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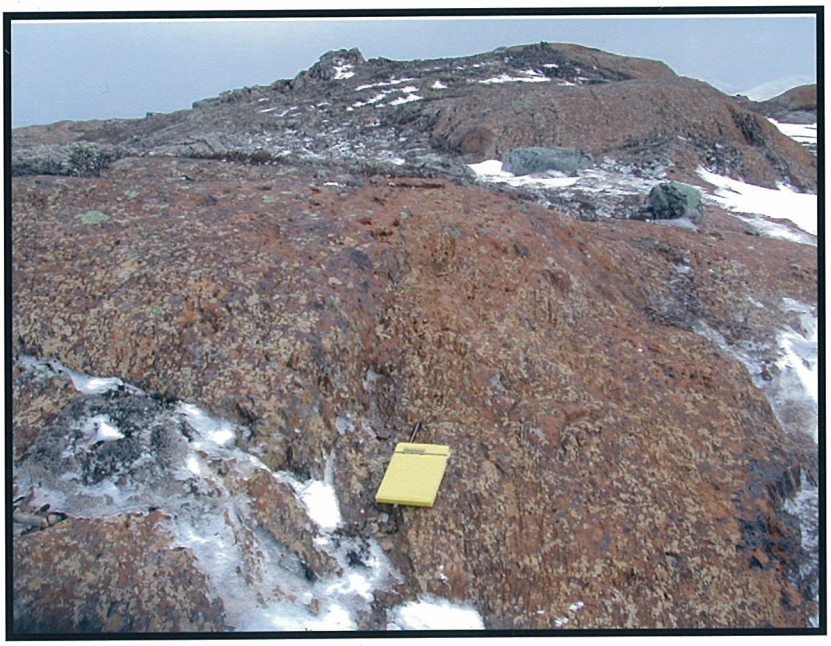
Golden Chalice Resources Inc

Structural and GIS Analysis of the Varden Ridge Zn-Pb-Ag-Au Exploration Prospect, Northern Norway

Target Generation Report

BY
7188

October 2004



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Rapporten er fra 2004.
Rapporten gjennomgår geologien og de tidligere arbeider som er gjort i feltet.
Det er gjennomført ny strukturgelogogisk kartlegging. Denne påviser at tidligerer boring ikke har testet de mest markerte soners potensiale.
Mineraliseringen i området blir sammenlignet med Cobar Ore Field i Australia.
Det blir foreslått et diamantboringsprogram.

1 vedlegg

ST CONSULTING GROUP, INC.

Per Zakken Brekke, Bergmester
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December 15, 2004

Dear Mr. Brekke:

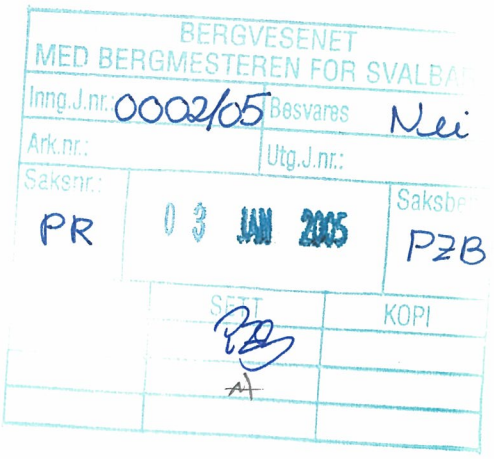
Enclosed is a report on work done during 2004 on the Varden Ridge area of Haugfjellet plateau located east of Narvik. The mutinger at Varden Ridge are held by Geologiske Tjenester of Oslo, which are under option to Golden Chalice of Vancouver.

Please contact me if you have any questions.

Best Regards,

Tom Robyn

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Report No.08/04

Executive Summary

The Varden Ridge base metal and gold prospect in Northern Norway represents a good opportunity for the discovery of an economic Zn-Pb deposit in an under-explored Lower Proterozoic terrain. The system of mineralization at surface extends for over 3km in strike and up to 750m in width and is characterized by a series of steeply dipping zones of anomalous sulphide mineralization which contain multiple narrow high grade Zn and Pb lenses, some with anomalous Cu and Au content.

This study has focused on defining a structural framework and context for mineralization through new structural mapping and synthesizing the existing exploration data. The results of the analysis have outlined a structurally controlled pattern of mineral lenses that represent drill targets to test the geometry, grade and continuity of the mineral system. Previous drilling did not test the most significant zones of potential that this study has highlighted.

The key results of the structural study are:

- The concentration of mineralization is characterized by heterogeneous strain and folding resulting from a localization of compressional shears along the axial zone of Varden Ridge. An impressive feature of the mineral system is the very extensive silica system which is structurally controlled and appears to be an early phase of the paragenesis.
- The host rock package is a steep dipping, continuous westward younging sequence of turbidites within which the finer grained lithologies tend to be favorably mineralized. Units within the sequence are frequently truncated by internal shearing and also folded in the axial zone so mineralization tends to be discontinuous.
- The high-grade mineralization is replacement style and is controlled by a series of steeply dipping shears within broader sulphide rich zones.
- Comparisons are made between Varden Ridge mineralization and the economic deposits of the Cobar Ore Field which were formed during inversion of a basin margin.
- Delivery of a powerful GIS database to critically evaluate all the data relationships and define a series of drill locations. A sample series of 10 maps have been generated from the GIS data integration analysis.
- A drill program is outlined to primarily test the potential of the central zone of mineralization followed by testing of the remaining zones.

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1. Introduction

1.1. Background and Scope

Golden Chalice Resources Inc. of Canada is currently exploring the Varden Ridge base metal and gold mineralization prospect in the Rombaken Window, of Northern Norway. Their objective is to discover an economic zinc-rich base metal deposit within the well-exposed package of mineralized Proterozoic meta-sediments. The current high price of lead also enhances the economic viability of this base metal deposit

The mineral rights for the mutinger (licenses) covering Varden Ridge are held by St Group Inc. and Geologiske Tjenester A/S and these are shown on all of the maps within this report. A full description of the location, property details and exploration history is in the report 'Varden Ridge Drilling Proposal' 2002 prepared by ST Group, Inc.

The style and structure of Varden Ridge mineralization have been somewhat unclear with several different interpretations. The metal sulphides are sediment hosted but the age and genesis are very uncertain although comparisons have been drawn with the Sullivan sedex deposit in British Columbia which has an early syn-sedimentary of syn-diagenetic age. The previous structural interpretations have suggested the possibility of a major synformal fold along the axis of the ridge with mineralization concentrated in the core, however this was never tested by drilling and has not been established. Exploration has reached the stage where a more robust structural model is required prior to any further drilling. A new focus on the structural geology of the prospect was viewed as a necessary step to target the next round of drilling and successfully advance the project. This current project is based on a new, short field program to investigate the structure of the prospect and integrate all of the previous exploration data into a new geological model.

1.2. Objectives

The objectives of this project are to:

- Produce a new structural map of Varden Ridge
- Prepare a GIS map database to allow an accurate and flexible integration of all the previous, new and future data.
- Generate a robust structural model for the prospect
- Identify target areas for drilling

1.3. Field Program

A 12 day field program was undertaken by a two man camp during June 2004 to investigate the structure of the Varden Ridge prospect covering the PL blocks shown in GIS database (reference Varden Ridge Land Position Mutinger Varden 1-6 ST, Group, Inc & Geoloiske Tjenester A/S). Approximately 30% of the ground was snow covered although the main ridge area was relatively well exposed.

A newly commissioned ortho-corrected colour aerial photo base map and corresponding topographic data were prepared for the field program. Earlier mapping was located on a local pegged grid which has largely disappeared on the ground. A Garmin Summit GPS system was used for field locations and the structural orientation data has been recorded using a magnetic variation of 7 degrees east of Grid North. The field locations and all map information are projected onto a common a grid system based on WGS 84 Zone 33.

A small 8'x 5' mobile work hut was deployed by helicopter for the duration of the field program at a base camp at the northern end of the ridge.

1.4. Data

New field data

Structural, lithological, alteration and mineralization data was recorded at 331 locations. This data is compiled in a digital spreadsheet (Enclosures and CD) and analyzed in the ArcView map database. A number of rock samples were collected and sliced for inspection of fabrics and lithology.

The structural data includes, mineralized vein orientations, silica structures, shear structures, bedding, cleavage and fold orientations.

Aerial photo and topographic data

An orthocorrected colour aerial photograph mosaic was prepared for the new field program. This is in digital from and has been used as the main base and projection for the mapping and compilation of the previous exploration data.

Previous exploration data

Geology

The geological mapping of 1985 (Report No. 85-67-47) recognized the mineralized area of Varden Ridge to comprise a variety of metasediment rock types which were dominated by greywacke sediments with several horizons of multiple thin units of black shales and carbonates as well as thick sand units. West of the main ridge the rocks are dominated by green mafic volcanoclastic sediments and possibly tuffs with only a few weak mineral occurrences. The eastern part of the greywacke sequence is intruded by a large tabular granite, the Rombaken Granite and marks the eastern limit of the mineral zone. The 1988-89 report (Report No 89-26-01 & Map 1:5,000 1988) divided the rocks on Varden Ridge into four main formations or mapping units although the stratigraphic sequence was uncertain. The direction of younging was dominantly westwards. The 1985 report interpreted the green, unaltered, mafic volcanoclastics west of the main prospect as the part of the oldest sequence overlain by the greywacke sediments (refer to Fig 15, 1985 report),

The current mapping is based on a series of E-W traverses and has recorded the principal rock assemblages in 10 different categories and distinguishes the main sand dominated greywacke sequences as map units (Map. 7, this report). The younging directions are consistently west and indicate that the Varden Ridge greywacke package is a west younging, upward facing sequence with only local overturning on mesoscopic folds which complies more with the stratigraphic interpretation shown in Fig 5b in Report No 89-26-01.

Mineralization and geochemistry

The previous base metal and gold surface sampling data have been digitized from 1:5,000 scale Haugfjellet- Rock Geochemistry and incorporated in the GIS database. The selected samples (1988 program) are compiled in file 8488.dbf. The two sets of data are:

1. Rock chip samples updated 1988
2. Surface geochemical traverses

The zinc anomalies have been plotted on the final maps. All the other elements can be viewed in map form in Arc View.

All occurrences of sulphide and mineralized veins from the new field mapping are recorded in the database.

Geophysics

The combined magnetic and EM survey results from 1984 have been digitized from an overlay map and incorporated in the GIS database.

Drill hole data

The collar drill hole locations for the two rounds of drilling are included in the GIS database.

1.5. GIS Analysis

All of the above data have been compiled in ArcView 3.2 Geographic Information System (GIS) to integrate and spatially analyze the information towards developing an exploration model and targets.

Each data set or theme, either data or image file, is represented as an Arc View table (spreadsheet) and shape file (map view).

The analysis of the data and main results of the project are summarised in a series of ten maps as individual ArcView layouts. Each map integrates a different combination and display of the exploration data. These maps are a sample of the large range of maps that can be generated from the database.

2. Geological Setting of the Mineralization : Results of the mapping

2.1. Host rocks

The host rock package to the mineralization is a clastic sedimentary sequence dominated by silty turbidites with some thick sandy mass-flow beds and numerous shale and thin carbonate units (see Photos 5,6,7 & 8). According to an earlier petrographic study these sediments are largely derived from a volcanic source although the location of the source is not defined (Ref *). The mineralized stratigraphy has several fining upward sequences although the packages are difficult to correlate between the traverses in part due to internal shears, attenuation and disruption of the beds.

The sequence dips steeply to the west and appears to young consistently to the west suggesting there is a continuous stratigraphy **with no major fold closure**. The eastern and lower part of the sequence has several massively bedded sandstone units whilst the central area and main host rock type is dominantly siltstone (Map 7). The youngest, unaltered, unsilicified and less deformed sequence on the western flanks of the ridge (the Ovrevatn Formation) is hangingwall to the main sulphide zone and consists of unaltered green, mafic volcanoclastic turbidites with possibly some basic intrusive sills. These latter rocks are stratigraphically older than the main host rocks.

Some of the sulphide zones are clearly pyritic or pyhrotitic shales of probable sedimentary or diagenetic origin. These sulphide zones do however vary greatly in thickness along strike, frequently die out and commonly transgress bedding indicating either significant late tectonic modification or possibly a syntectonic in origin (refer to models in **Section 3**)

The thin carbonate units are generally disrupted, either due to possible soft sediment deformation (Photo 10) or tectonic deformation i.e. shearing and attenuation within shales.

The overall architecture of the sedimentary basin or sediment prism is not clear.

2.2. Silicification

A major feature of Varden Ridge is the extensive silicification of the sediments that appears to be an early phase of the hydrothermal mineral system (Map 8). The large area of silicification focused along the main ridge probably is probably an indication of the scale the large hydrothermal system >3km long and 750m wide associated with the base metal occurrences, although there is no proven link. It has been suggested that this silicified zone may represent a feeder system to a sedex type deposit (St Group 2002), however strong veining and breccia type zones are exposed extensively at surface which would require the system to be inverted, which is not compatible with the right way up sequence.

The dominant silica type is a gray to black fine-grained silica and varies in style from replacement of beds to well defined zones or veins parallel to and cross-cutting bedding (Photo 9). Silicification also follows the main shear, cleavage planes and mineral vein directions (Photo 4) suggesting that the event is syn-tectonic w.r.t. the main shear event. **Moreover, cross-cutting silica zones are steep dipping in all orientations suggesting that they perhaps formed during or after the beds were**

steepened. In places there is a high density of silica zones resulting in a 'breccia' style texture which had been noted in the earlier mapping.

The main trends of the silica veins and the interpreted extent of silica zone are shown in Fig 8. Map 8 (CD enclosure and GIS data). There is a relatively sharp boundary on the western margin of the silica zone with the mafic volcanoclastics having only a few isolated silica veins. In contrast the central area of the ridge is extensively silicified for large areas. All silica veins are steep, west dipping and appear to form several sets both sub-parallel and oblique to the N-S trend of the ridge and bedding. In the northern part of the ridge a significant NE trending set of veins develop which cross-cut bedding whilst at the southern end of the ridge a NW set of cross-cutting veins are present. These structural trends may reflect the geometry of the mineralization?

More sparse younger white quartz veins are associated with some of the discrete shears.

2.3. Structure

The structure of Varden Ridge is a steep, west dipping sequence of sediments which are cut by a series of steep, northerly trending anastomosing shear structures (Fig 2 & Fig. 11). Where the younging direction of the beds is unequivocal (turbidite units, graded beds, cross-beds and load structures) they show a consistent west younging direction indicating **a continuous right way up sequence with no major fold structure**. The sequence of mafic volcano-clastics to the west of the ridge is also westward younging and stratigraphically and structurally overlies the mineralized sequence.

There are three main shears in the central area that may be related to concentrations of discordant zinc mineralization. These are shown in Fig 2, Map 2 and the cross-section Figure 11.

The main ridge area is typified by wide zones of strong cleavage with a steep northwest to west plunging linear stretching fabric. In contrast, the mafic hangingwall sediments west of Varden Ridge are much less deformed and are largely uncleaved and unsilicified.

There does not appear to be a strong Caledonian thrust overprint at Varden Ridge within the Rombaken Window.

Bedding

The trace of the bedding (Fig 2) and the main mapping units (Fig 7) show a deformed anastomosing pattern which is the result of shearing sub-parallel the strike. The central ridge area shows the most heterogeneous pattern with very deformed zones of sheared out bedding separated by relatively undeformed areas. At the southern end of the ridge the bedding trends and units converge. This pattern of bedding deformation is very similar to that in the Cobar ore field.

Cleavage

The pattern of cleavage fabric is shown in Fig 4 (Map 4). Cleavage is generally steep to moderate west dipping, and dominantly NNE trending, locally very strong and commonly clockwise to the strike of the beds. In contrast the cleavage is only weakly developed or absent west of the main ridge highlighting a strong spatial association between the mineralized area and shear formation. The nature of the obliquity of the

cleavage to bedding suggests the cleavage is superimposed on already steeply dipping beds i.e. the beds were rotated into a steep attitude prior to the penetrative cleavage formation. This is very typical of high level deformation of sedimentary sequences which commonly have little or no cleavage associated with bed rotation associated with young inversion. The alternative interpretation for this geometrical and timing relationship at Varden Ridge is for it to represent the limb of downward facing recumbent fold which is possible but unlikely.

The overall regime is a compressional with the cleavage, stretching direction and minor shears indicating a NW compression with a variable oblique shear component on the northerly trending structures. N-S trending minor shears indicate a mainly sinistral sense of movement with a consistent dextral sense of shear for the NNE set.

The structure in the southern part Varden Ridge has a major WNW trending transverse structure which has had a control on the main ductile deformation and is probably early and contemporaneous with main mineralization event.

