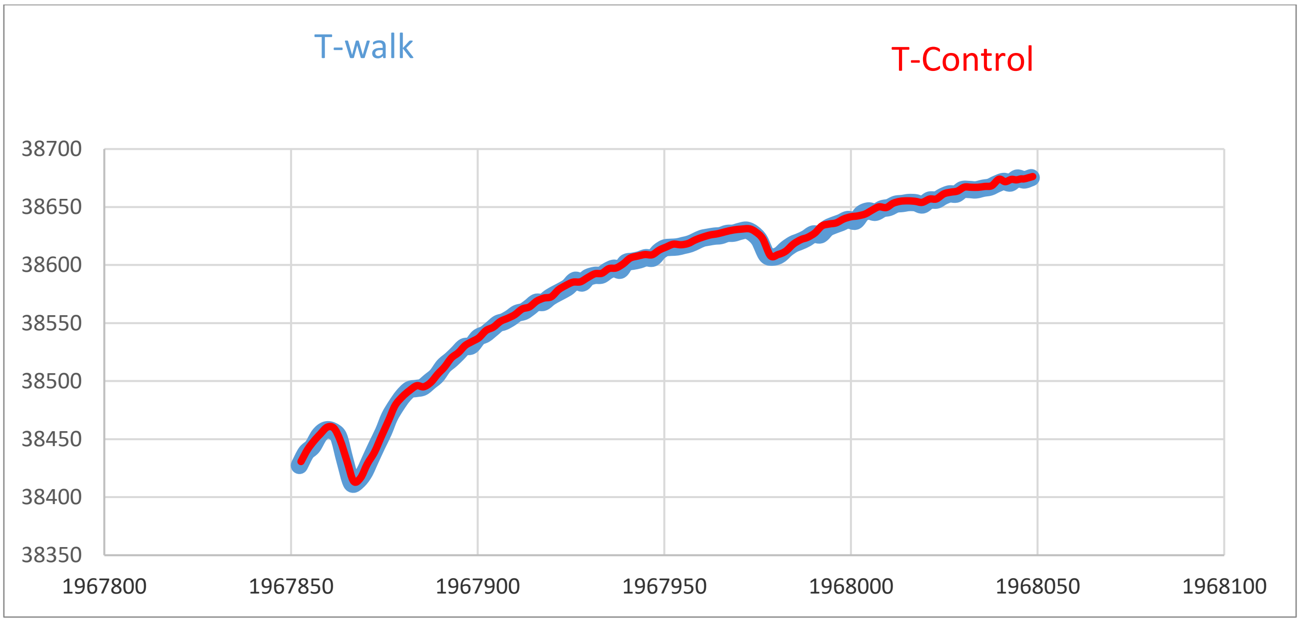

Fig 7.6. Original mag field value vs control measurement value for the control points

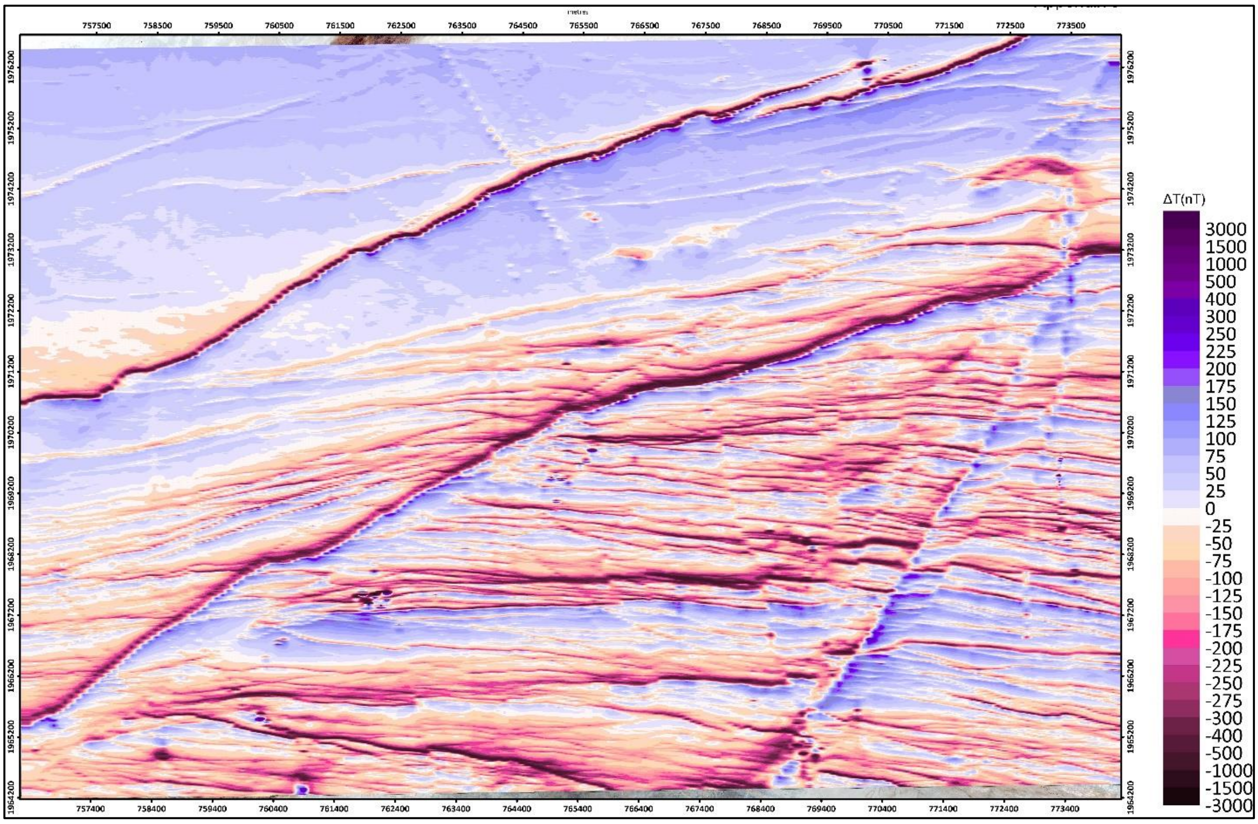

Fig 7.7. Result map of ground mag survey.

Detailed ground magnetic survey was carried out within the geochemical anomalies of Zones 9 and 10 (Fig 7.8) to get a better idea on structures to be able to plan trenches and drillholes more effectively. Profiles for detailed survey was chosen to be S-N as it was in total survey program, but the distance between profiles was reduced this time from 100m to 25m (Fig 7.9. and 7.10.).

Surveyed areas of the Zones 9 and 10 are 2.6 sq.km and 2.8 sq.km respectively. In total 104km of profiles were surveyed in the Zone 9 and 112km of profiles were surveyed in the Zone 10.

Detailed maps of anomalies of total magnetic field in the Zones 9 and 10 are presented in Fig 7.10 and Fig 7.12.

