# Haveri Project

## Core Validation Field Trip - Observation Summary

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# Part I – Core validation

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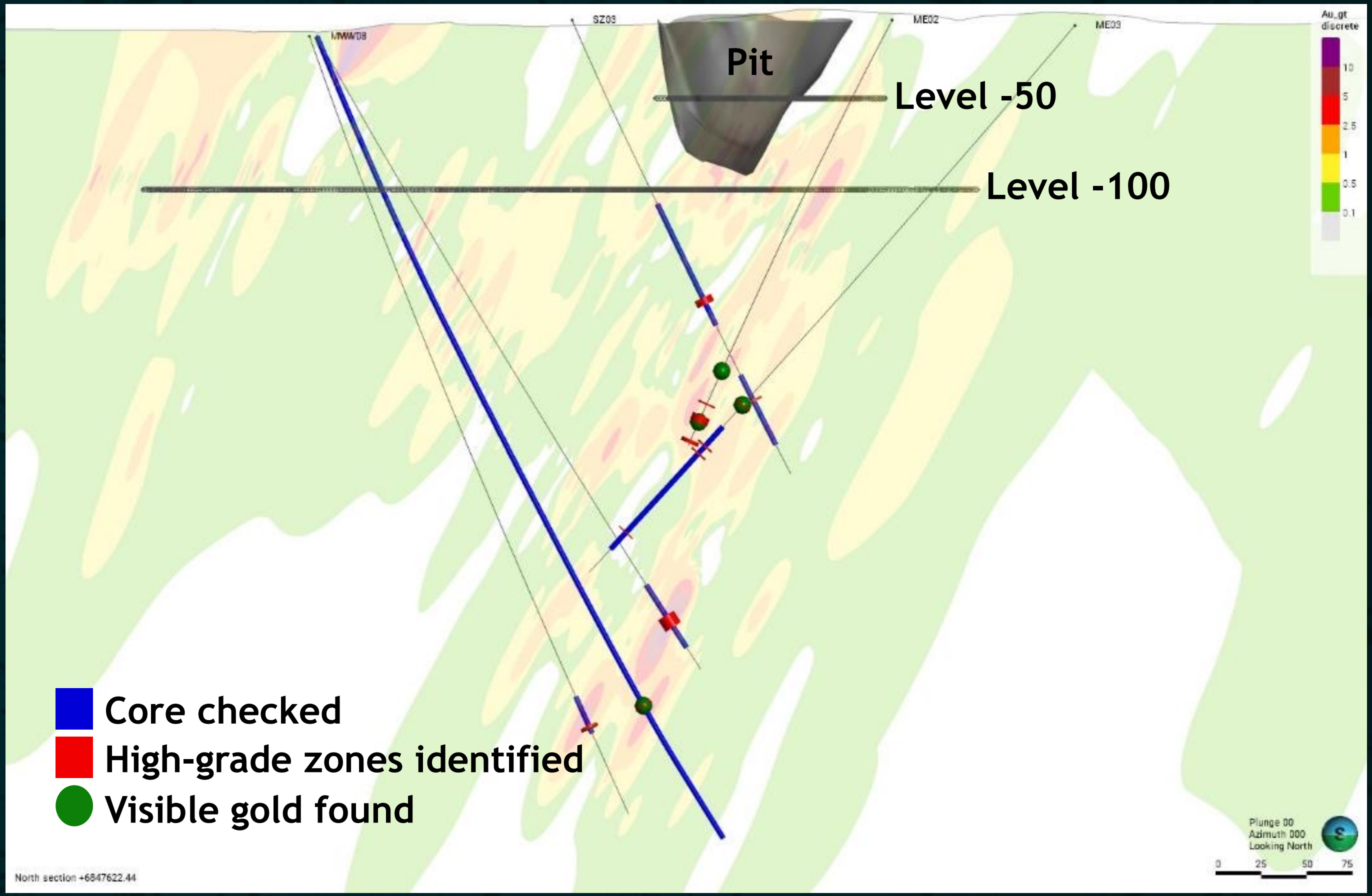
# INTRODUCTION

In February 2024, a short field trip to Haveri was undertaken by J. Zach and S. Hönig. The aim of this trip was a validation of historic drill core from previous drilling campaign made at the project.