Shears and folds

The shears have several sub-trends of NNW and NNE which form an anastomosing network enclosing low strain lenses and several shear related en echelon open folds e.g. North Fold and Central Fold. These internal folds which are developed along the axial zone of the ridge are interpreted as forming during reverse shear and represent compressed blocks of lower strain between the main shears (Fig 2. Map 2).

These folds are non-cylindrical with variable style and plunge along their length and also are truncated by the shear structures.

2.4. Mineralization

Mineralization appears to be of two styles.

1. Disseminated massive sulphide chiefly pyrite +/- pyrhotite and possibly base metals both stratabound and transgressional to bedding.
2. Course Zn-Pb rich veins with significant concentrations of Au and Ag.

Type 1. Low grade sulphide

The distribution of massive sulphides is shown in Fig 5 (Map 5). There are multiple bed-parallel horizons of disseminated sulphides across the main sequence largely in the siltstones and some of the thicker shale beds. These sulphide zones are discontinuous and commonly pinch and swell with more sulphide often concentrated in higher strain rocks. These 'stratiform' sulphides are predominantly pyrite but do contain minor base metals (from previous sampling). The sulphide rich zones are predominantly in the central and west areas of Varden Ridge and not in the more sandstone dominated lower sequences although there are some horizons west of the Rombaken Granite.

The low-grade sulphide mineralization is associated with the central and western part of the structural zone and may be largely bed controlled- albeit discontinuous- in siltstones and occasional shales. The grades and distribution of the base metal content is very uncertain.

Type 2. High Grade Base Metal

The distribution of the high grade Zn and Pb is not clear at present. The conspicuous coarse mineralized vein zones do not obviously relate to the general high pyrite rich sulphide zones and appear to be more concentrated within shears. The veins are generally steep west dipping and sub-parallel to the cleavage or bedding. The higher grade zinc may be concentrated along the central shears within the permeable siltstone host (Map 5)

The overall geometry of the higher grade base metal lenses is still very uncertain although the higher grade zinc at surface is associated with steep structures and in the central area of the silicification.

The higher grade structures suggest that the potentially economic ore bodies are steep dipping and may be discordant to the bedding. A true scale cross-section of the northern are illustrates the interpreted structural style from the field data and the possible Zn rich lenses (Fig. 11). The structural style and strain symmetry (stretching direction) would suggest that they may be short strike length, or discontinuous in strike along a zone, with a steep north of north pitch possibly similar to the Cobar systems.

3. Structural models for the deposit

The structural regime and local architecture of Varden Ridge is the product of one oblique compressional deformation which has resulted in a steep dipping sequence with a central zone of heterogeneous of strong cleavage, internal shear network and silicification along a north-south trend. This heterogeneous and focused shearing is typical of zones of ductile fault inversion generally along basin margins. These zones are areas of reverse faulting, hangingwall folds, steeply rotated sequences with local shear related internal folds. A key feature of these zones is also a focusing of fluids either from basement along active faults or from the basin interior.

The CSA Zn-Pb-Cu mine near Cobar in NSW is a good analogue for Varden Ridge and is briefly summarized below:

The Cobar Model

The Cobar mineralization shows the following key characteristics:

- High grade base metal and precious metals are hosted in a sequence of turbidites and sandstones along a basin margin.
- The mineralization occurred early in the basin history during inversion of the basin margin prior to the final post-rift phase.
- A thick zone of semi-stratiform pyrhotite mineralization occurs during the early part of the basin history but is overprinted by base and precious metals. An 'early inversion ' stage in Fig 13 is the probable environment for this early mineralization.
- A progressive paragenesis of Pb → Zn→Cu →Au metals mineralize the sediments through time during inversion and deformation of the basin sediments. A series of different types of base metal and base metal –gold deposits form along the basin margin although they are all formed within the same structural environment and time phase. Deposits from north to south vary from Pb-Zn-Ag (Elura Mine), Zn-Pb–Cu (CSA Mine), Cu (Great Cobar Mine and others), Cu-Au –Zn-Pb (Peak), Cu-Au (New Cobar-Chesney- New Occidental-Queen Bee Mines)
- Inversion of the basin margin results in a zone of locally steep dipping and sheared sediments that are the focus of mineralization. The steep shear zones and penetrative cleavage are associated with compressional faulting reactivating early extensional faults (fault inversion) (Fig 15).
- The deposits are controlled by steep, cross-cutting ductile – brittle shear zones that initiate early in the diagensis of the sediments. The early stages of the shear zones are associated with an extensive replacement of the sediments, prior to the precipitation of metals (Fig 14).

Features of Varden Ridge compared to the Cobar Deposits and Sullivan Group Deposits

Feature	Varden Ridge	Cobar Deposits	Sullivan Deposits
Host sediments are greywackes	√ Post-rift ?	√ Post-rift	√ But in syn-rift, Turner et al.
Host sediments steeply dipping, cleaved and sheared	√	√	Argued to be sea-floor exhalative
Focused strain and uncleaved sediments in the regional hanging wall	√ Appears to be	√	Ore process not related to inversion
Pervasive silicification, bed parallel and cross-cutting	√	√	Not dominant feature
Irregular ore zones sub-parallel to beds but cross cutting (epigenetic)	√	√	Dominantly stratabound -sedex
Zn-Pb-Cu-Au assemblage and progressive paragenesis	√ present but paragenesis uncertain	√	No precious metals
Steep ore zones	Strongly suggested	√	Present at Stemwinder
Extensive early Pyrhotite & Pyrite	√	√	√

4. Target Generation and Exploration issues

Fig 9 and Map 9 is a summary target generation map.

4.1. Key issues

The most crucial unknown at Varden Ridge is the structural geometry of the high-grade mineralization. The results of this mapping and analysis suggest that the structure and mineralization has a geometry illustrated in the section in Figure 11. The following are the important points of note:

- The high-grade base metal mineralization is probably steep zones of irregular veins or replacement that are associated with higher strain zones. The surface expression of the higher grade sulphides may not be representative of the down plunge mineralization- note in the Cobar region the CSA mine and all the subordinate ore-bodies at Elura and the Peak Mine have either very weak mineralization at surface or are blind.
- There appear to be several discontinuous lenticular zones of sulphides between 20 to 100m wide which have indications of concentrations of higher grade base metals at surface and constitute general areas of interest (Fig 9, Map 9). The surface structure would suggest that internal to the zones the high-grade lenses are discontinuous and probably en echelon and therefore drill holes through the zones may show either good or poor intersections within a potentially economic zone.
- The center of the silica system and of Varden Ridge is almost certainly the center of the hydrothermal system and probably has the best potential as opposed to the outer zones (e.g. West Zone) and the northern area.
- The higher grade mineralization may be concentrated within specific shears or on the margins of the silicified zones within sheared zones. These are more focused target areas.
- The interaction of the transverse and main N-S shears may have focused the discordant mineralization in the southern region of Varden Ridge and this area may have the best potential.

4.2. Recommended Drill Holes

A series of diamond core recovery drill holes are recommended to test the most prospective zones. It is recommended that these holes are both surveyed down hole and the core oriented to test the down hole structure.

The positions of the holes are located on the exploration summary Map 9. The locations are also shown on the topographic base (Map 11).

The holes are all base on intersecting steep west dipping zones of mineralization and should be drill at relatively shallow angles towards the east. The suggested end of hole positions are shown on the map based on a 60 degree hole.

4.3. Proposed Drill Hole Summary

Drill Hole	Target	Comments
401	To test the down-dip continuation of the upper part of the central zone and the east zone	This hole is testing the down dip of the surface mineralization in two zones with proven high grade zinc. Previous drilling DDH 8801 and DDH 8802 may have only just intersected the central zone.
402	To test the down dip continuation of the central at the northern most extent of high grade surface samples.	Previous drilling DDH 9501 and DDH 9502 were too short to intersect this zone.
403	To test two narrow surface zones which are possible continuations of central and eastern zones.	These zones in this central area have not been tested in the past.
404	To test this multiple and widest zone of disseminated sulphide	This zone does have some high Zn values and several internal shears but seems to die out rapidly north and south. However if mineral lenses are steeply plunging then this zone is very comparable to the surface lenses at CSA mine (Fig. 16)
405	To test an eastern zone with some high surface Zn values	This is a narrow zone which has uncertain strike length.
406	To test the southern zone which is within a general sulphide area.	This appears to be an intersection of two trends of shears and is very enigmatic structurally.

5. Conclusions and recommendations

This study brings together most of the exploration data collected over several decades and with new ground based mapping outlines a structural framework and possible setting for Varden Ridge base metal mineralization.

The high grade zinc and lead mineralization appears to be epigenetic and emplaced during deformation along a series of steep structures sub-parallel to bedding along a strike-length of more than 3km.

The mineralized corridor on Varden Ridge is characterized by heterogeneously sheared sediments in contrast to the less deformed un-mineralized rocks west of the ridge. This argues strongly for a shear control for the mineralization.

The structural study concludes that mineralization is within a continuous sequence of west younging greywackes with a central zone of highly non-cylindrical internal folds developed which are typical of fault/shear related folds.

The high-grade mineralization appears to be focused along these types of steep dipping shears and the central zone of Varden Ridge is most likely the core of the system and has the best potential for an economic deposit. The closest analogue known for this style of mineralization in a similar tectonic setting is the Cobar Group of deposits in Australia, in particular the CSA Mine.

5.1. Risk and uncertainty

There are a number of unknowns regarding the Varden Ridge Prospect:

- There is virtually no sub-surface data apart from a few shallow drill holes to confirm the regional structure and sub-surface geometry of the ore zones. This obviously opens up great potential as very little has been tested but it presents a challenge to define economic zones.
- The continuity of the high grade mineralization is difficult to predict and can only really be understood by drilling. The plunge of the main linear fabric is steep north but its is not certain if this is reflected by the plunge mineralised lenses.
- There are clearly multiple zones of mineralization containing some very high grade samples across a 750m wide zone along a 3km strike length which suggests a large system although there is no clear single core concentration at surface level. Defining a core concentration at depth from surface structure is very difficult given the non-continuous style of mineralization.

5.2. Recommendations

1. A series of single drill holes are suggested in this report. To test any one zone adequately a fence line or fan of holes would be required, depending upon the results of the single holes.
2. The list of recommended drill holes have not been prioritised and the total meters have not. The Central Zone is considered to be the most prospective and 401,402 and 403 are recommended as the first holes.
3. This report attempts to outline a number of potentially mineralised zones by extrapolating structures between traverses and attempting to correlate sporadic anomalous base metal samples. There surface sampling is too sparse to

confidently define 'mineralised' zones, in particular any continuity of low grade base metal zones that may be associated with general sulphide-rich zones which may be economic at depth. A detailed surface sample program in this very well exposed ground would clarify the linkage of the zones and pattern of grade variations.

4. The regional geological context of Varden Ridge is not clear and very little research has been done on the Proterozoic of the Rombaken Window. An understanding of the architecture and history of the basin would provide much better constraint on the setting and genesis of the mineralization.

6. Acknowledgements

Tom Robyn for his useful discussion during the project

Trond Blomlie for organizing the field logistics.

Trond Brrdstø and dog for their assistance and safety in the field and their great company.

Boye Flood for providing data to the project.

7. References

CSA Geology. 1996. J. Mc Dermott, C. Smith & Je. Jeffrey. In The Cobar Mineral Field- A 1996 Perspective. Ed Cook, Ford, McDermott, Standish, Stegman and Stegman. AUSSIMM.

The Cobar Gold Field – A Geological Perspective.1996. C.L. Stegman & J.A. Peacock . In The Cobar Mineral Field- A 1996 Perspective. Ed Cook, Ford, McDermott, Standish, Stegman and Stegman. AUSSIMM.

The geological Environment of the Sullivan Deposit, British Columbia. 2000. Ed J. W. Lydon, T. Hoy, J Slack % M E.Knapp. Sp Pub. No 1. Geological Association of Canada. Mineral Deposits Division. Collection of papers.

Company Reports on Varden Ridge

Report No. 84-67-40: Ground geophysical work, Rombak project, 1984, Per Abildgaard, Dec 10, 1984

Report No. 84-670-27: Preliminary geophysical report, DIGHEM survey, Rombak project, Norway, May, 1984

Report No. 85-67-47: The Rombaken Project Area, North Norway, summary of work done 1984, Boye Flood, March, 1985

Report No 89-26-01 : Exploration for massive sulphides and gold at Varden Ridge and Haugfjellet, Rombaken Project, North Norway, 1988. Geologiske Jenester A.S.

Report No. 89-28-01: Sampling for gold at Varden East and Hundalsbotn, the Rombaken project, North Norway, 1989

Varden Ridge Drilling Proposal, Rombaken Lower Proterozoic Sedex Prospect, Northern Norway, March 8, 2002, T. Robyn

Map: Narvik 1431 IV, 1:50,000 scale topographic map

Map: Haugfjellet geological map, 1:20,000 scale, January, 1985

Map: DIGHEM enhanced magnetics, 1:20,000 scale, covering Haugfjellet and northern Klubbdalen

Map: Haugfjellet geophysical anomaly map, 1:5,000 scale covering Varden Ridge, Per Abildgaard, 1984

Map: Varden Ridge geology, 1:5,000 scale, November, 1988

Map: Haugfjellet – Rock geochemistry, selected samples, 1:5,000 scale, December, 1984 updated December, 1988

Map: Geology of Haugfjellet (Varden Ridge), 1:5,000 scale, December, 1984, mapping by Jim Bielak and Bjorn Thomassen

Appendix 1 Figures

Figure 1. Field locations and topographic-photo base for Varden Ridge (Map 1)

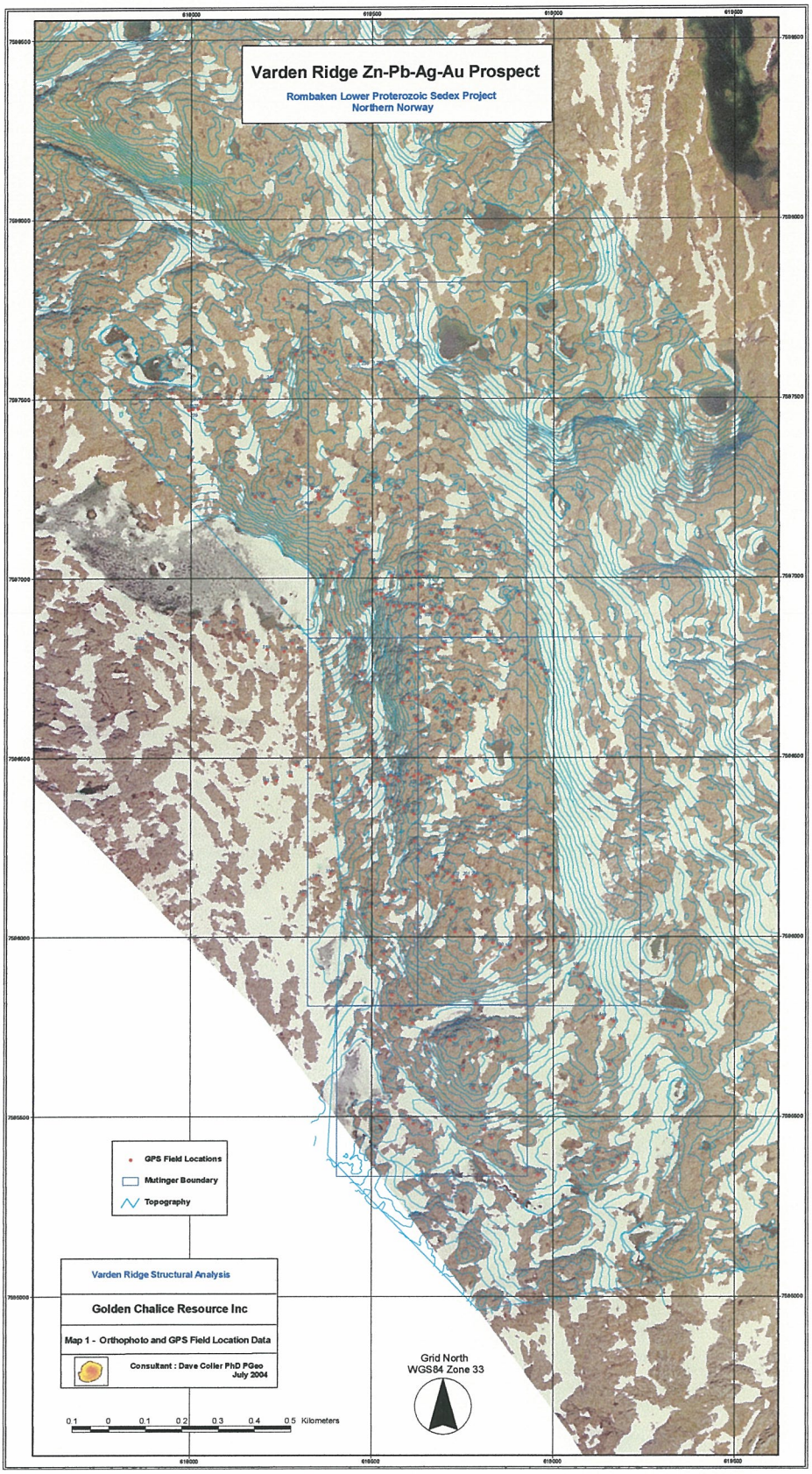


Figure 2. Bedding and main silicification (Map 2)