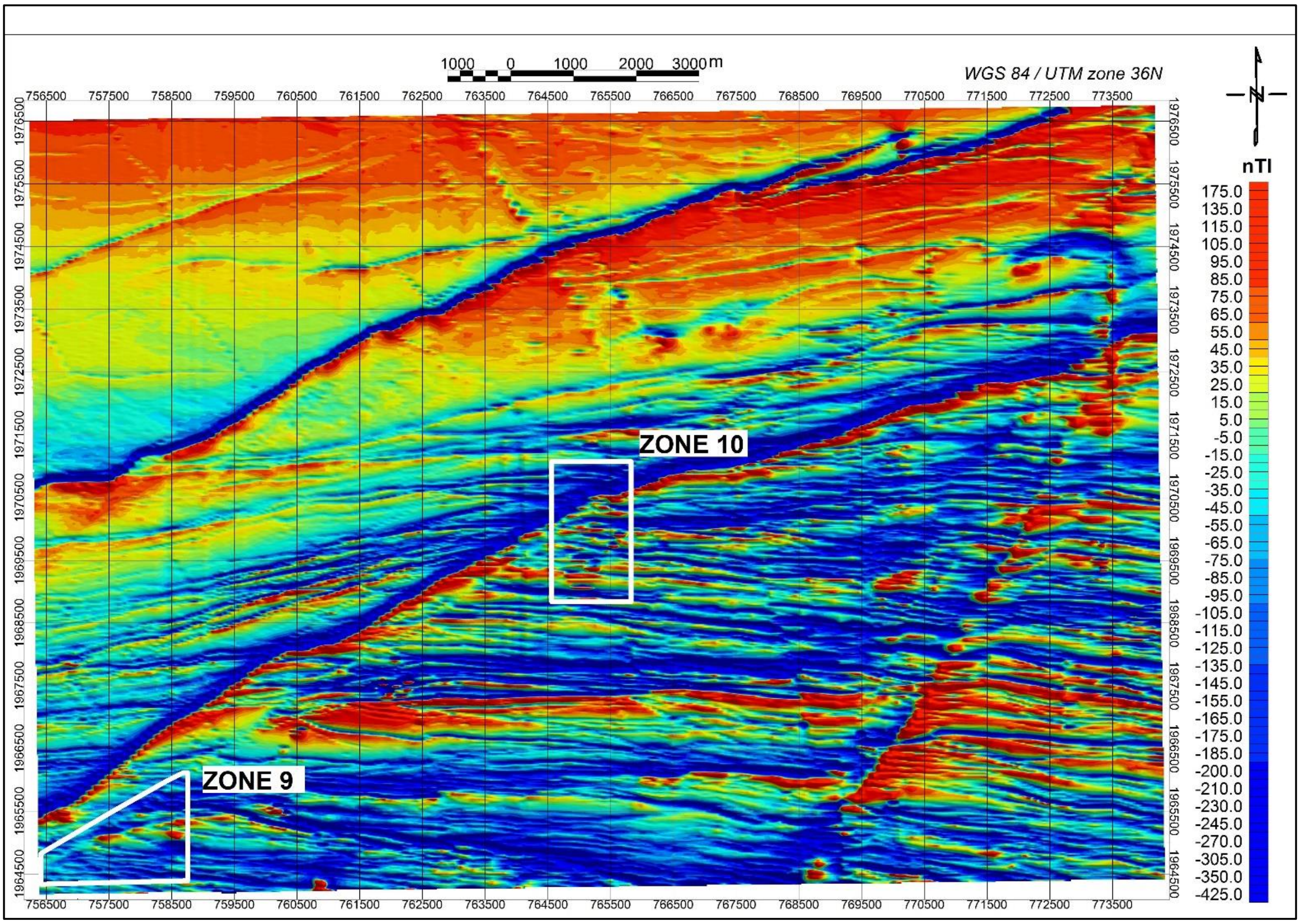

Fig 7.8. Boundaries of detailed ground mag survey on the anomaly map of total magnetic field of Block 64D area

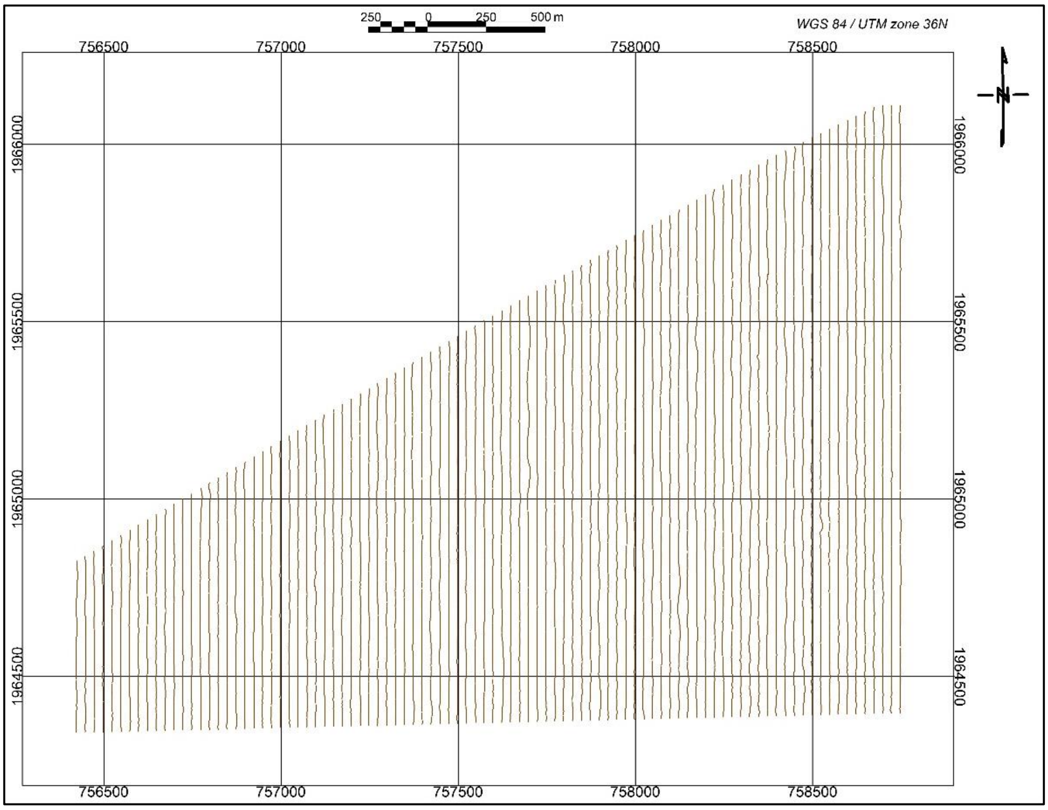

Fig 7.9. Detailed Mag Survey profiles within Zone 9

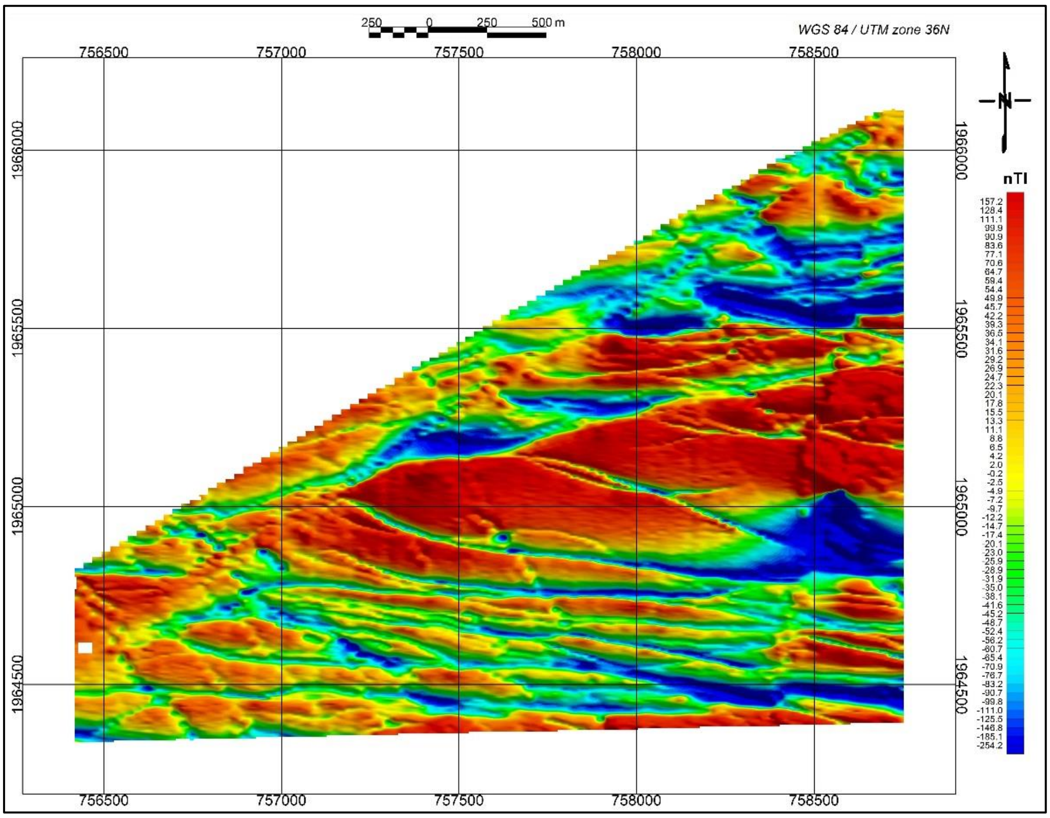

Fig 7.10. Detailed anomaly map of total magnetic field within Zone 9

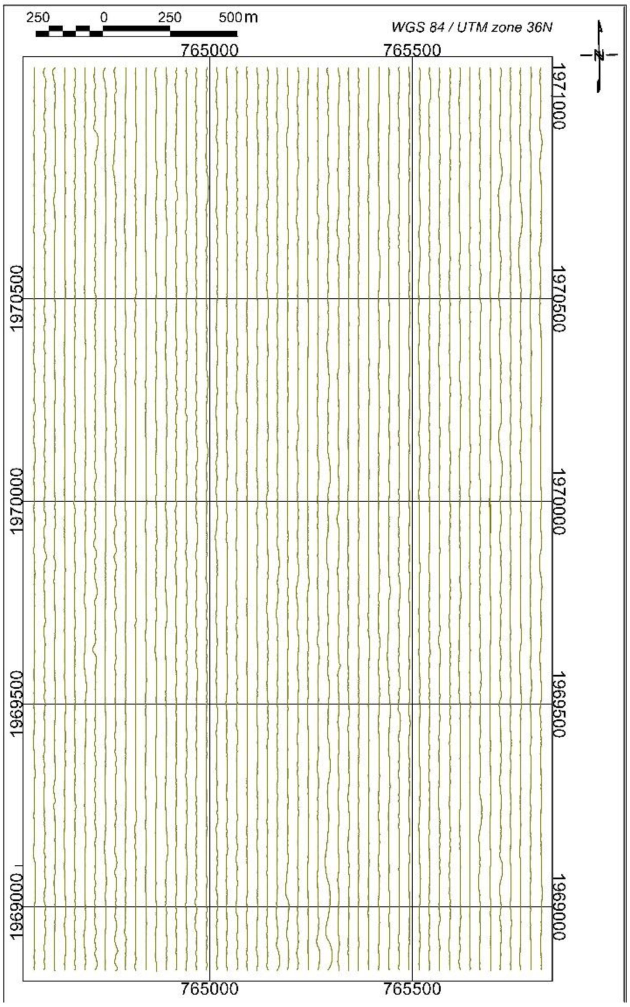

Fig 7.11. Detailed Mag Survey profiles within Zone 10

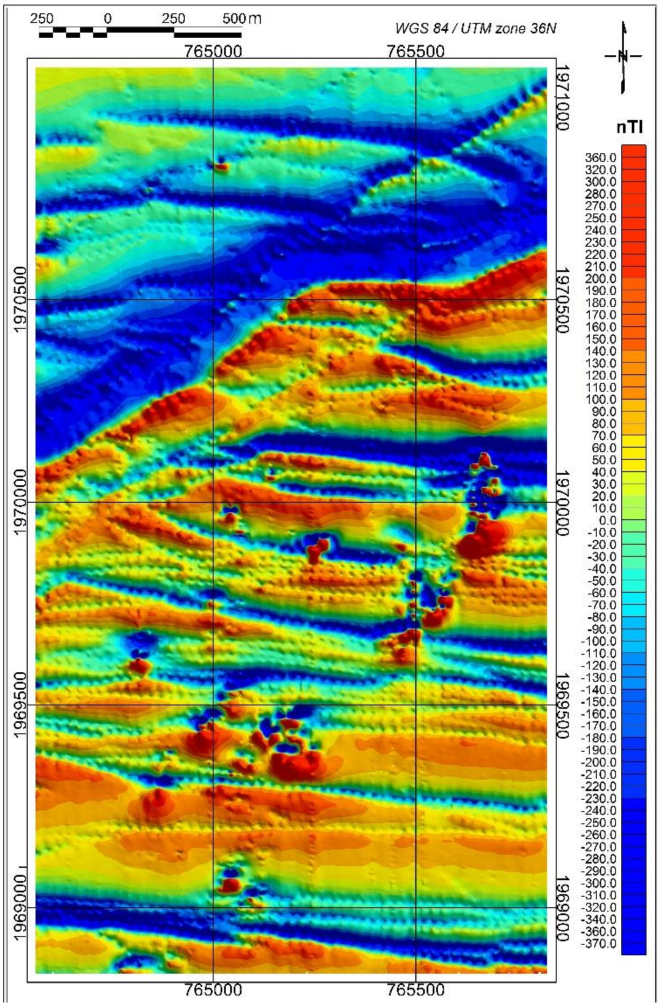

Fig 7.12. Detailed anomaly map of total magnetic field within Zone 10

8. IP SURVEY

IP is a special type of electrical survey that utilizes the electrochemical (galvanic) effects caused by a current passing through disseminated metal sulphides. The current creates an electro-chemical charge on the boundaries of the sulphide grains where the flow of current changes from ionic to electronic (and vice versa). Such rocks are said to be chargeable. When the primary current is switched off, the decay of this secondary voltage can be detected, and so provides a measurement of the size and position of the chargeable body. Induced polarization is virtually the only geophysical method that is capable of directly detecting concealed, disseminated sulphides in the ground.

IP Survey were used in the NE corner of the license are, where a potential VMS target (Target #1) were identified by remote sensing.

Two methods of IP survey were implemented for the project. Fistly the whole area of interest were covered by Gradient Array method, which is relatively quick method and is very often used for IP reconnaissance. The profiles for Gradient array had SE-NW strike, and the distance between profiles were set 200m.

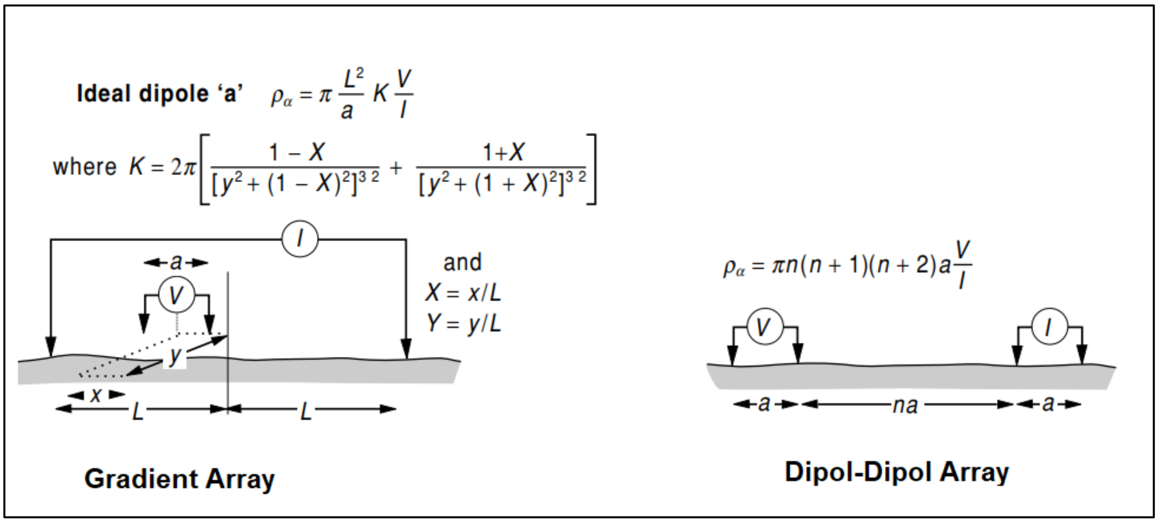

Fig 8.1. Comparison of Gradient array and Dipol-Dipol Array of IP survey.

Then on the areas of IP anomalies discovered by gradient survey Dipol-Dipol profiles were used. This method is relatively expensive due to low speed of implementation and labour intensive techniques. They are therefore used as direct ore-targeting tools in established prospects where the presence of disseminated metallic sulphide ore is suspected. Dipol-Dipol pseudo section were processed and inversed to probable models using Oasis Montaj VOXY process.

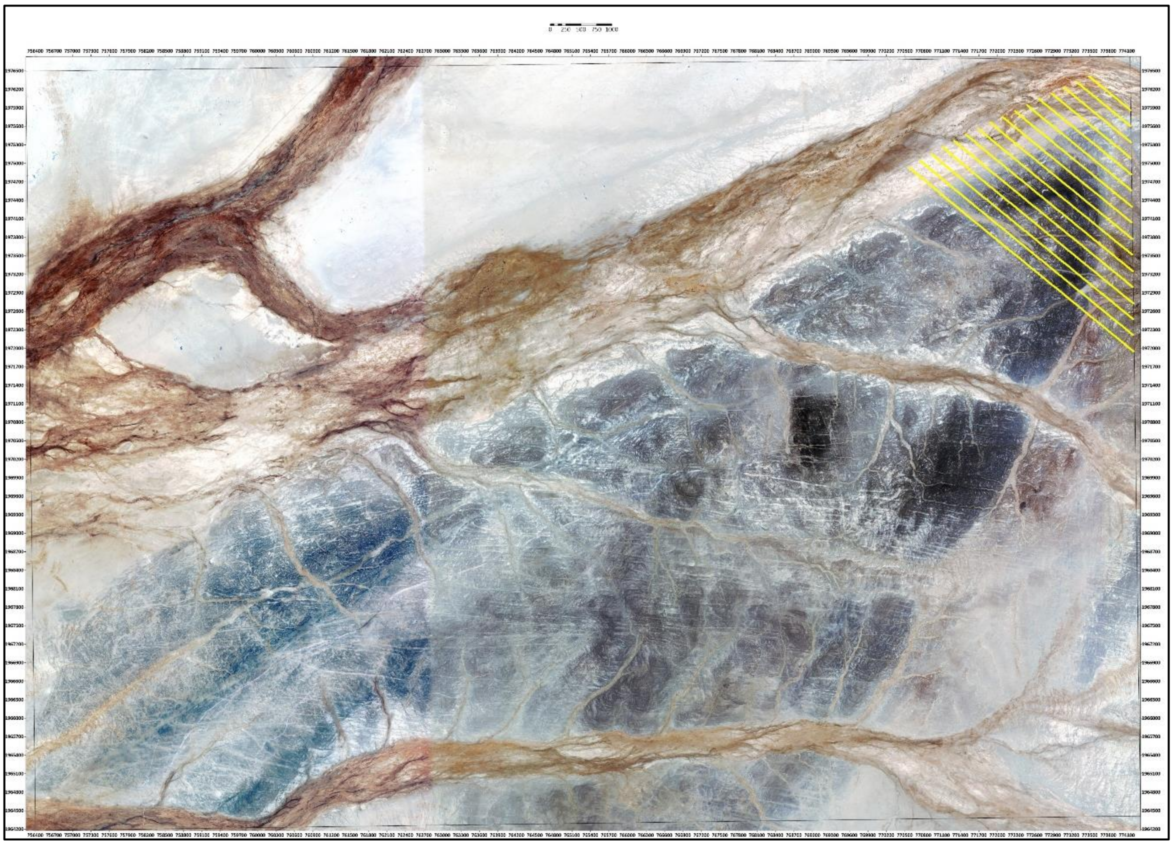

Fig 8.2. IP profile in the area of Target 1.