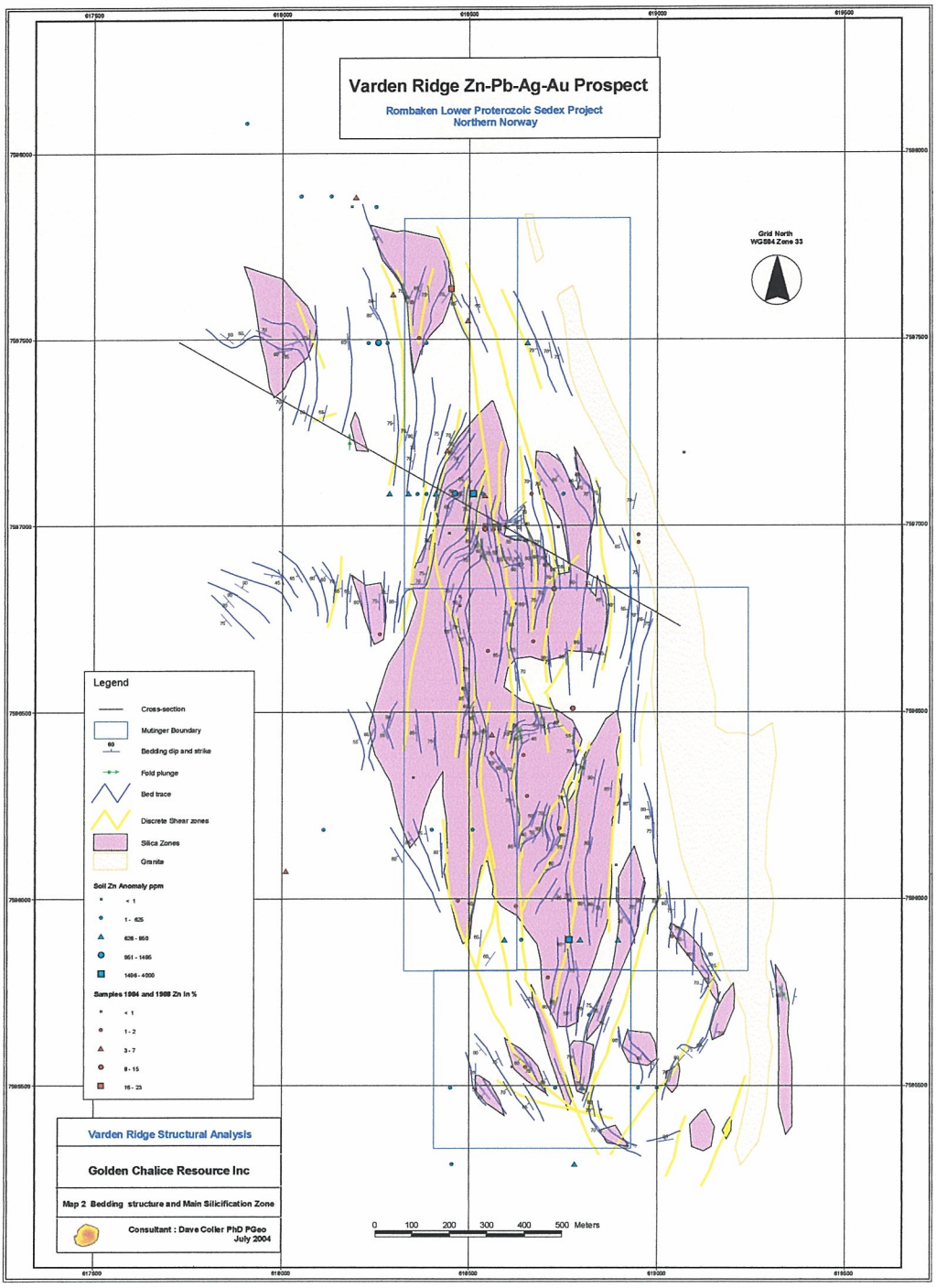


Figure 3. Strain map and shear zones (Map 3)

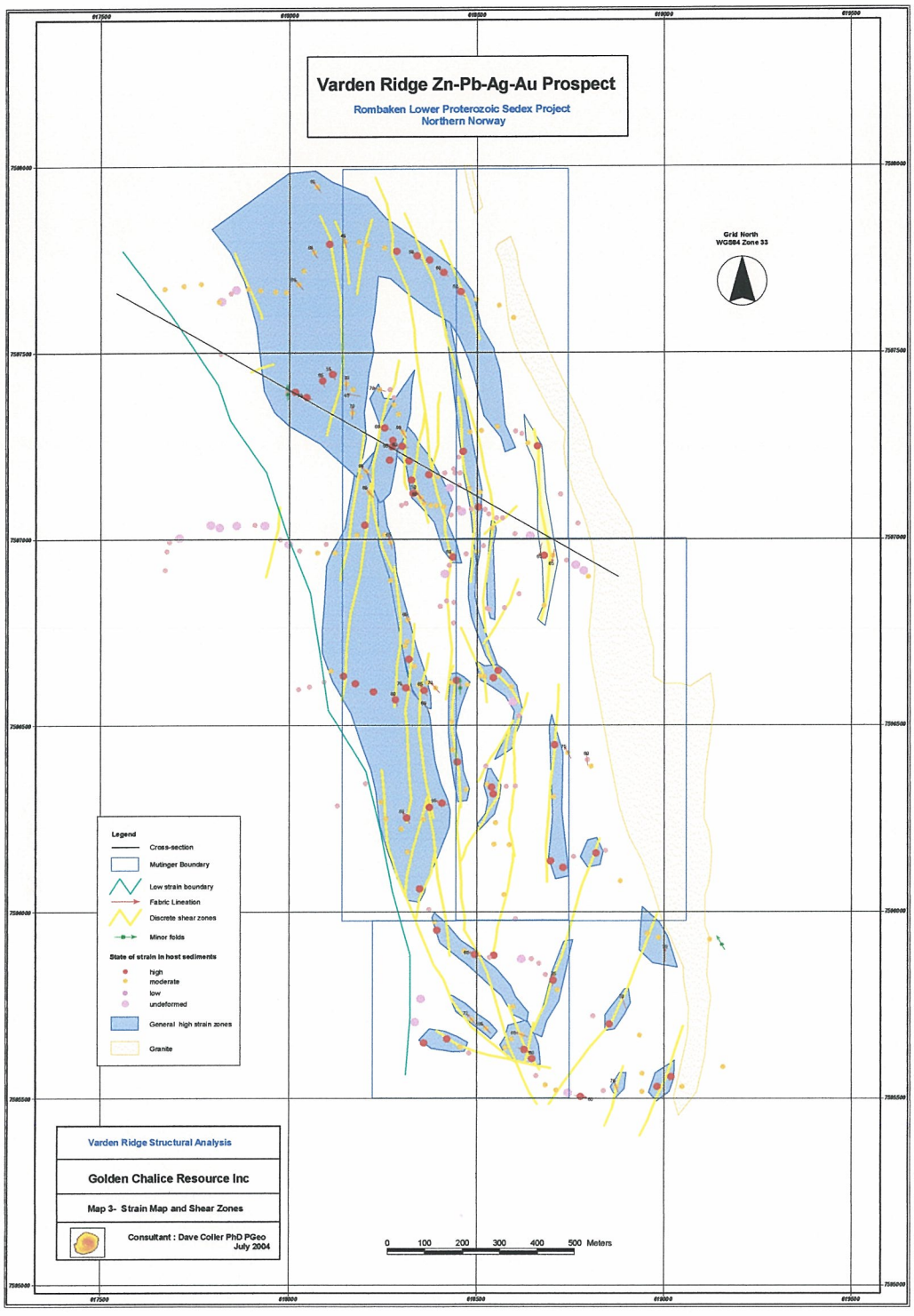


Figure 4. Cleavage Map on zone of silification (Map 4)

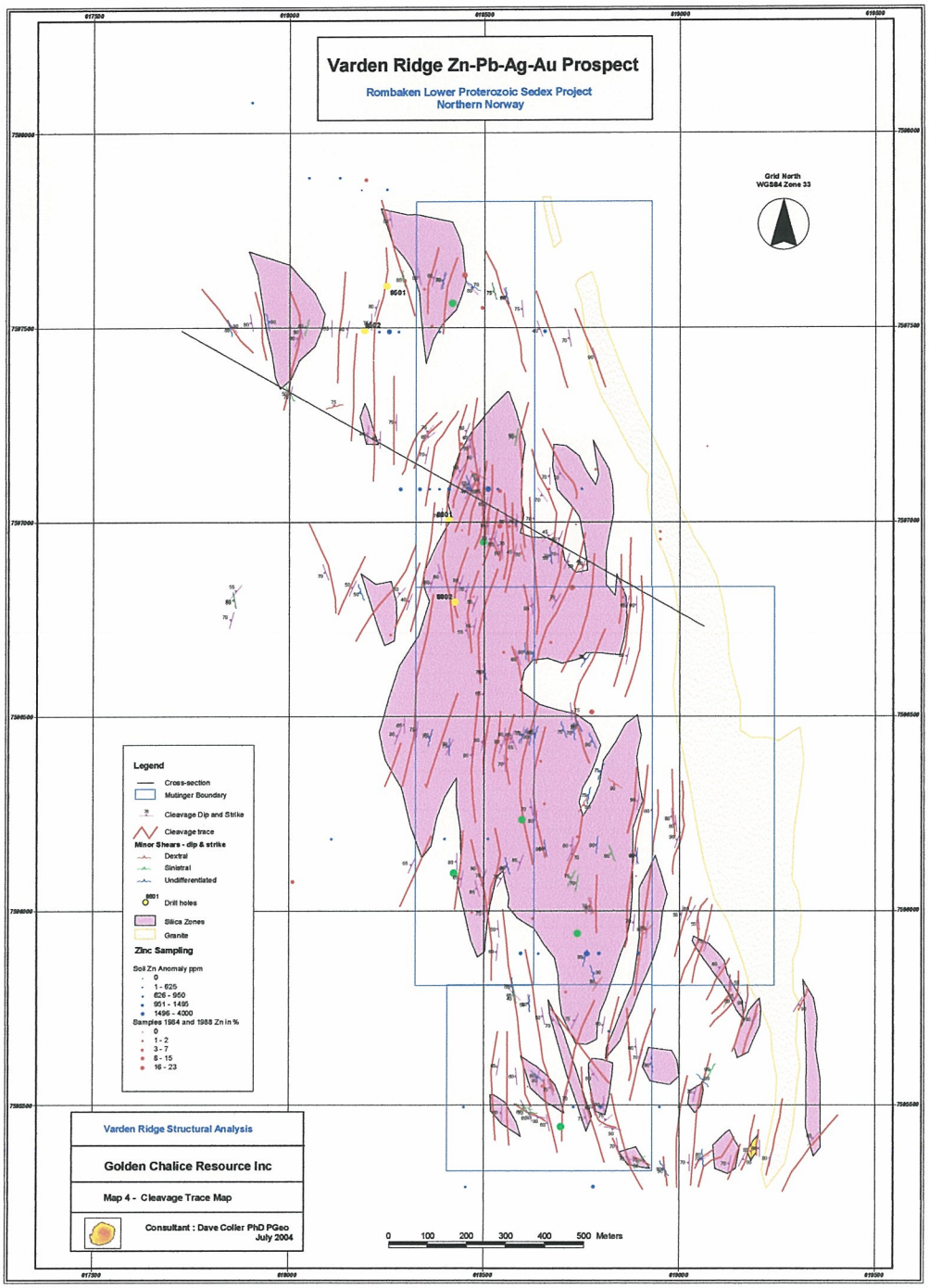


Figure 5. Mineralization Map (Map 5)

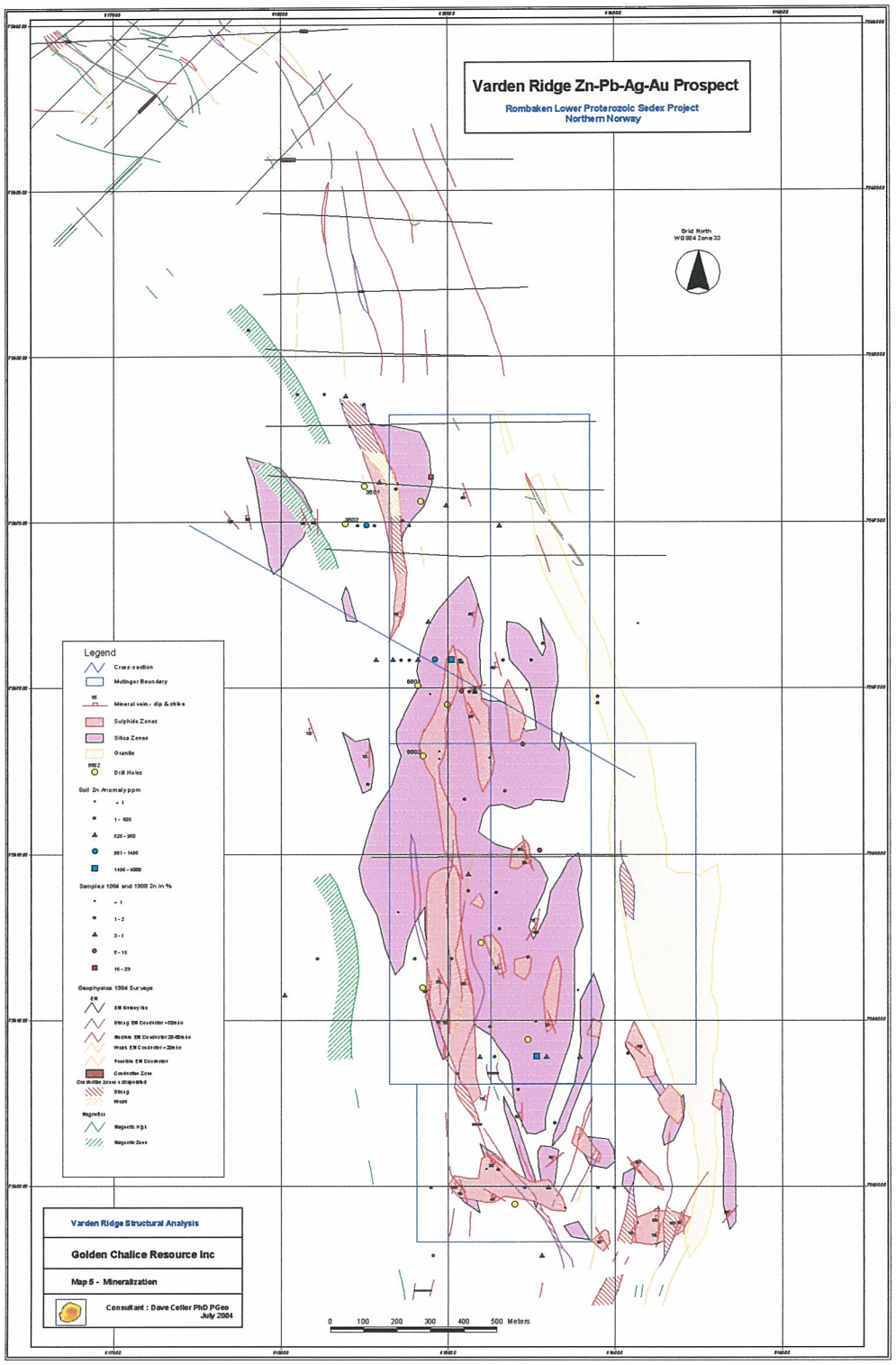


Figure 6. Classification of deformation of the sediments (Map 6)

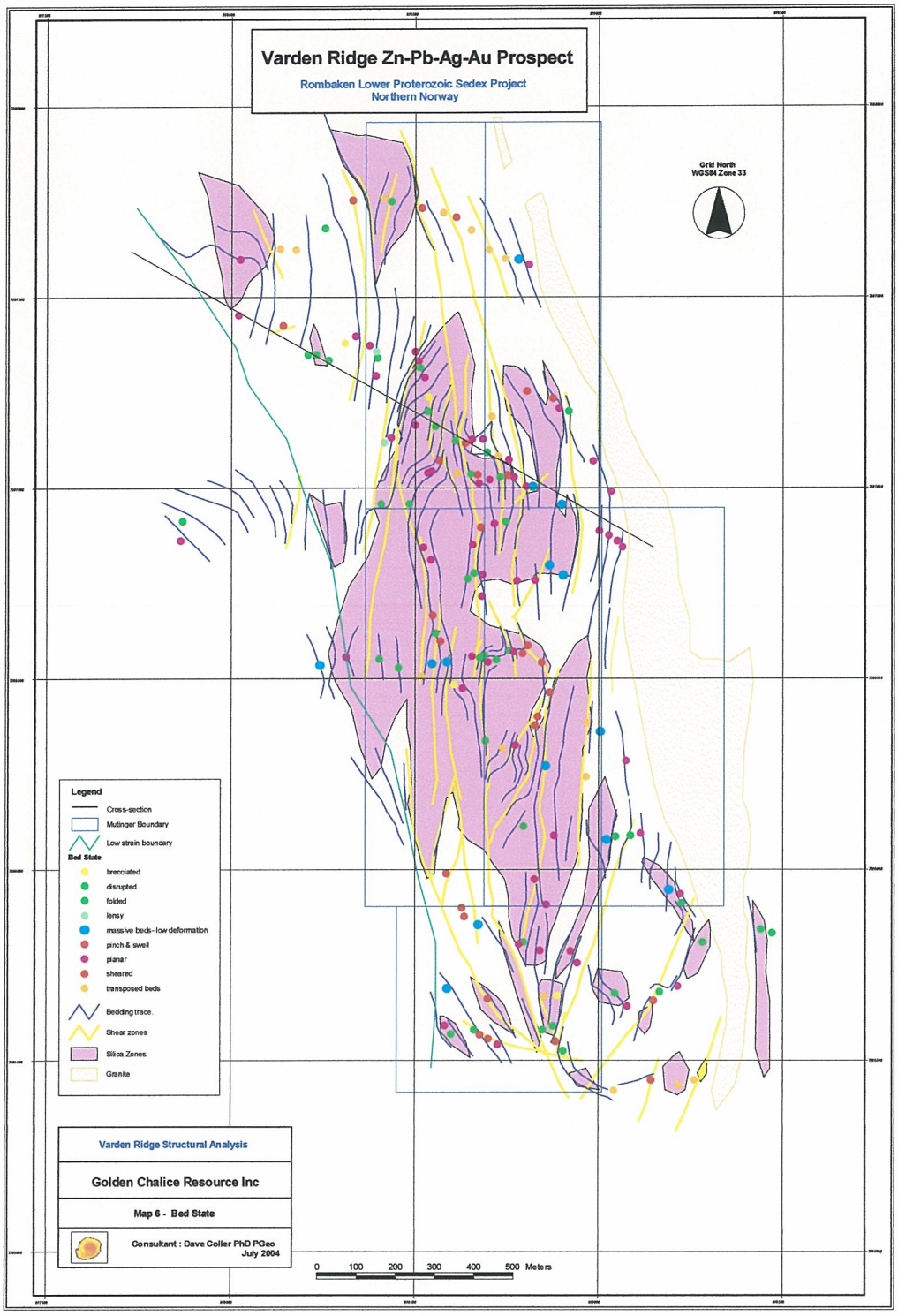


Figure 7. Major sandstone units and bedding trace (Map 7)

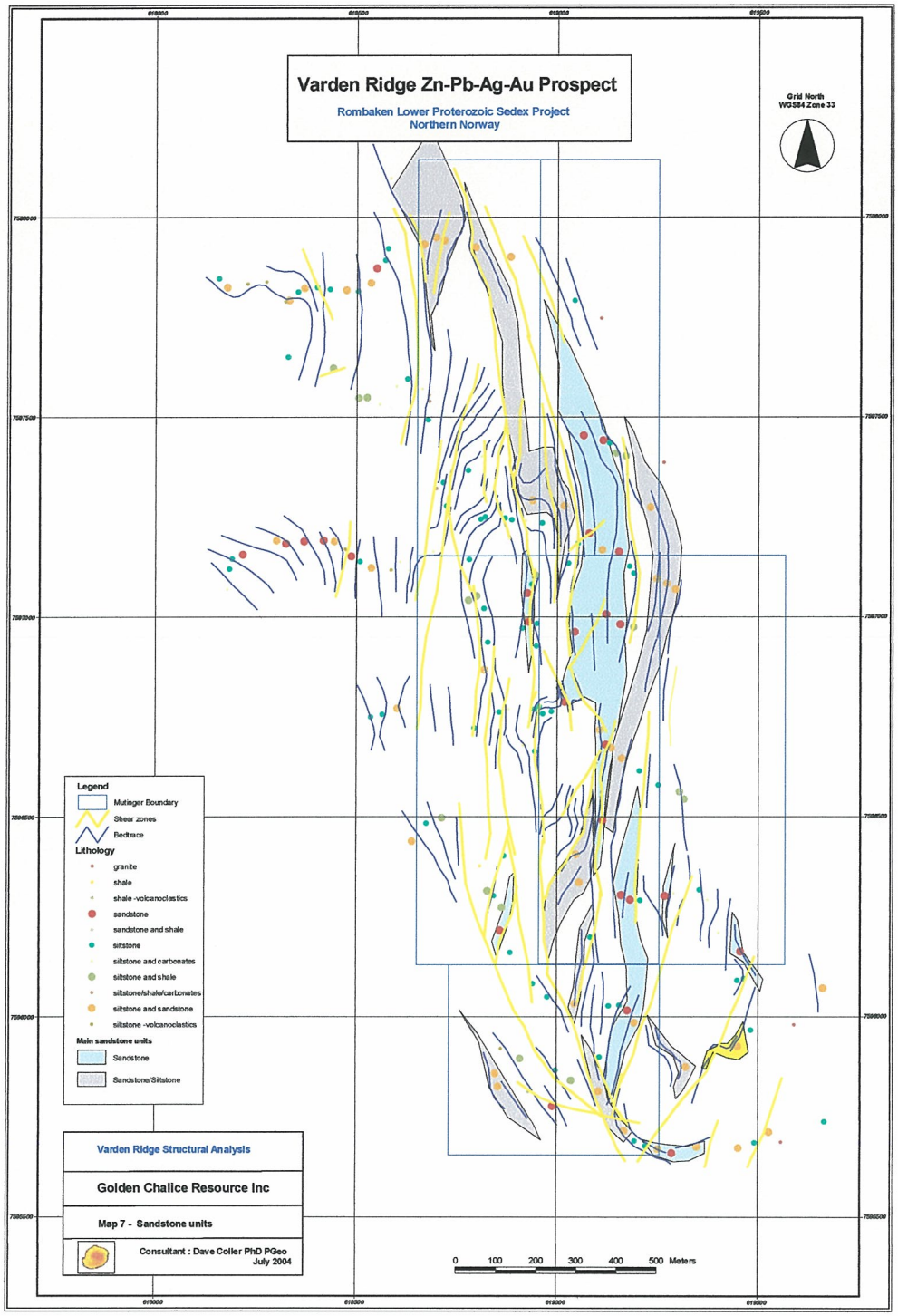


Figure 8. Summary of silicification (Map 8)

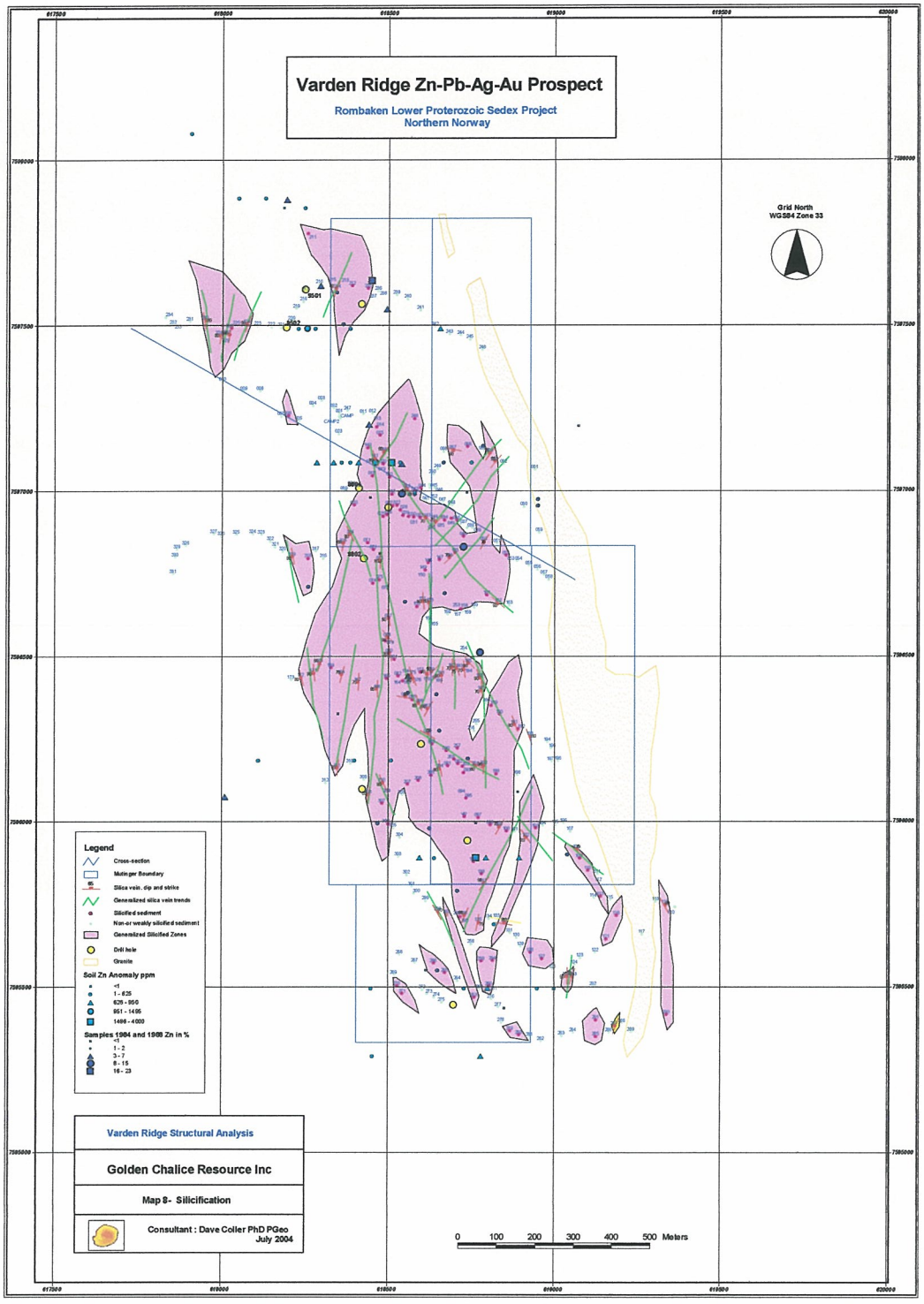


Figure 9. Exploration Summary (Map 9)

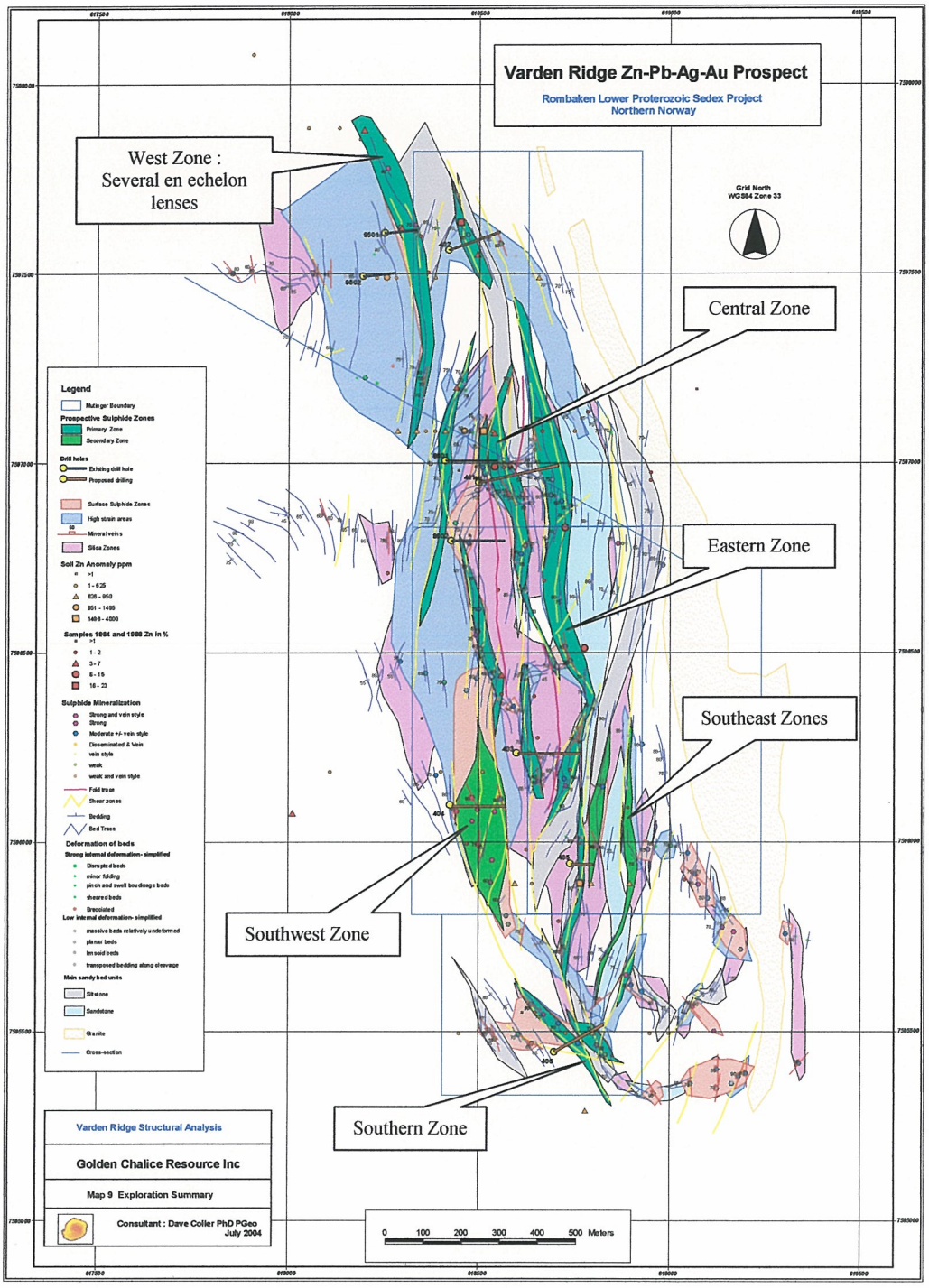


Figure 10. Drill base map (Map 10)