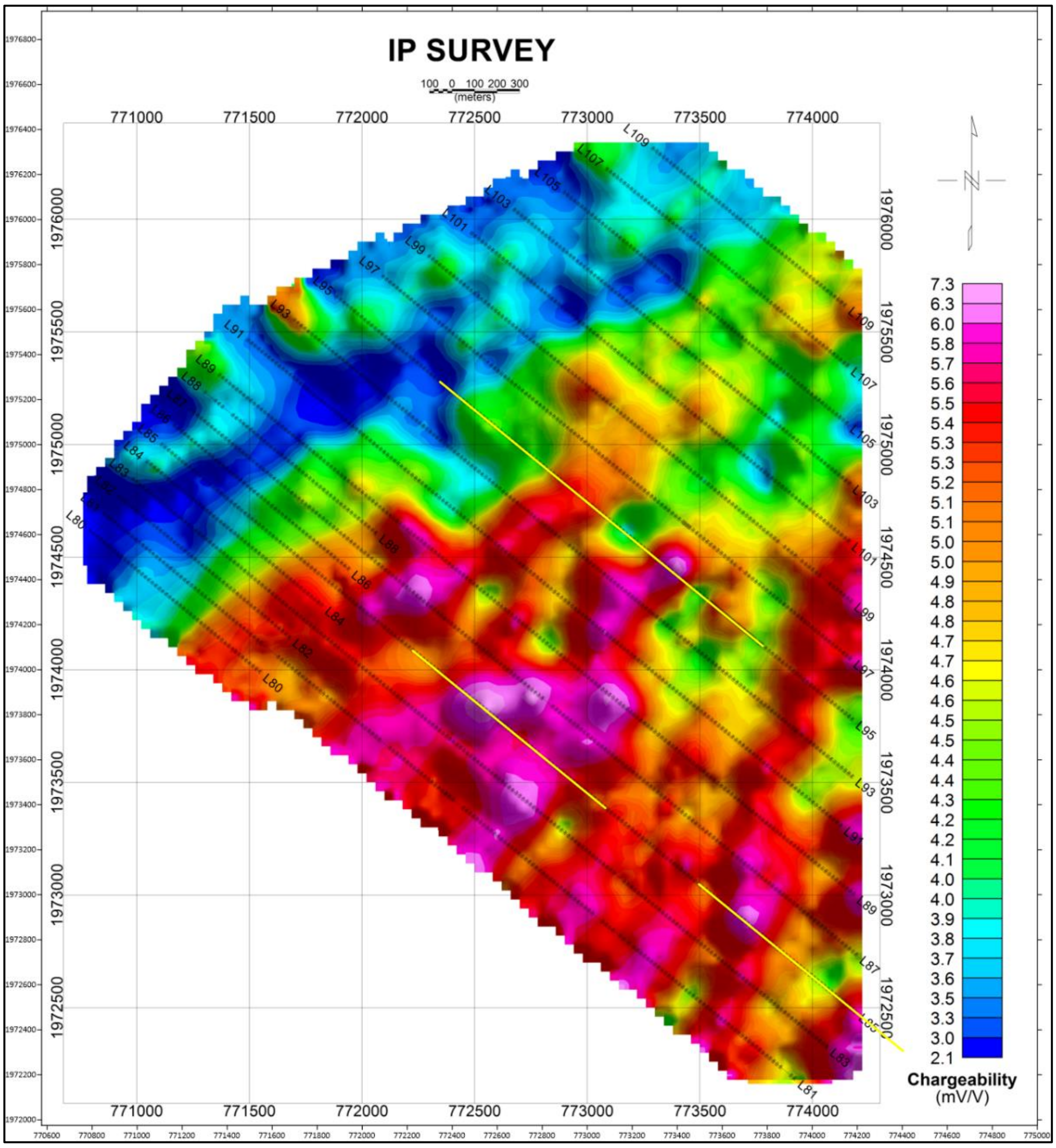

Fig 8.3. IP anomaly map

9. TRENCHING

As a result of the prospecting works 10 prospective zones were identified for the further exploration activities: trenching and drilling (Fig 9.1).

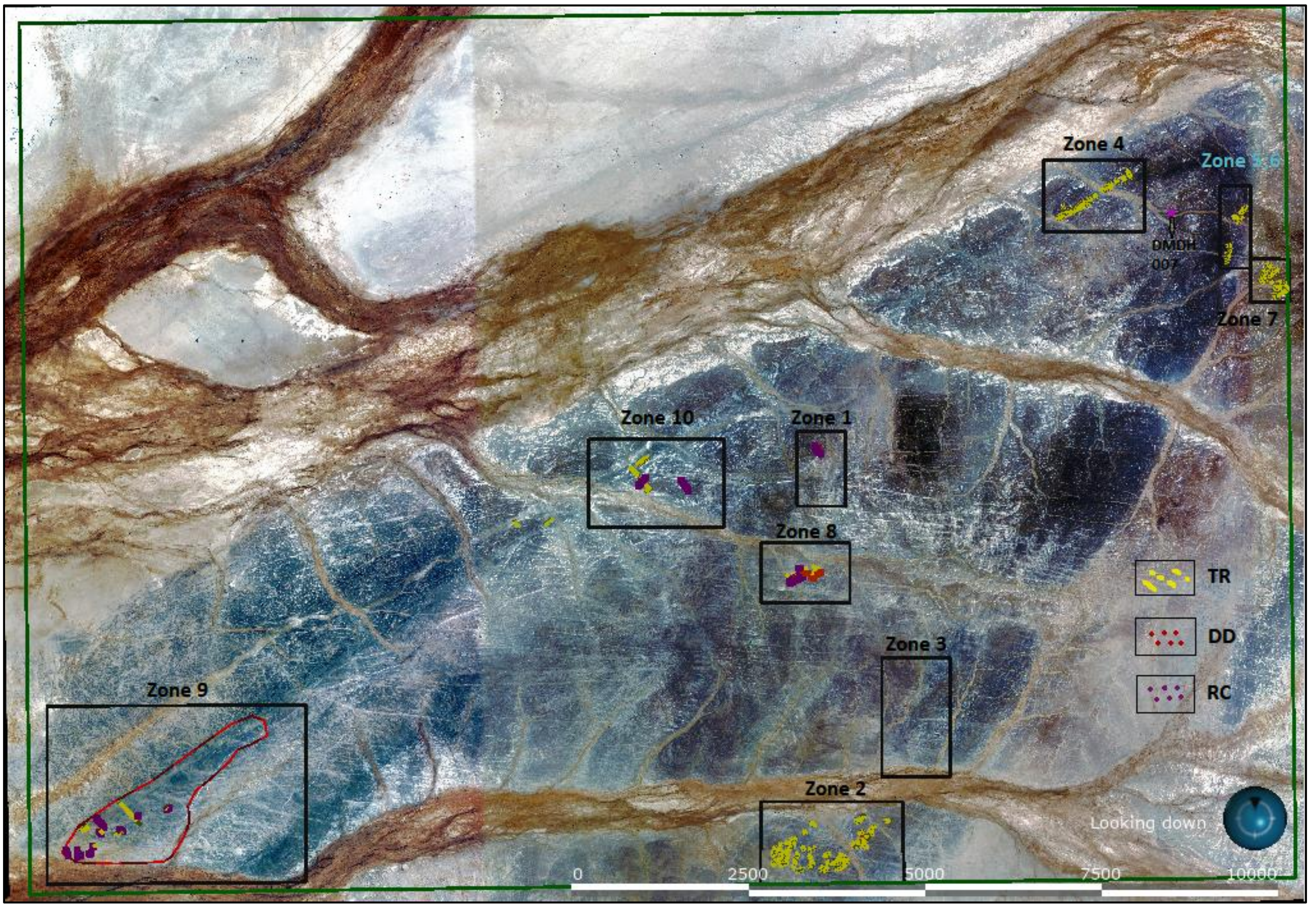

Fig 9.1 Location of prospective zones within the concession block RS-64D.

Before any drilling the trenching program was initiated in prospective areas to expose mineralized zones strike and dip directions. A 30t excavator was used to do the main earth work (Fig 9.2), then walls and floors of trenches were cleaned manually in the places where mineralization signs were noticed. All the trenches were logged and sketched (Fig 9.3), sampling intervals were marked (Fig 9.4) and sampled by 5cmX10cm channels. Quartz veins were channeled using electric grinders (Fig 9.5). All samples were documented and collected in calico bags.

Totally 35,250m of trenches are excavated during the reporting period. And more than 7,300 channel samples were taken from trenches. All the channel samples are assayed at DM lab.

Fig 9.2. Trench excavating

Fig 9.3. Trench logging and sketching by a geologist.

Fig 9.4. Channel sampling of shear zones stripped on trench wall. Chisel and hummer are used to cut channels.

Fig 9.5. A channel cut over the quartz vein. Handy angle grinder is used.

All the trench were sketched (Fig 9.6, 9.7). Before backfilling all trenches are surveyed to create real coordinate 3D models of the zones (Fig 9.8, 9.9). Sketches and outcrop/subcrop observations were used to create local geological maps of zones.