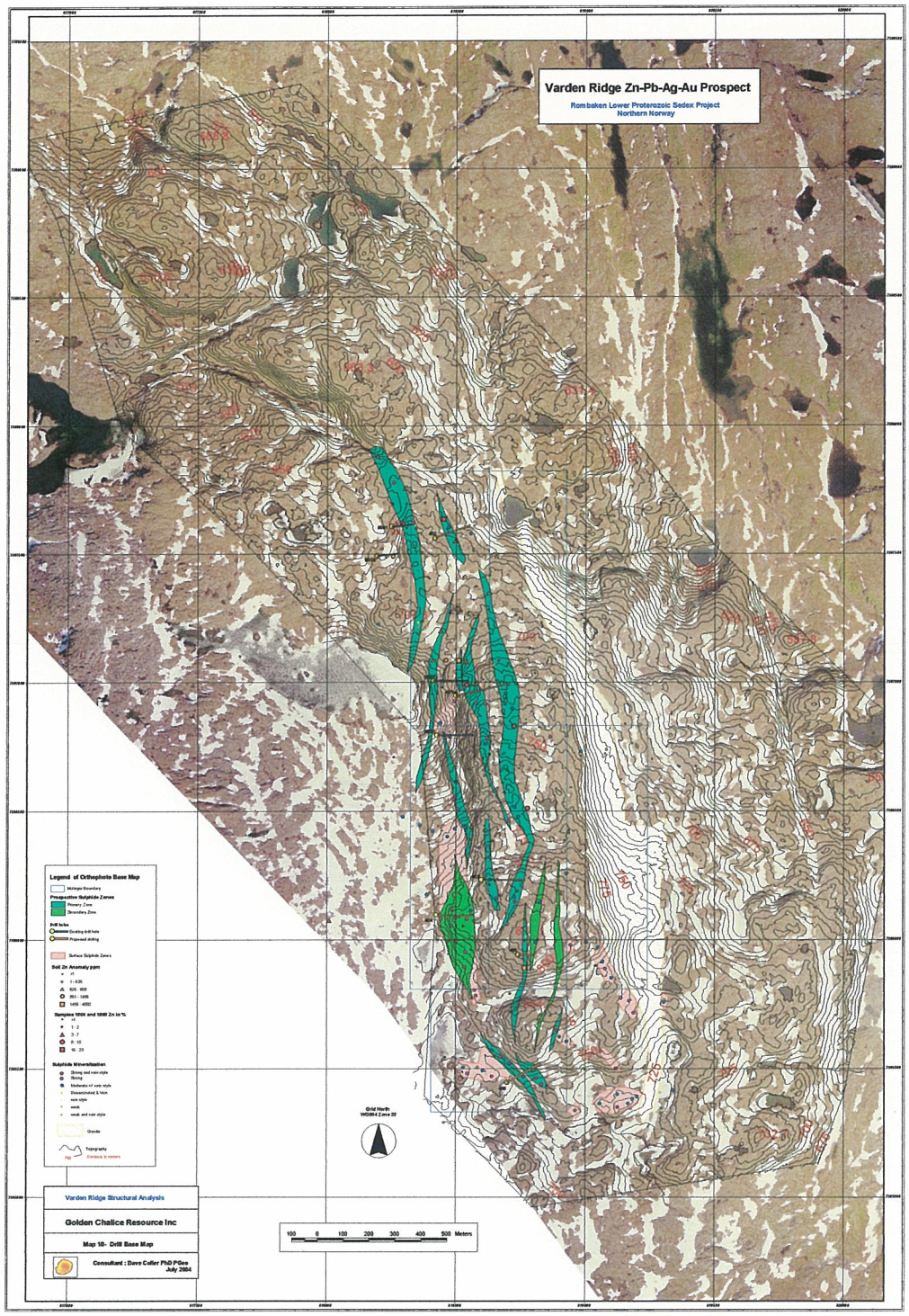
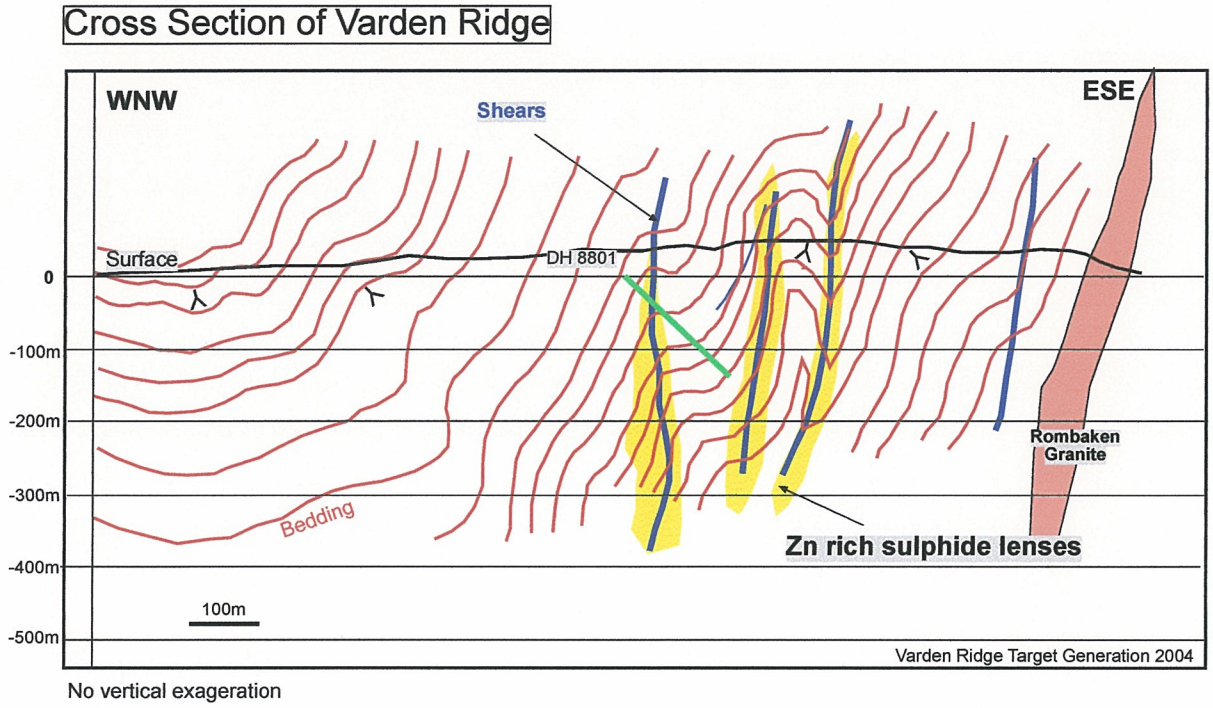


Figure 11. Cross-section of Varden Ridge.

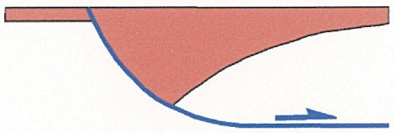


No vertical exageration

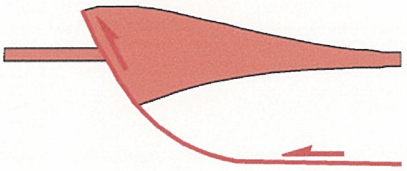
Figure 12

Structures associated with inversion.

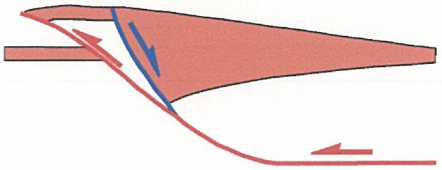
A. Extensional half-graben with syn-rift deposition



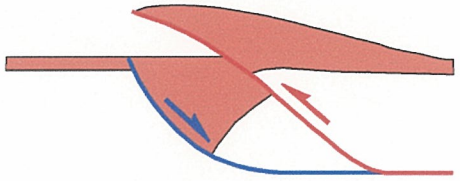
B. Simple inversion of syn-rift basin



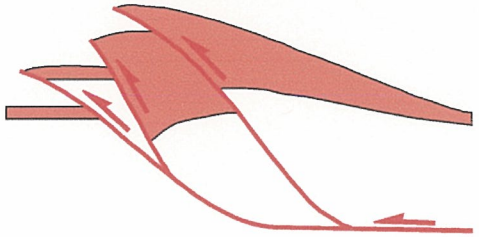
C. Footwall shortcut fault



D. Hangingwall bypass fault



E. Footwall shortcut and hangingwall bypass faults



(After McClay, 1994)

Figure 13. Sketch sections of a simplified model sequence of extension and inversion along a sedimentary basin margin

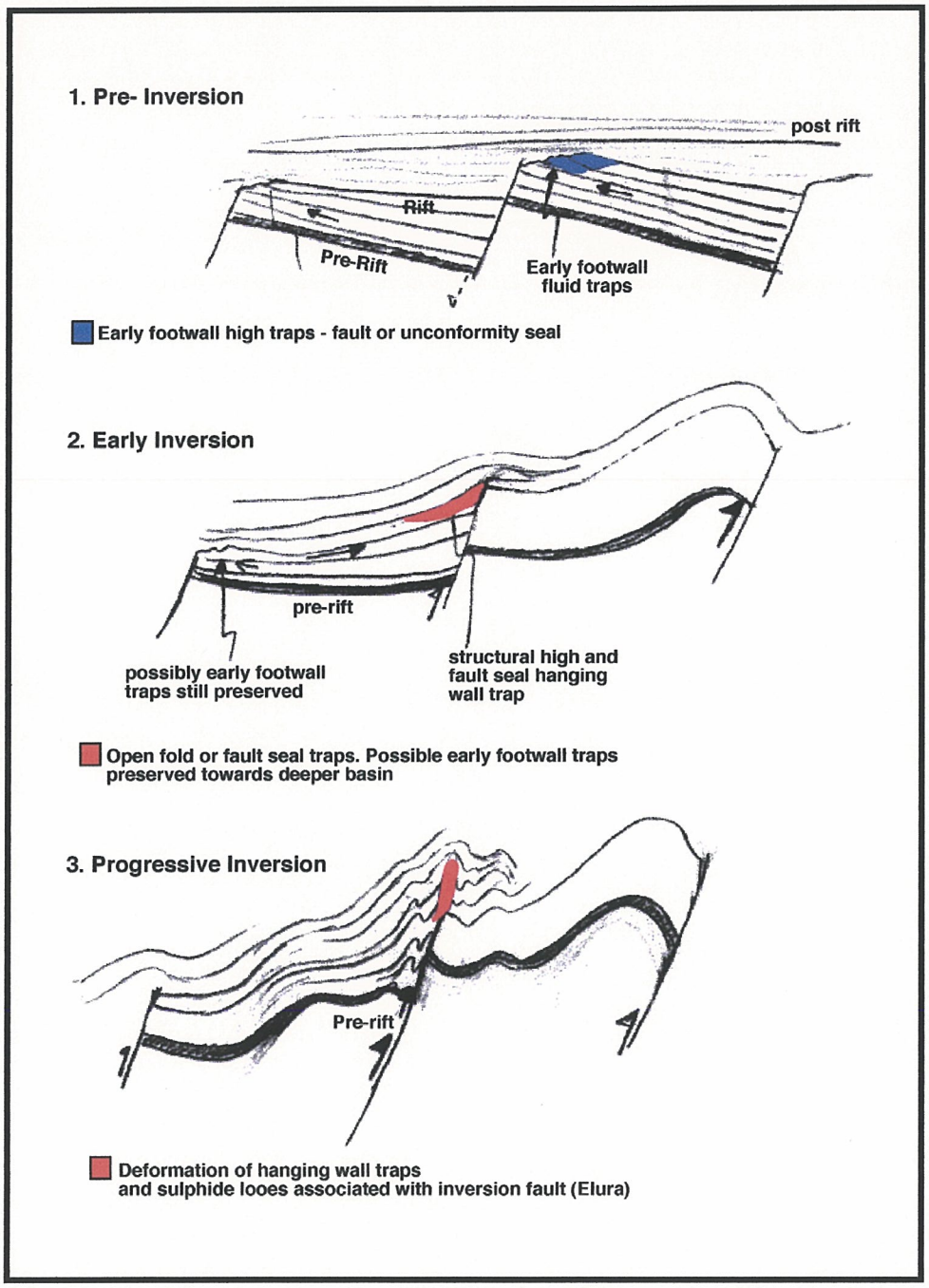


Figure 14 . Level Plan of the Western Ore Body of the CSA bas metal-Cu deposit.

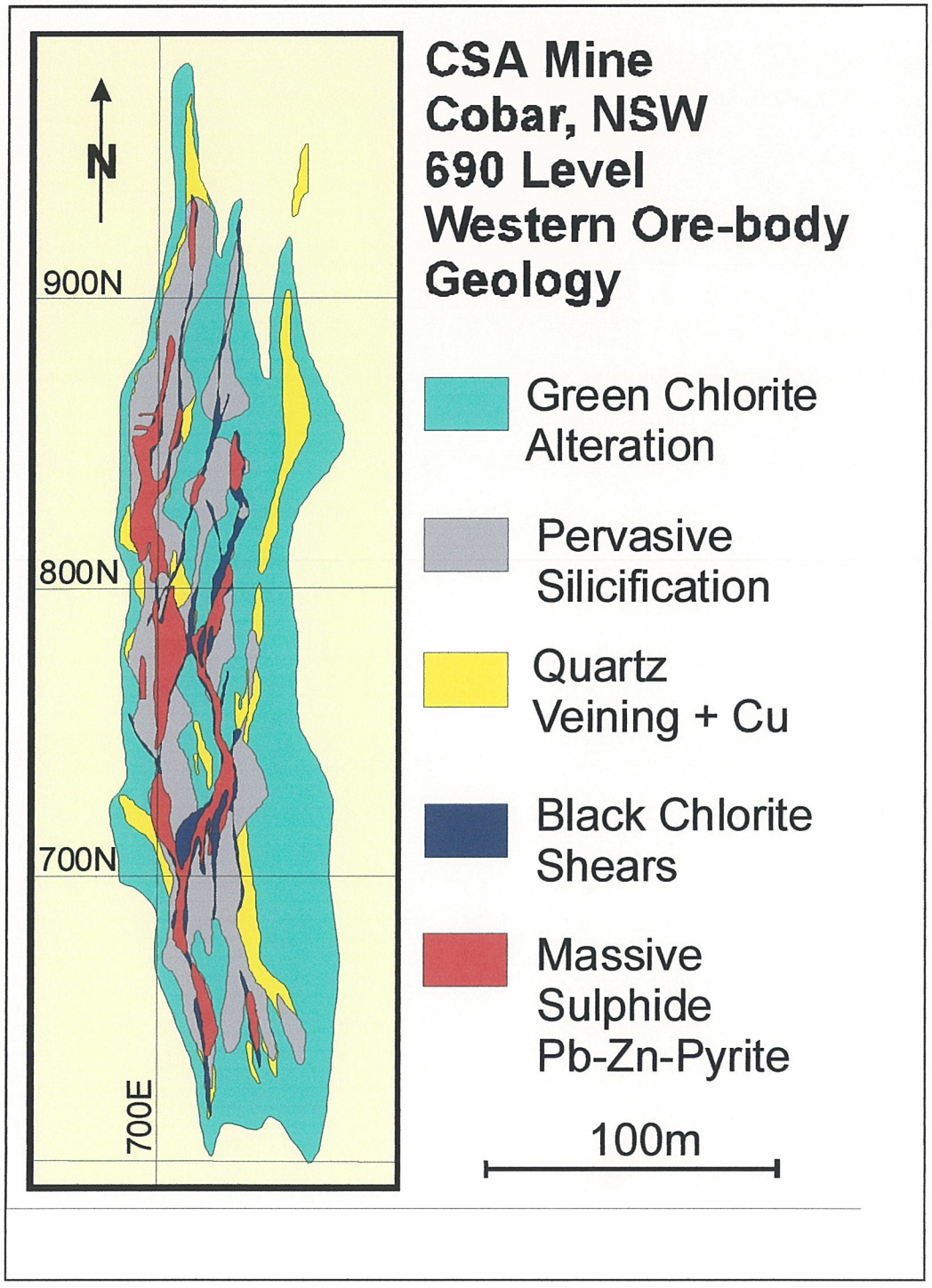
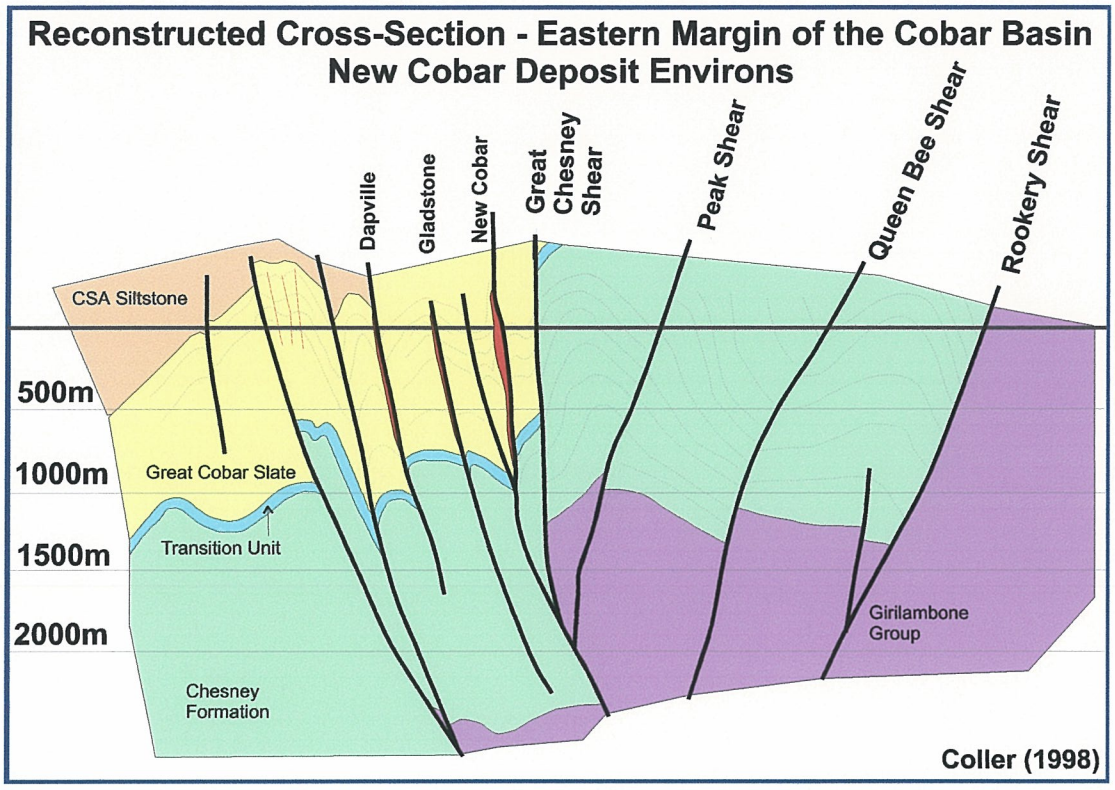


Figure 15. Cross-section of part of the Cobar ore field showing the geometry of the fault system and the ore bodies.



Note 1. The Great Chesney Shear is the compressional main inversion fault, but which still exhibits an extensional downthrow.
Note 2. The mineralization occurs along compressional shears in the hangingwall of the main fault.

Fig 16 Plan of the main ore bodies of the CSA Mine

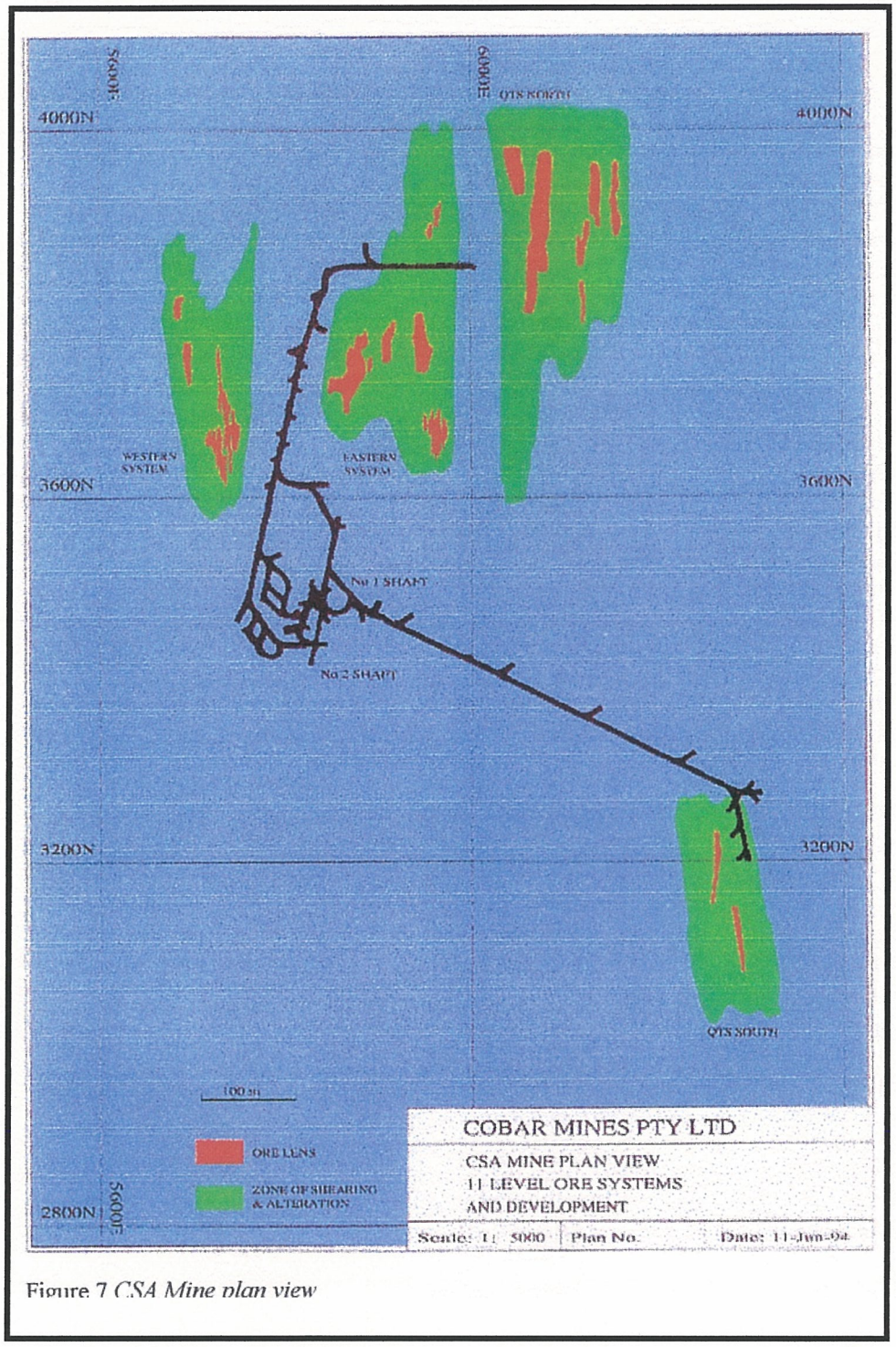


Figure 7 *CSA Mine plan view*

Figure 17 Cross-section of the CSA Mine

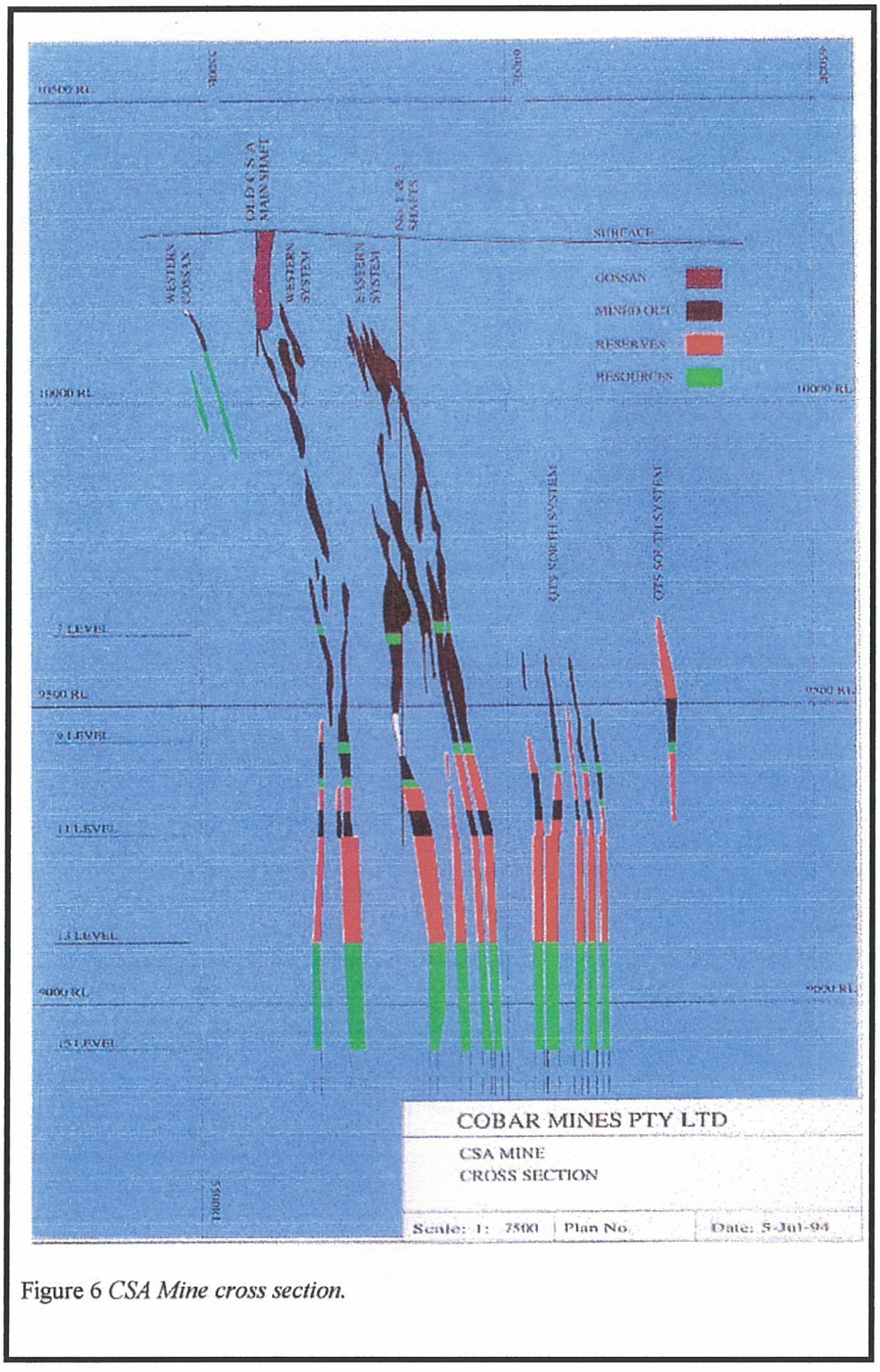


Figure 6 *CSA Mine cross section.*

Appendix 2 Plates



Photo 1. Sulphide-rich zone (4-8m wide) in SW Varden Ridge

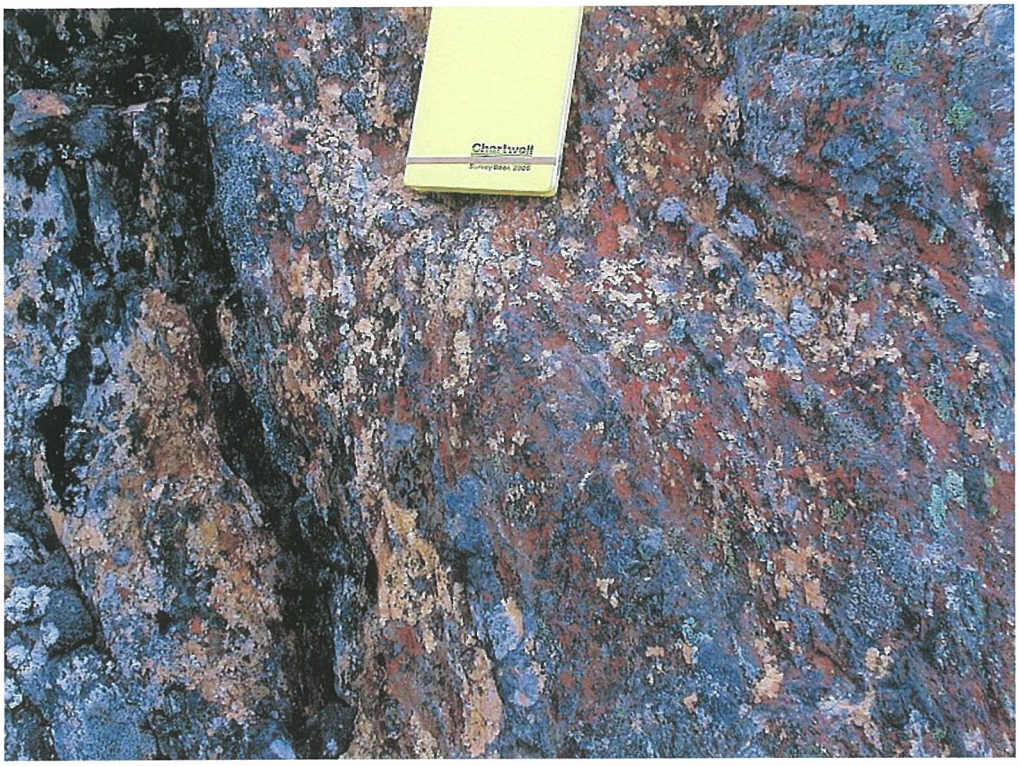


Photo 2 . Typical sheared shaley sulphide-rich zone with replacement silica bands



Photo 3. Galena-Sphalerite vein parallel to cleavage within a sulphide-rich zone

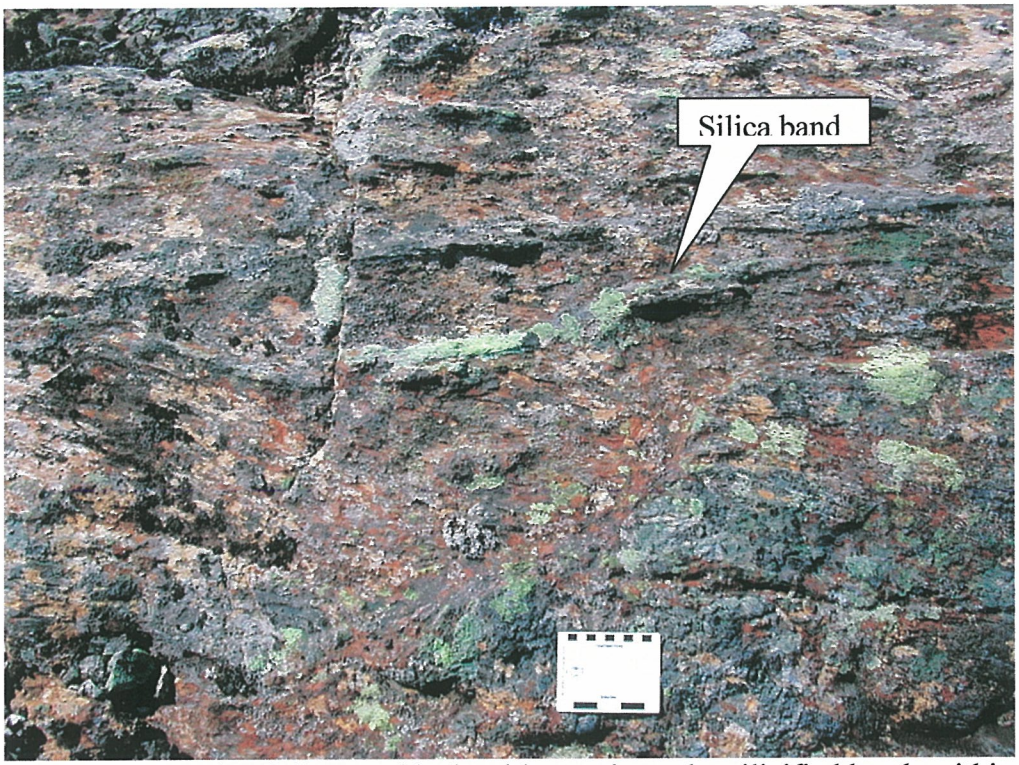


Photo 4. Sheared and disrupted beds with grey irregular silicified bands within a sulphide-rich zone.



Photo 5. Relatively undeformed sandstones with ripple-bedded tops (VR GPS41)

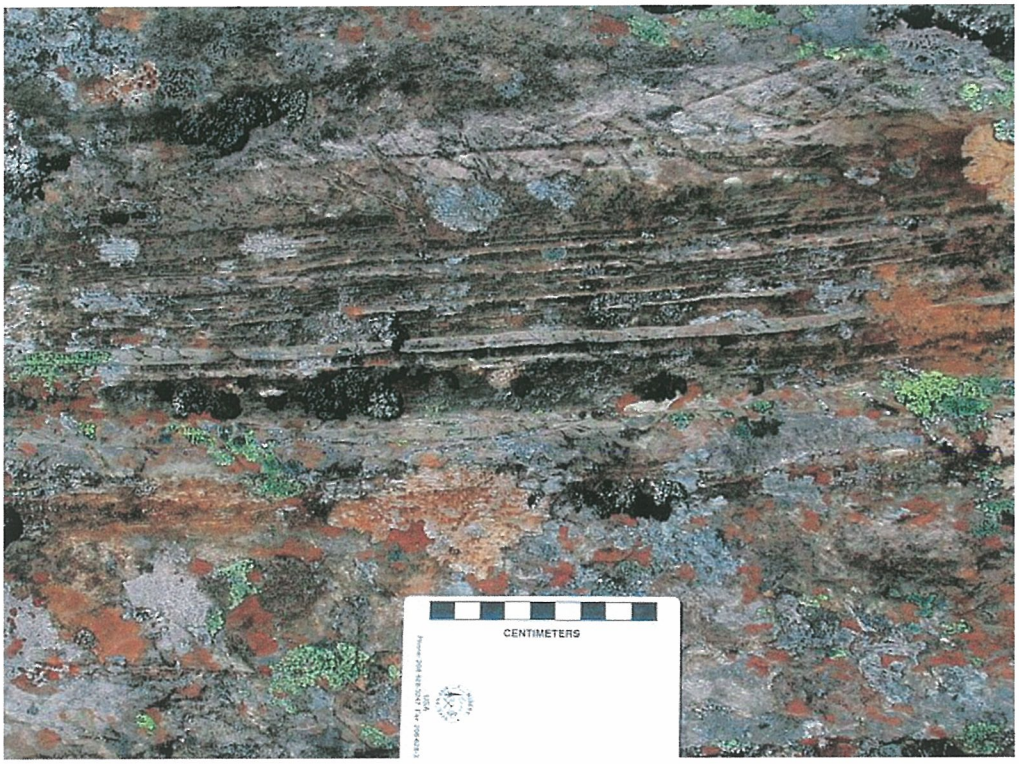


Photo 6.Thin bedded siltstone, sandstone and shale, typical of much of the sequence.