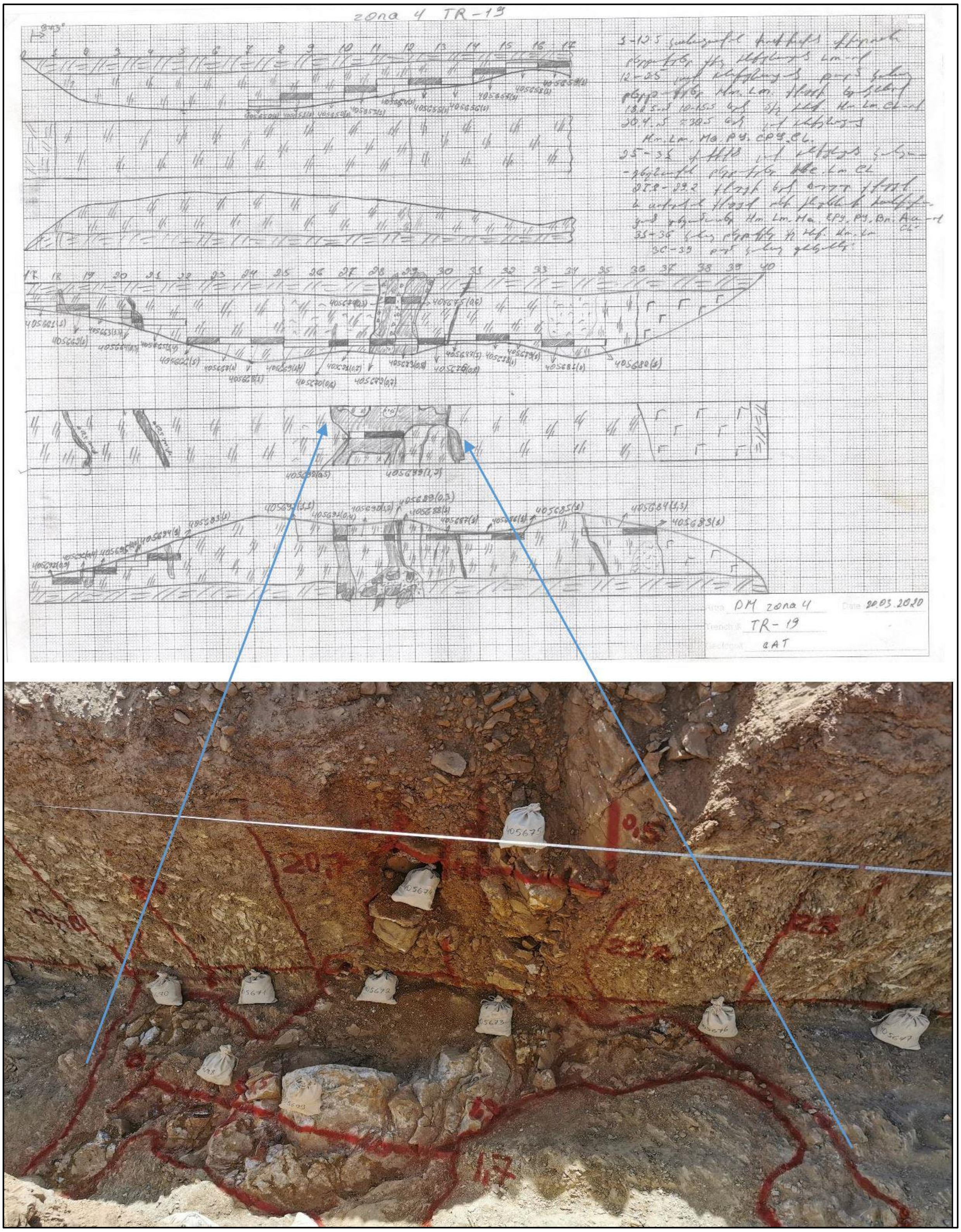

Fig 9.6. Sketch drawing of Trench#19 of Zone 4 and a photograph of the central part of the trench.

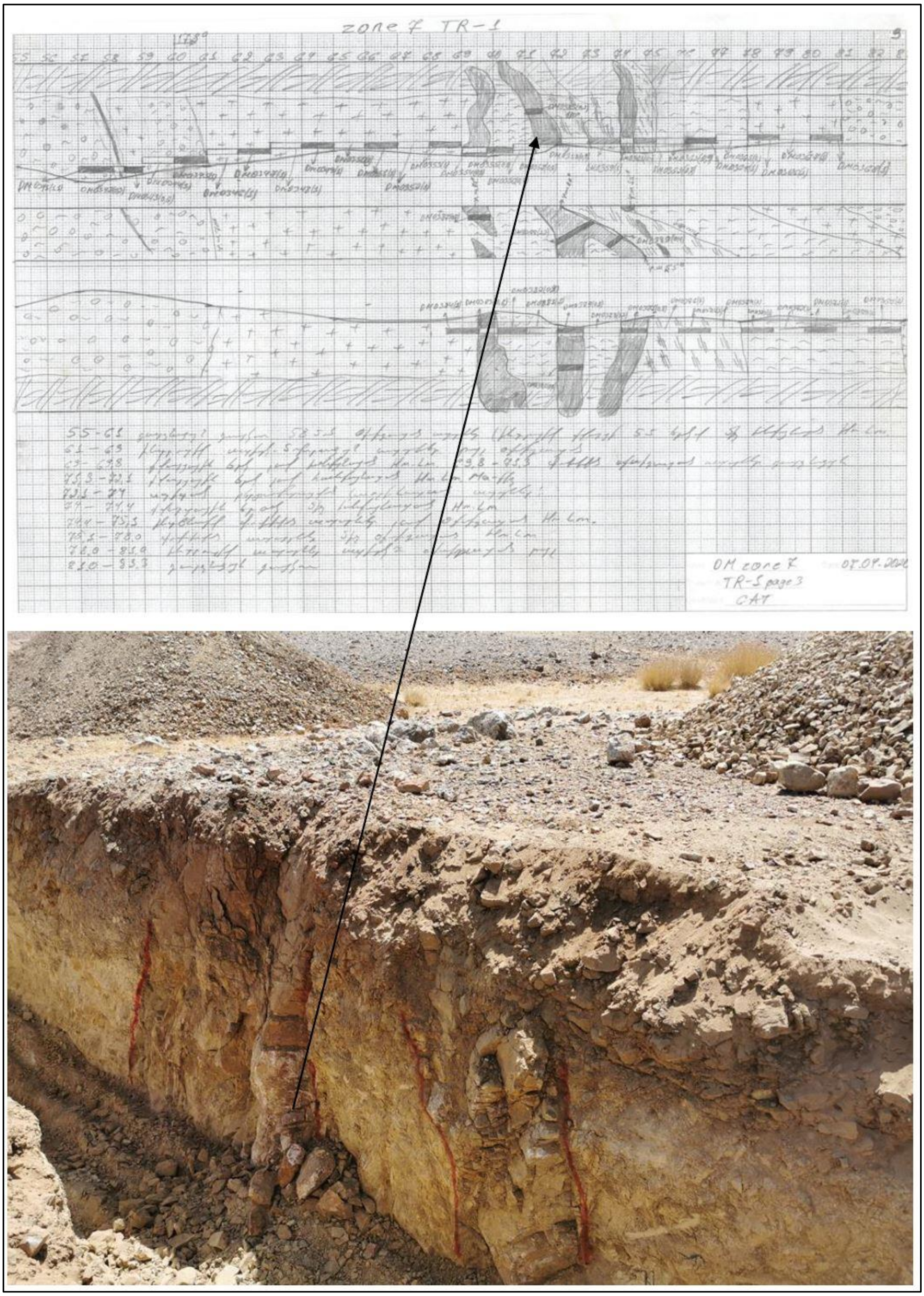

Fig 9.7. Sketch drawing of Trench #1 of Zone 7 and a photograph of the central part of the trench.

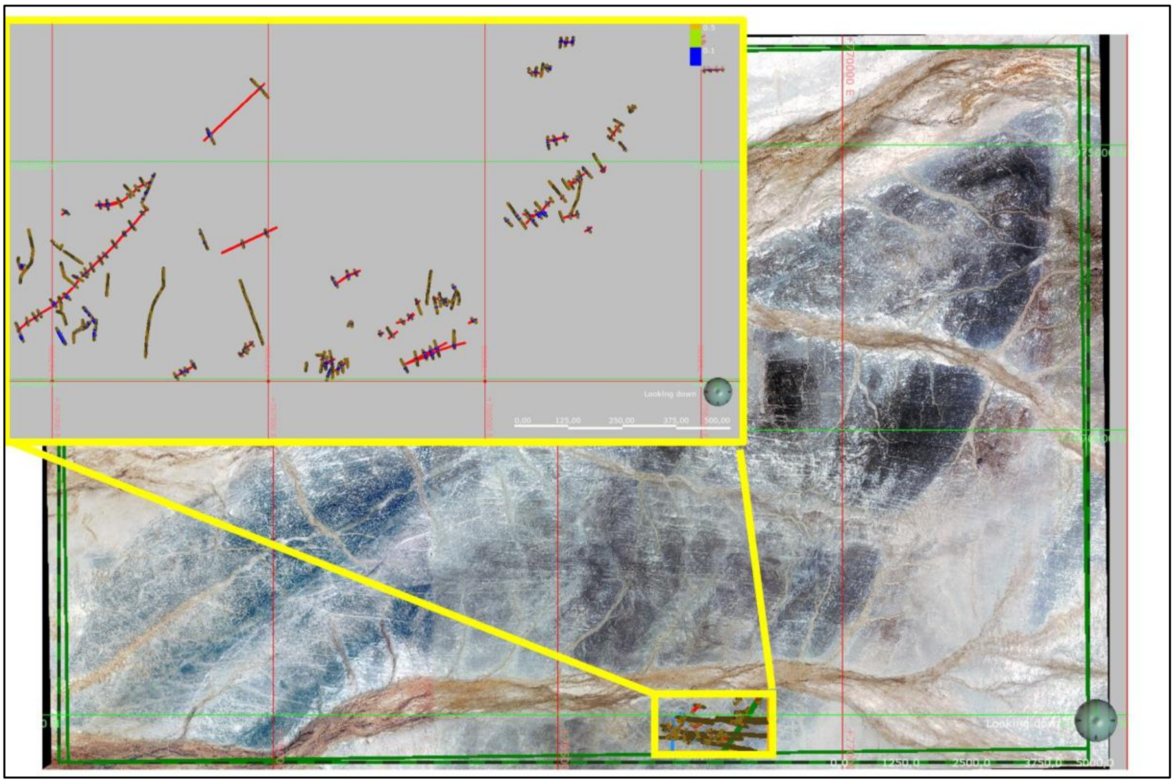

Fig 9.8. Trenching map of the Zone#2.

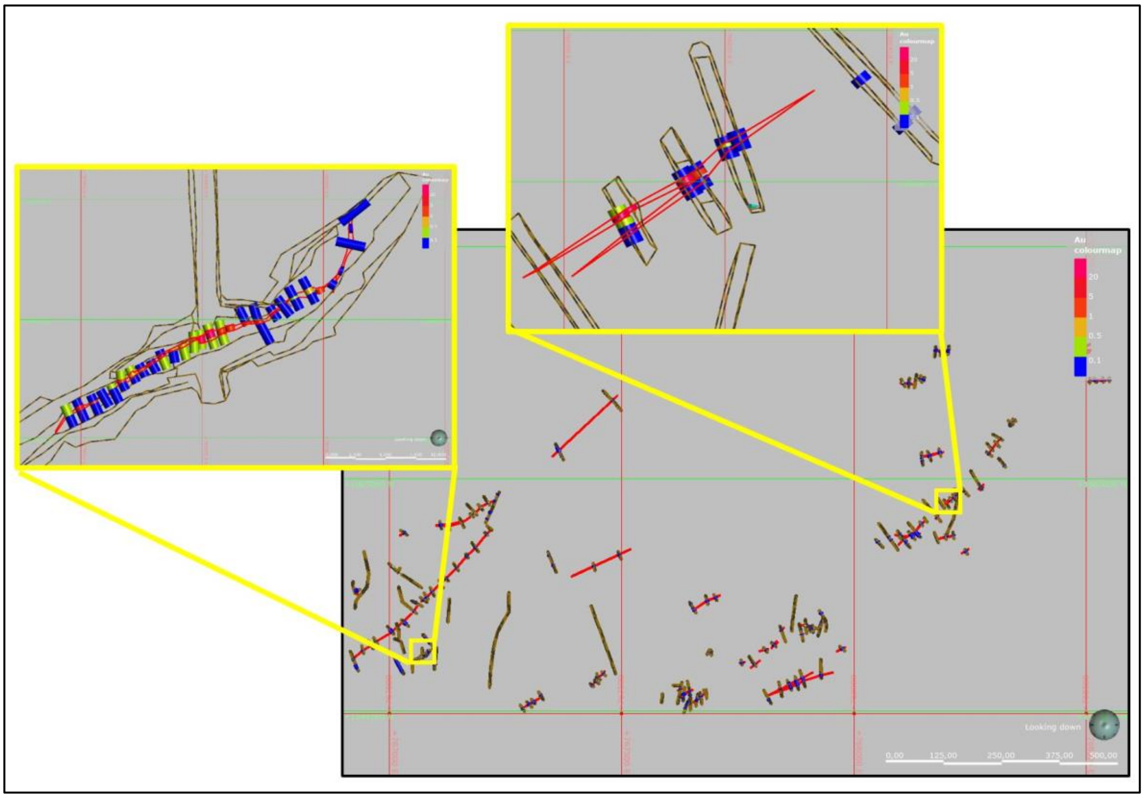

Fig 9.9. Trench details within the Zone#2

10. RC DRILLING

After summarizing of the trenches for prospective zones drilling programs were initiated.

Totally 22,750m of RC holes are drilled within the concession block. Almost all the holes are drilled at 55-degree inclination, which is the shallowest possible dip at the rig type (D&B30 multi) DM has used (fig 10.1). Depths of the holes varies from 25m to 175m. Drill hole diameters vary from 125mm to 133mm depended on ground conditions.

Each meter of drill holes gives about 35kg of cut sample, which is being weighted, numbered and split by by 12.5/87.5 riffle splitter (fig 10.2 fig 10.3.) Reduced samples (~4.5kg) were packed in calico bags, numbered and weighted. The riffle splitter was cleaned by compressed air after each use.

Each meter of RC holes was sampled. About 0.5kg of sample was wet screened to select coarse chips for geological logging (fig 10.4., fig 10.5.). Then they are packed in chip trays and stored in sample storage (fig 10.6.). Totally 27,300 samples (including QC/QC samples) were collected from RC holes and assayed

Fig 10.1. Drilling an inclined RC hole by D&B30multi rig.

Fig 10.2. Initial RC sample weighting and numbering.

Fig 10.3. Splitting of the initial RC sample using a riffle splitter.

Fig 10.4. RC drill cutting logging by a geologist

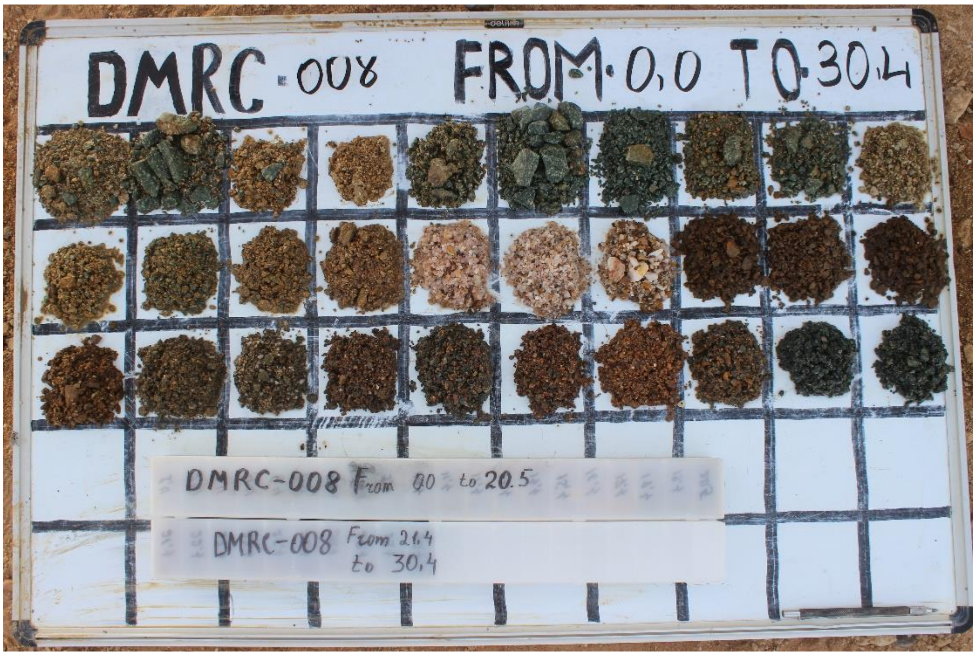

Fig 10.5. RC washed and screened drill cuttings on the logging desk. A quartz vein is exposed from 14m to 17m.

Fig 10.6. RC drill cuttings in chip trays at DM sample storage.

11. DIAMOND DRILLING

Once the morphology and the zonation of veins and shear zones are identified by RC drilling program, diamond drillholes are planned and drilled to model mineralized zones more precisely and to collect materials for geotechnical and metallurgical testworks.

Diamond holes were drilled 24 hours a day in two 12 hour shifts (Fig 11.1) to avoid any long pause which can cause stacking of drill rods. Totally 16,500m of diamond holes were drilled.

Fig 11.1. Diamond drilling pads in early morning and in the night time.

Diamond holes were drilled at 55-60 degree of inclination. The same D&B30 Multi drill rig were used for both diamond and RC drilling. HQ diameter is applied for the whole hole. Small water ponds were built next to drill holes to use circulated water for the drilling (Fig 11.2).

Fig 11.2. Drilling of DMDH-002a diamond hole, Azimuth 65 degree, inclination 55 degree

Fig 11.3. Recovering of a core from core barrel.

Fig 11.4. Measuring of the recovered core length.

After recovering a core from each drill run it was measured and its geotechnical characteristics were logged before placing cores into a core box (Fig 11.3, fig 11.4).

Then core boxes were photographed and logged lithological and sampling intervals were identified (Fig 11.5). Cores then were cut on core saw along their long axis at intervals which were identified by geologists to be sampled as they showed a sign of mineralization (Fig 11.6). All half cores were sampled and put into calico bags to be sent to the DM Lab in Khartoum. Totally 4,950 core samples are collected from the Diamond Drillholes and were assayed at DM Lab in Khartoum. The other half of cores are left in core boxes at the core shed.

Fig 11..5. A core box photograph. A mineralized quartz vein and hosting gneisses are seen.

Fig 11.6. A core cutting procedure by a manual core saw.