Photo 7. Thick-bedded sandstones with open folds, Central Varden Ridge (GPS015)



Photo 8 Thin, planar bedded quartzitic sandstones and silstones

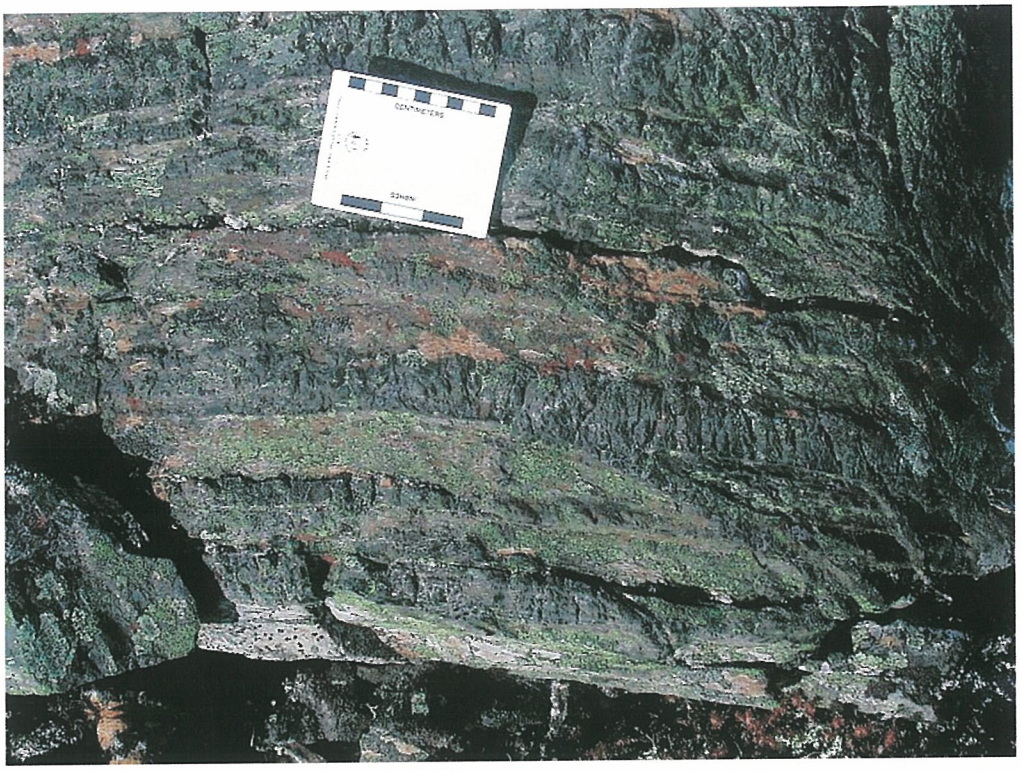


Photo 9. Dense network of dark silica veins parallel and cross-cutting bedding typical of the broad silicification zone within the main prospect (GPS 050)

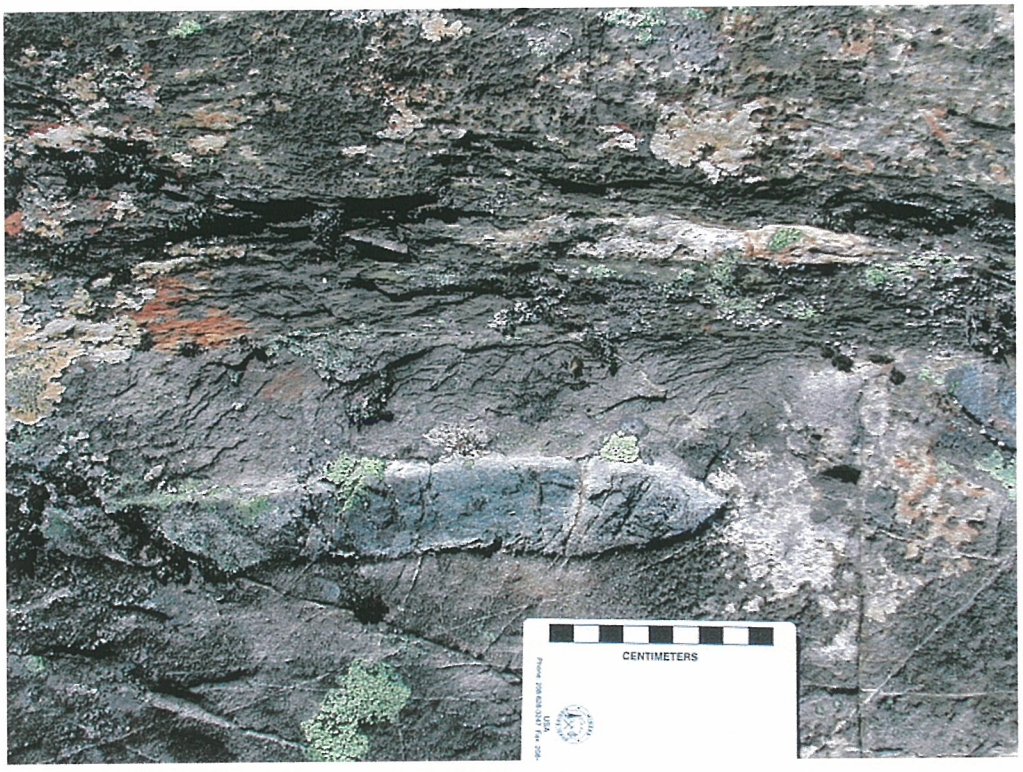


Photo 10. Detached carbonate lens within shales in a sheared zone. Note cleavage oblique to the bed.

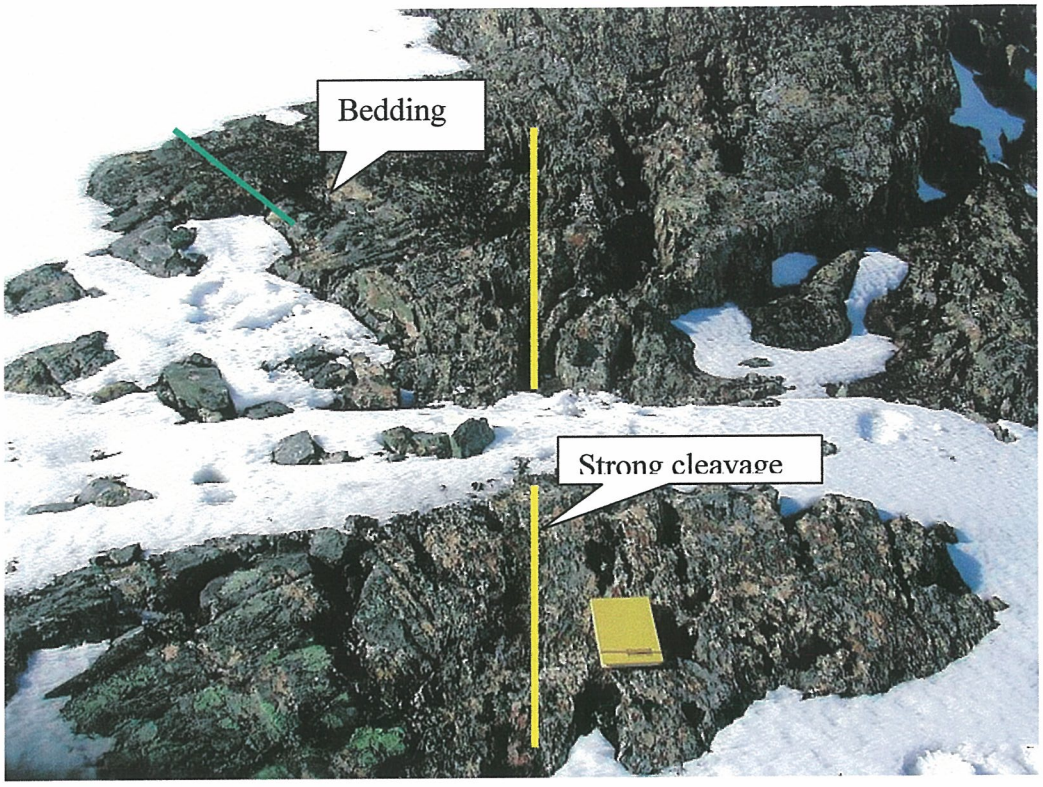


Photo 11. Example of a shear zone with strong cleavage and rotation of bedding into shear zone (GPS256)

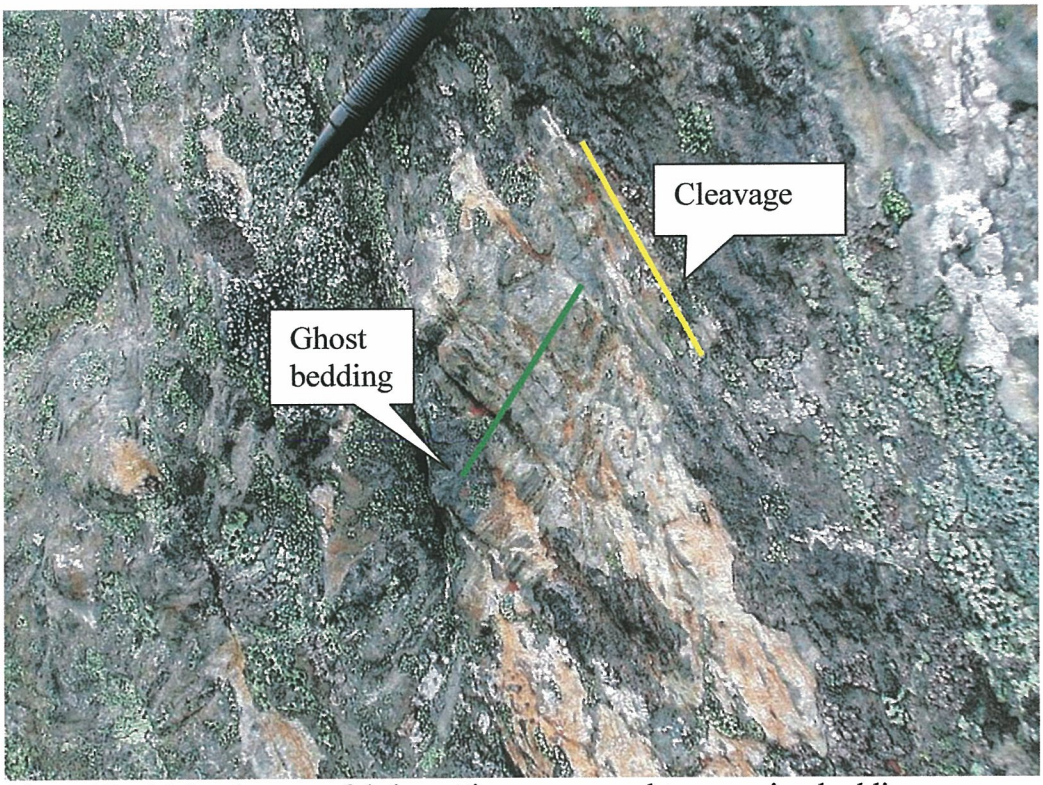
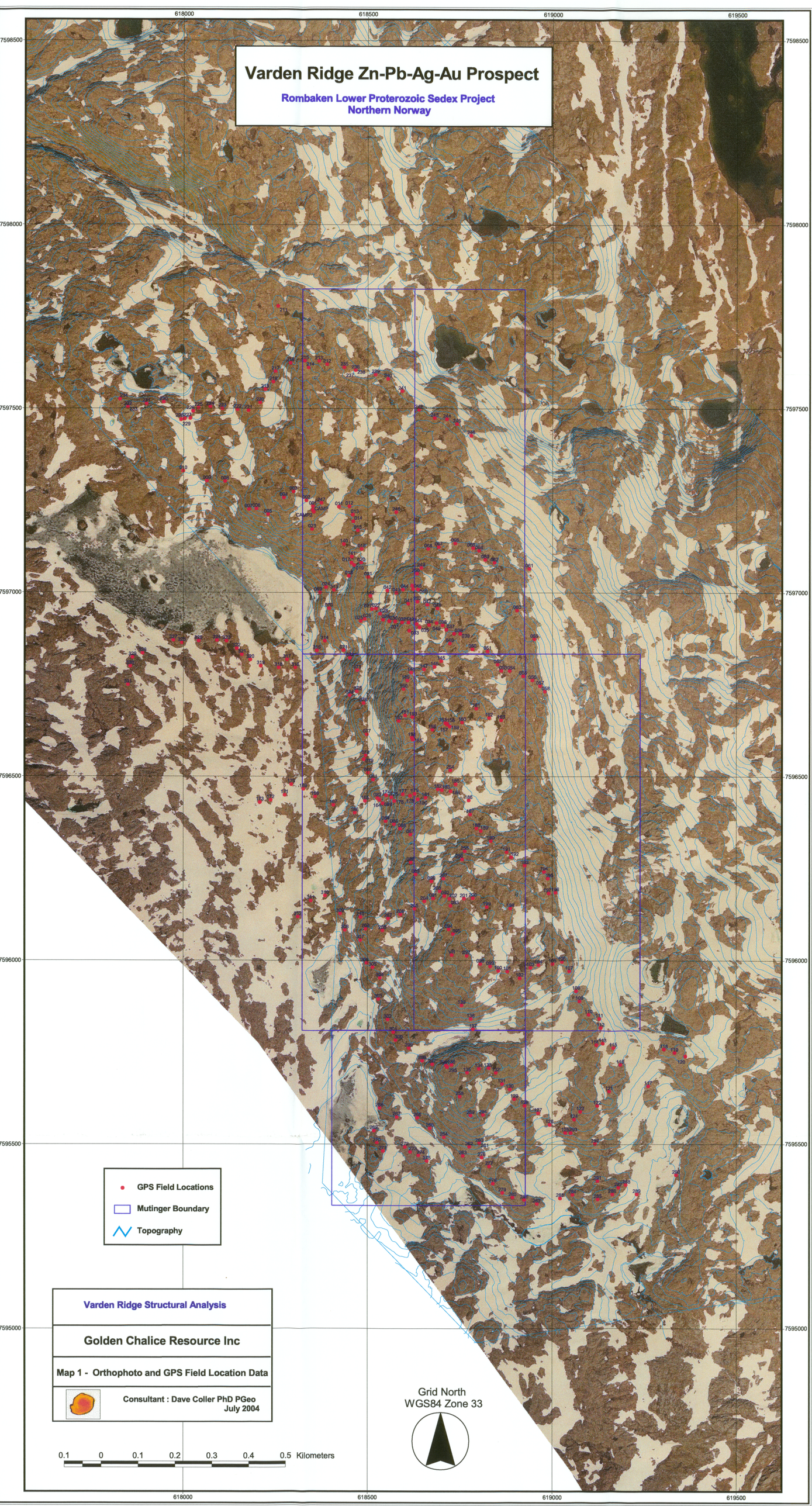


Photo 12. Main cleavage fabric cutting across and transposing bedding


618000
618500
619000
619500
7598500
7598000
7597500
7597000
7596500
7596000
7595500
7595000
Varden Ridge Zn-Pb-Ag-Au Prospect
Rombaken Lower Proterozoic Sedex Project
Northern Norway
GPS Field Locations
Mutinger Boundary
Topography
Varden Ridge Structural Analysis
Golden Chalice Resource Inc
Map 1 - Orthophoto and GPS Field Location Data
Consultant : Dave Coller PhD PGeo
July 2004
Grid North
WGS84 Zone 33
0.1 0 0.1 0.2 0.3 0.4 0.5 Kilometers

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

617500 618000 618500 619000 619500

7598000 7597500 7597000 7596500 7596000 7595500

Grid North
WGS84 Zone 33

Legend

- Cross-section
- Mutinger Boundary
- 60 — Bedding dip and strike
- Fold plunge
- Bed trace
- Discrete Shear zones
- Silica Zones
- Granite

Soil Zn Anomaly ppm

- < 1
- 1 - 625
- 626 - 950
- 951 - 1495
- 1496 - 4000

Samples 1984 and 1988 Zn in %

- < 1
- 1 - 2
- 3 - 7
- 8 - 15
- 16 - 23

0 100 200 300 400 500 Meters

Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 2 Bedding structure and Main Silicification Zone



Consultant : Dave Coller PhD PGeo
July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

617500 618000 618500 619000 619500

7598000 7597500 7597000 7596500 7596000 7595500 7595000

Grid North
WGS84 Zone 33

Legend

- Cross-section
- Mutinger Boundary
- Low strain boundary
- Fabric Lineation
- Discrete shear zones
- Minor folds