Trenching and Drilling data were used to create geological models of the mineralized zones (Fig 11.7-11.13)

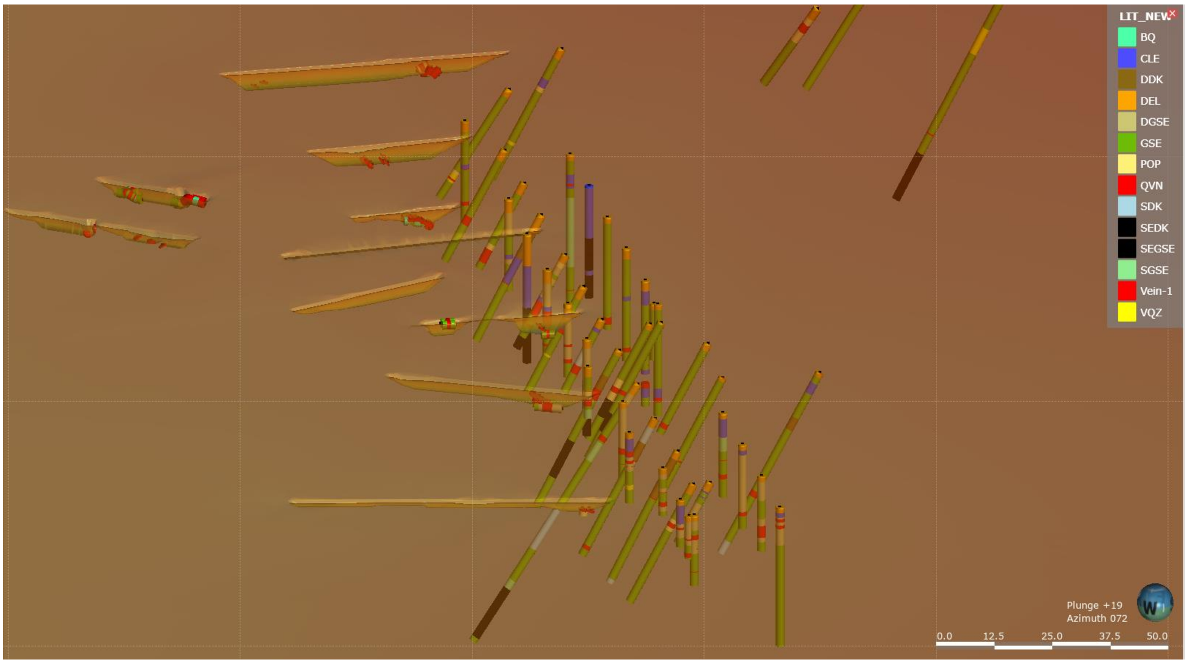

Fig 11.7. 3D view of the quartz vein area in the ZONE 8 with drillholes coded by lithology

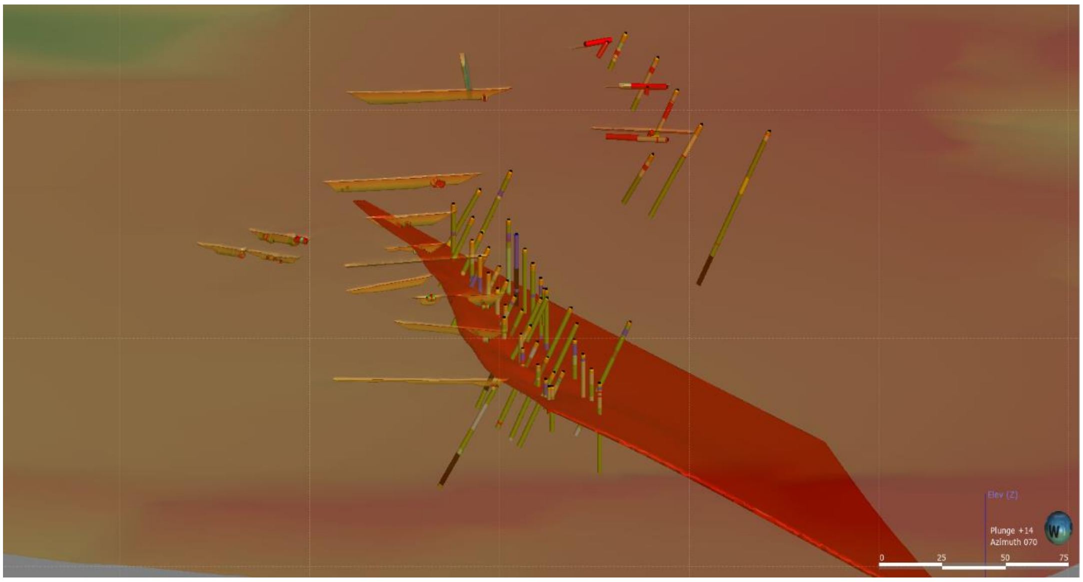

Fig 11.8. 3D view of wireframe model of the vein in ZONE 8

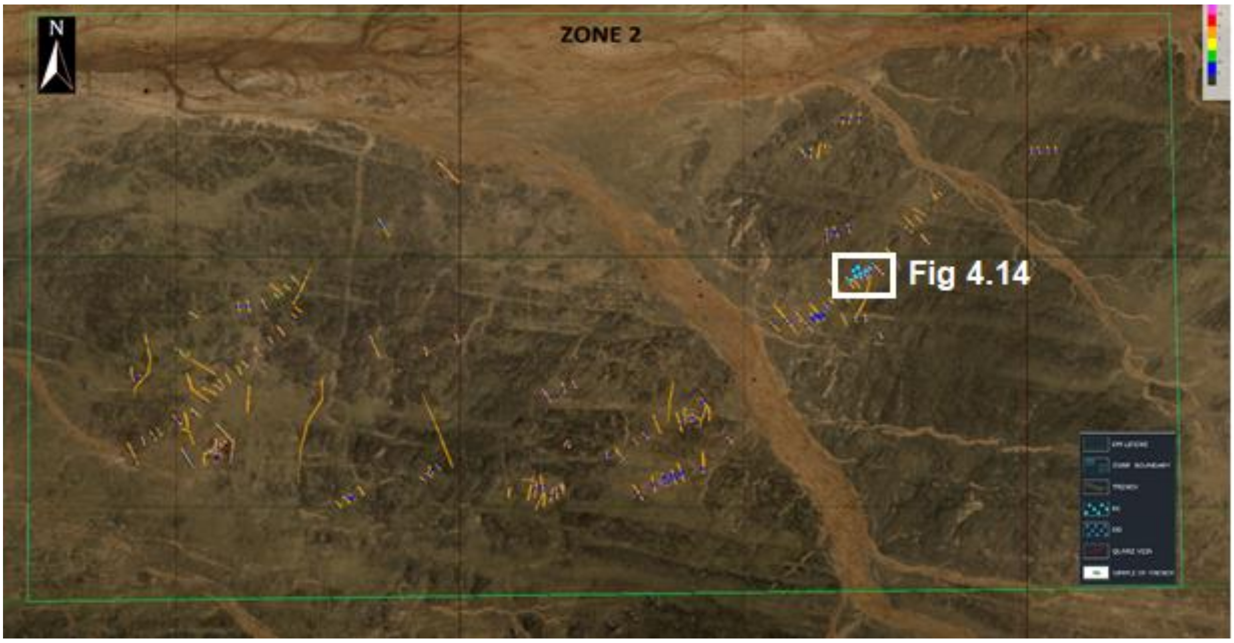

Fig 11.9. Location of trenches excavated in Q4 2019 in the ZONE 2

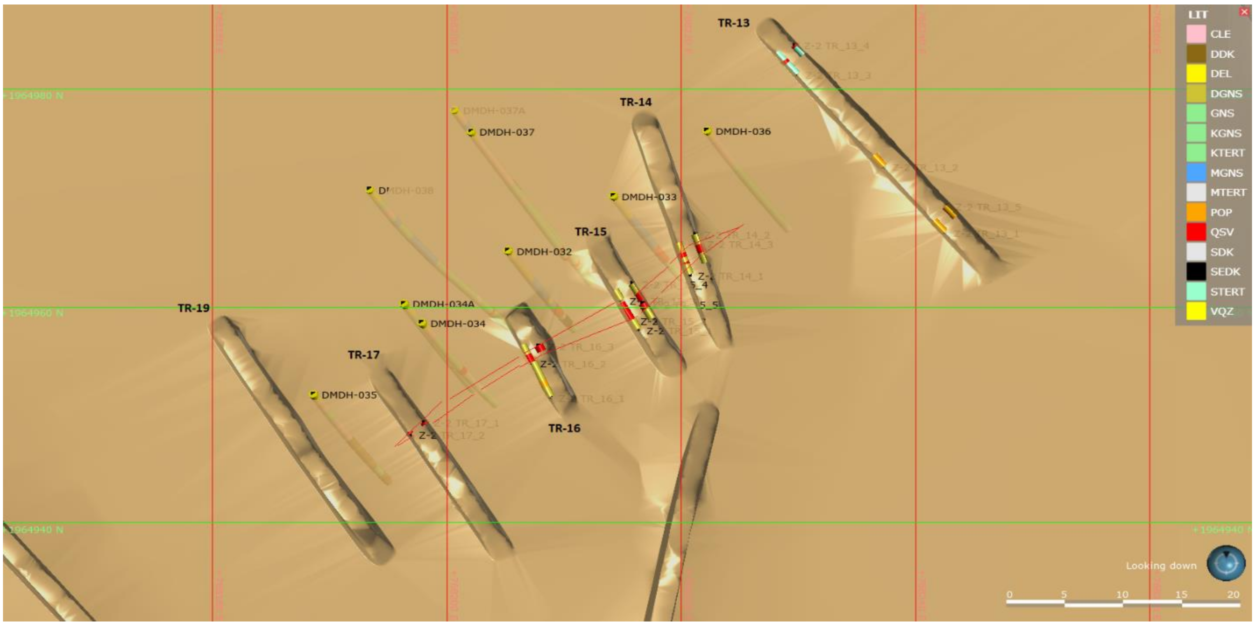

Fig 11.10. Trenches exposing high gold grade narrow quartz vein in ZONE 2.