State of strain in host sediments

- high
- moderate
- low
- undeformed
- General high strain zones
- Granite

0 100 200 300 400 500 Meters

Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 3- Strain Map and Shear Zones

Consultant : Dave Coller PhD PGeo
July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

617500 618000 618500 619000 619500

7598000 7597500 7597000 7596500 7596000 7595500

Grid North
WGS84 Zone 33

9501 9502 8801 8802

Legend

- Cross-section
- Mutinger Boundary
- Cleavage Dip and Strike
- Cleavage trace

Minor Shears - dip & strike

- Dextral
- Sinistral
- Undifferentiated
- Drill holes
- Silica Zones
- Granite

Zinc Sampling

Soil Zn Anomaly ppm
- 0
- 1 - 625
- 626 - 950
- 951 - 1495
- 1496 - 4000

Samples 1984 and 1988 Zn in %
- 0
- 1 - 2
- 3 - 7
- 8 - 15
- 16 - 23

0 100 200 300 400 500 Meters

Varden Ridge Structural Analysis

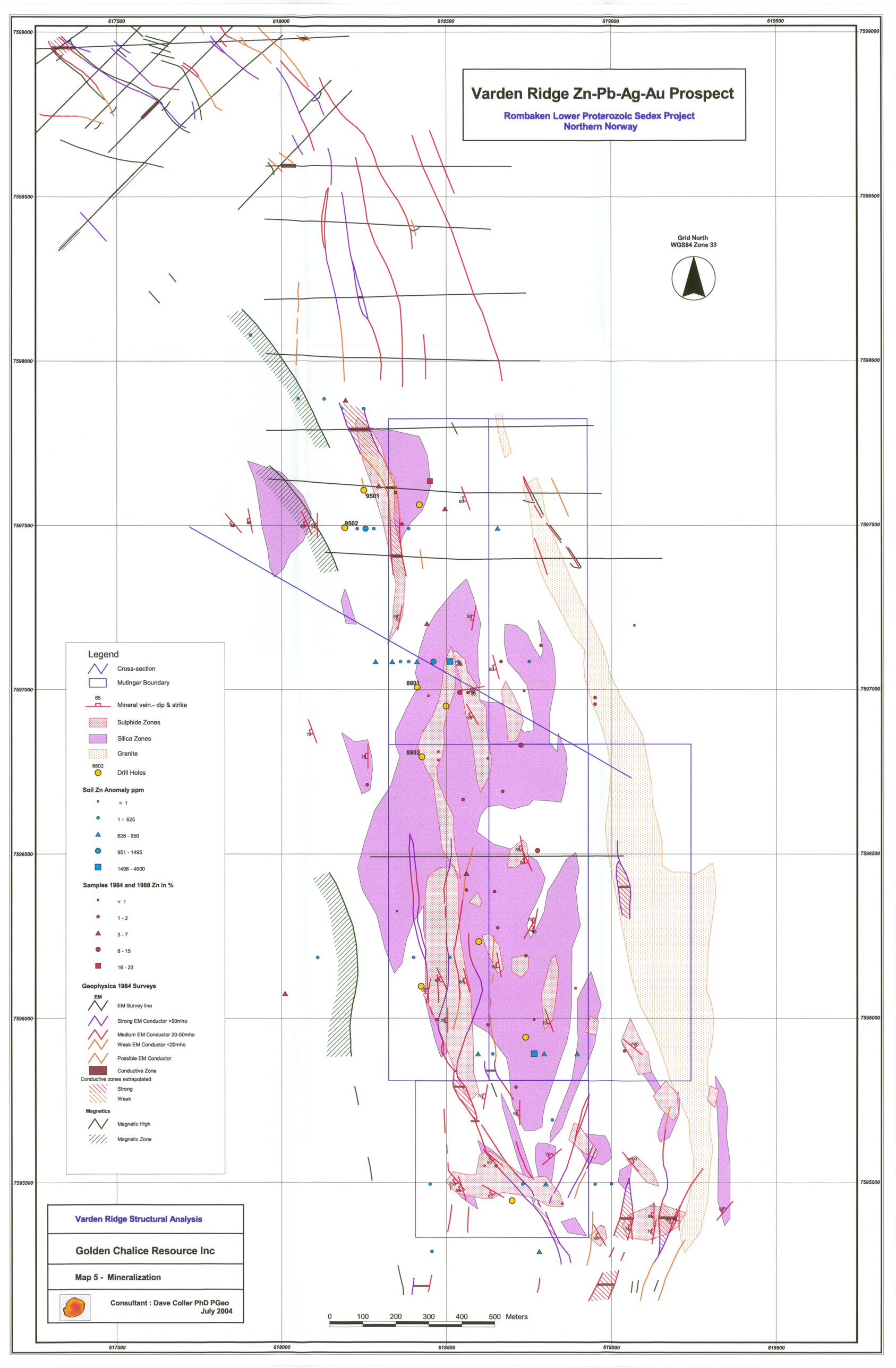
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Map 4 - Cleavage Trace Map

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July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway



Varden Ridge Structural Analysis

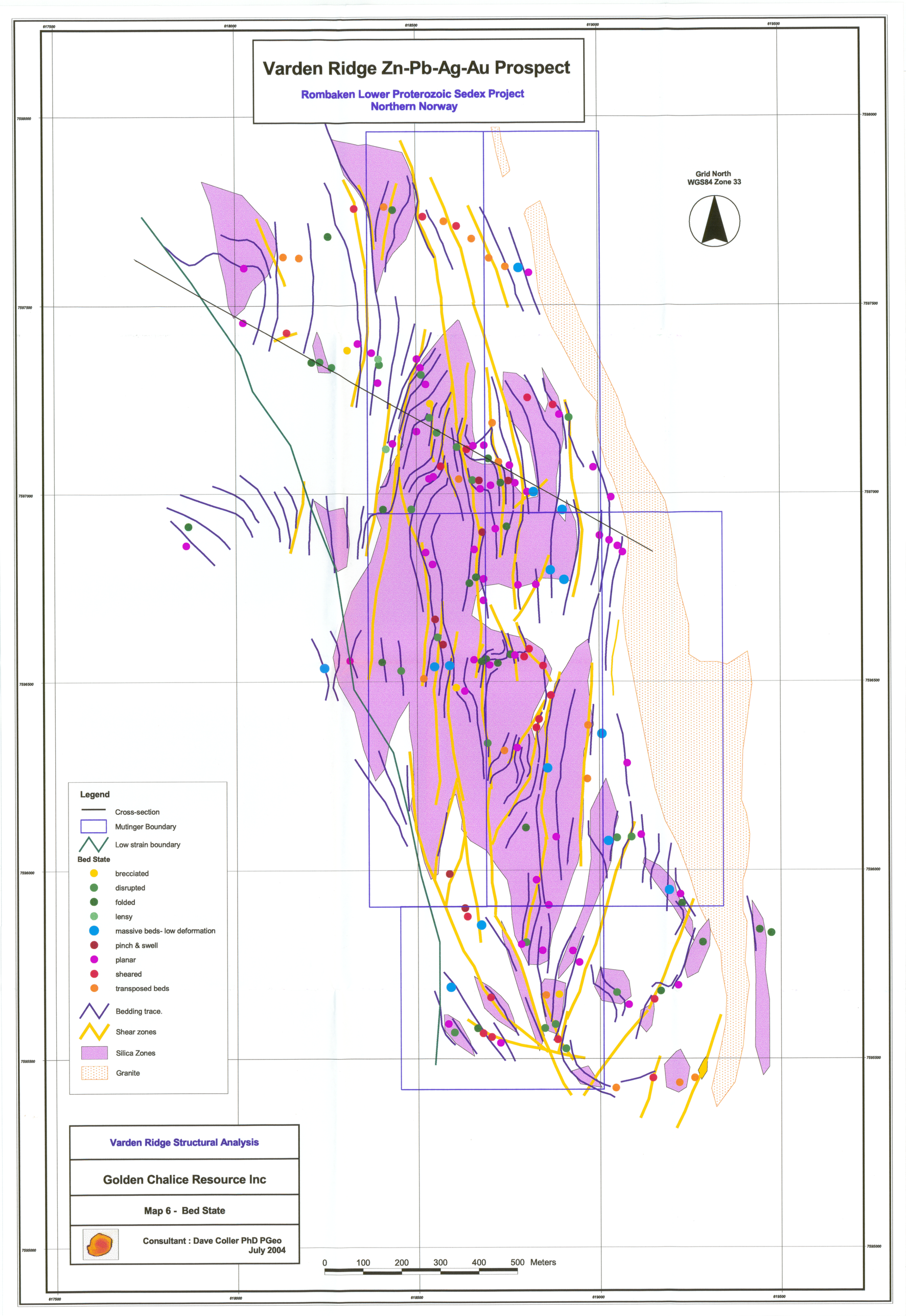
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Map 5 - Mineralization

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July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway



Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 6 - Bed State

Consultant : Dave Coller PhD PGeo
July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

Grid North
WGS84 Zone 33

618000 618500 619000 619500

7598000 7597500 7597000 7596500 7596000 7595500

Legend

- Mutinger Boundary
- Shear zones
- Bedtrace

Lithology

- granite
- shale
- shale -volcanoclastics
- sandstone
- sandstone and shale
- siltstone
- siltstone and carbonates
- siltstone and shale
- siltstone/shale/carbonates
- siltstone and sandstone
- siltstone -volcanoclastics

Main sandstone units

- Sandstone
- Sandstone/Siltstone

0 100 200 300 400 500 Meters

Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 7 - Sandstone units

Consultant : Dave Coller PhD PGeo
July 2004

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

617500 618000 618500 619000 619500 620000

7598000 7597500 7597000 7596500 7596000 7595500 7595000

Grid North
WGS84 Zone 33

9501 9502 8803 8802

CAMP CAMP2 VR

Legend

- Cross-section
- Mutinger Boundary
- 65 Silica vein. dip and strike
- Generalized silica vein trends
- Silicified sediment
- Non-or weakly silicified sediment
- Generalized Silicified Zones
- Drill hole
- Granite

Soil Zn Anomaly ppm

- <1
- 1 - 625
- 626 - 950
- 951 - 1495
- 1496 - 4000

Samples 1984 and 1988 Zn in %

- <1
- 1 - 2
- 3 - 7
- 8 - 15
- 16 - 23

Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 8- Silicification



Consultant : Dave Coller PhD PGeo
July 2004

0 100 200 300 400 500 Meters

Varden Ridge Zn-Pb-Ag-Au Prospect

Rombaken Lower Proterozoic Sedex Project
Northern Norway

Grid North
WGS84 Zone 33

617500 618000 618500 619000 619500

7598000 7597500 7597000 7596500 7596000 7595500 7595000

9501 9502 402 8804 401 8802 403 404 405 406

Legend

- Mutinger Boundary

Prospective Sulphide Zones
- Primary Zone
- Secondary Zone

Drill holes
- Existing drill hole
- Proposed drilling

- Surface Sulphide Zones
- High strain areas
- Mineral veins
- Silica Zones

Soil Zn Anomaly ppm
- >1
- 1 - 625
- 626 - 950
- 951 - 1495
- 1496 - 4000

Samples 1984 and 1988 Zn in %
- >1
- 1 - 2
- 3 - 7
- 8 - 15
- 16 - 23

Sulphide Mineralization
- Strong and vein style
- Strong
- Moderate +/- vein style
- Disseminated & Vein
- vein style
- weak
- weak and vein style

- Fold trace
- Shear zones
- Bedding
- Bed Trace

Deformation of beds

Strong internal deformation- simplified
- Disrupted beds
- minor folding
- pinch and swell boudinage beds
- sheared beds
- Brecciated

Low internal deformation- simplified
- massive beds relatively undeformed
- planar beds
- lensoid beds
- transposed bedding along cleavage

Main sandy bed units
- Siltstone
- Sandstone
- Granite
- Cross-section

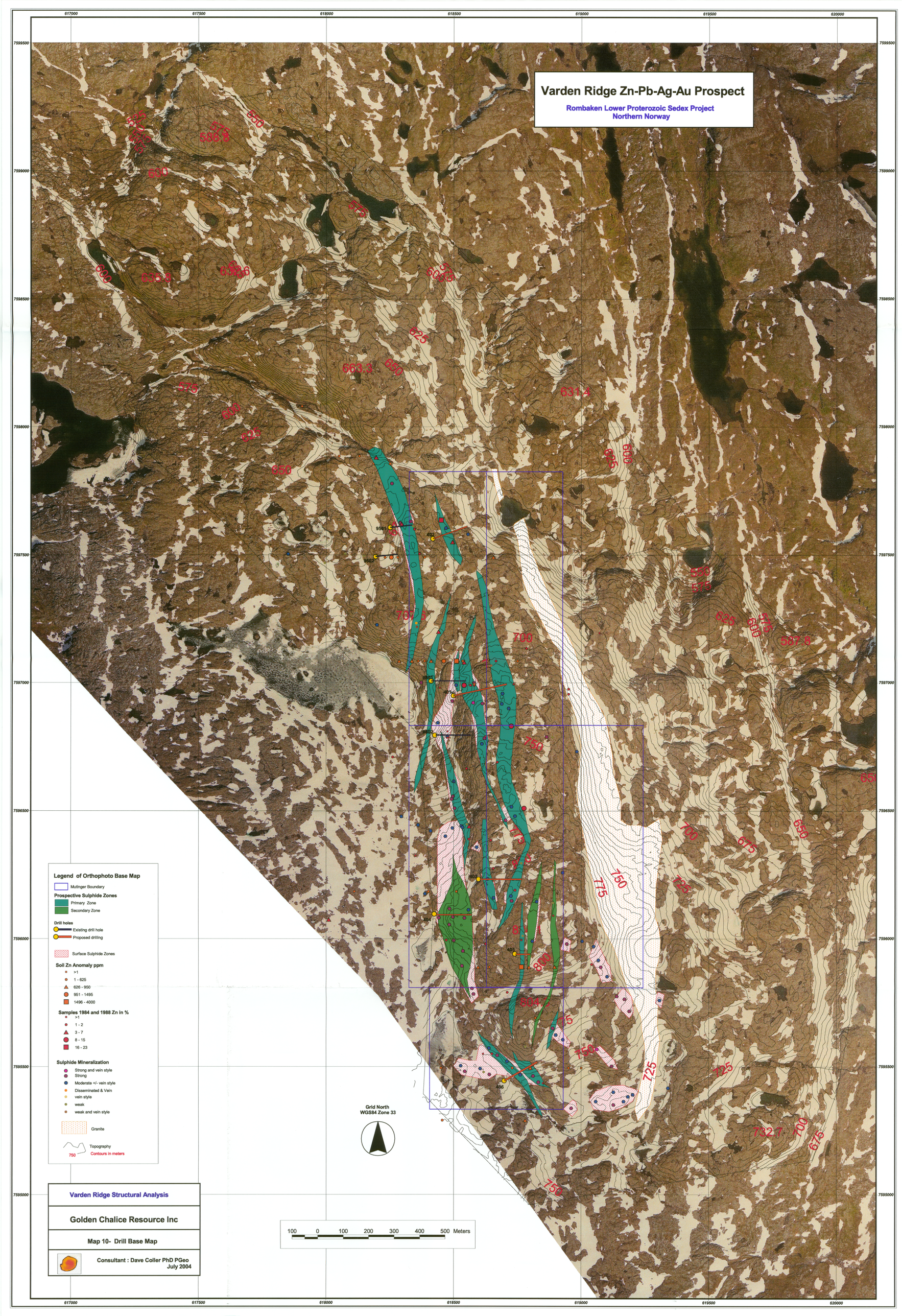
Varden Ridge Structural Analysis

Golden Chalice Resource Inc

Map 9 Exploration Summary

Consultant : Dave Coller PhD PGeo
July 2004

0 100 200 300 400 500 Meters


Varden Ridge Zn-Pb-Ag-Au Prospect
Rombaken Lower Proterozoic Sedex Project
Northern Norway
Legend of Orthophoto Base Map
Mutinger Boundary
Prospective Sulphide Zones
Primary Zone
Secondary Zone
Drill holes
Existing drill hole
Proposed drilling
Surface Sulphide Zones
Soil Zn Anomaly ppm
>1
1 - 625
626 - 950
951 - 1495
1496 - 4000
Samples 1984 and 1988 Zn in %
>1
1 - 2
3 - 7
8 - 15
16 - 23
Sulphide Mineralization
Strong and vein style
Strong
Moderate +/- vein style
Disseminated & Vein
vein style
weak
weak and vein style
Granite
Topography
750
Contours in meters
Grid North
WGS84 Zone 33
100 0 100 200 300 400 500 Meters
Varden Ridge Structural Analysis
Golden Chalice Resource Inc
Map 10- Drill Base Map
Consultant : Dave Coller PhD PGeo
July 2004