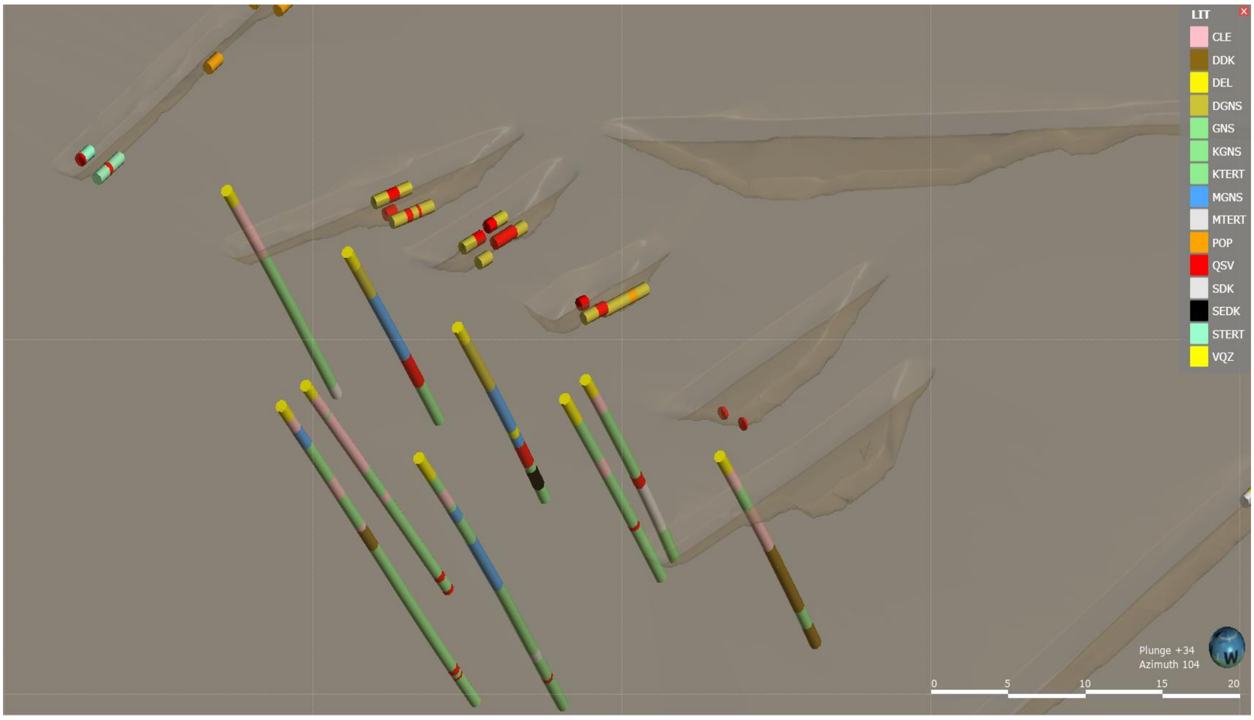

Fig 11.11. Drillholes in ZONE 2 colored by lithology.

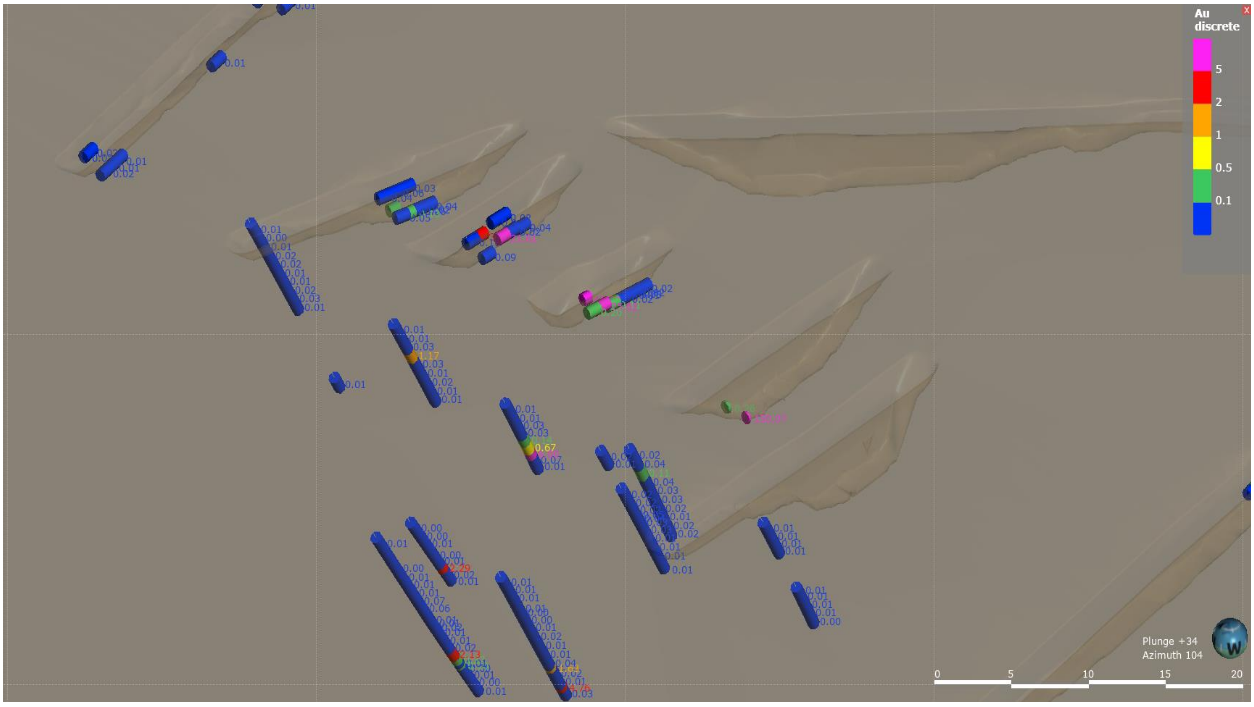

Fig 11.12. Drillholes in ZONE 2 with assay results

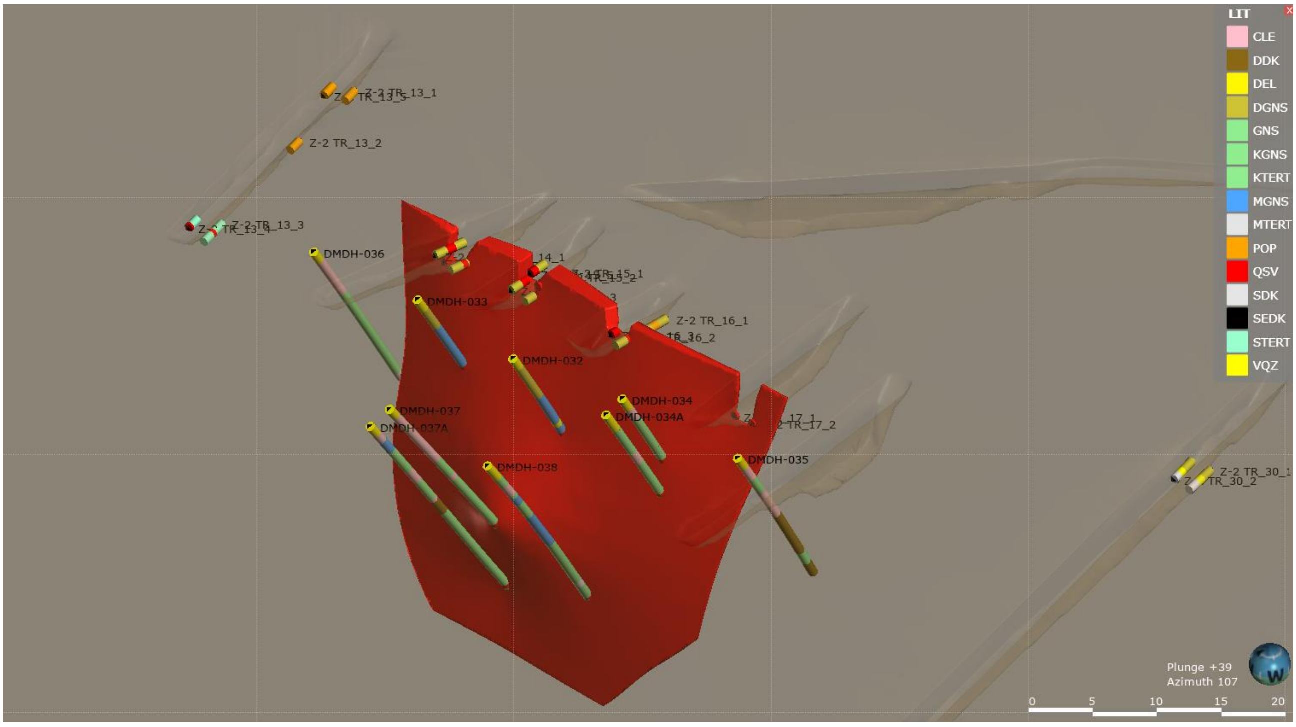

Fig 11.13. Wireframe solid model of the quartz vein in ZONE 2