Using a 3D geological and numeric model of Au mineralization (made to clients order by V. Sesulka in 2023 using Leapfrog Geo software), gaps in a known Au mineralization were identified as possible targets for new drilling exploration campaign.




*Section from Au numeric model showing the inspected core (blue intervals), high-grade zones (in red) and identified visible gold (green dots).*

# Introduction

13 drill holes in a close vicinity of the assumed drill targets were recognized as sufficient for core validation. However only 6 holes were available for this purpose.

High grade intervals, identified in model and database, were checked at least 15m to the hanging wall and footwall of the ore zone. Hole MW09 was observed in a whole length to verify historical logging.

The oriented core task could not be full-filled because of a poor condition of the core (bottom lines are not preserved, core is fragmented by cutting, and in places whole segments of core is absent). Moreover, not each historic hole was drilled for oriented core.

| Hole ID | Interval checked (m) | Best Au grades (gpt) |
|---|---|---|
| **MW09** | 0-493.4 | 31.7 |
| **MW11** | 390-412 | 16.51 |
| **MW03** | 350-391 | 15.4; 18.2; 10.2; 50.6 |
| **ME03** | 262-383 | 17.15; 5.5 |
| **ME02** | 180-280 | 6.6; 18.0; 14.0; 14.4 |
| **SZ03** | 215-258 | 6.4 |
| **SZ03** | 111-185 | 12.1; 12.9 |

## -[ INTRODUCTION ]-

Nevertheless, almost 900m of core was inspected by the team at site and the observations brought new information or verified historical knowledge.

The core inspection confirmed well-developed shear zone, which is controlling the high-grade Au mineralization:

- High-grade Au intervals correlate with an intensive shearing of the host rock,
- Dip of the shear zone is steep to sub-vertically, striking NNE-SSW,
- Shear zone consists of mineralized networking veins and veinlets, and as mineralized brecciated zones hosting gold grades,
- Visible gold (VG) marked on core boxes was confirmed several times, always invisible by naked eye and hard to spot with hand lens.

*Core shack in Hameenkyro.*

# -[ GOLD MINERALIZATION ]-

High-grade zones are clearly structurally controlled by intensive host rock shearing and related veinlets, veins and pervasively silicified intervals.

- Gold intervals correlate very nicely with the shear zone and intensive deformation.
- Mineralization and intensive shearing do not correlate with massive sulphides, which are not brecciated or intensively deformed.

<u>High-grade gold zones seem to be controlled by three major assemblages:</u>

1. System of networking amphibole and quartz veinlets with free native gold,
2. Quartz dominant + chlorite ± gold ± sulphides veins and patches
3. Brecciated intervals with quartz patches and associated disseminated, patchy and semi-massive sulphides mineralization.

High-grade zones closely associated with free native gold

- VG observed several times, hosted in quartz veins and networking amphibole ± quartz veinlets.
- Significant nugget effect have to be considered in regards to future analytical method

Chalcopyrite seem to be significantly more associated with higher gold grades than pyrrhotite.

*Piece of quartz-chlorite vein with disseminated chalcopyrite and VG (invisible by naked eye); interval returned 1.0m @ 39.7 gpt Au from 408.3m (DH MW09).*

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## -[ Mineralization style 1 ]-
### Networking Amphibole and Quartz veinlets

<u>System of networking Amphibole and Quartz veinlets with native gold.</u>

Shear zone related, networking thin veinlets with occasionally observed VG (in amphibole veinlets with accessory quartz) and sulphides.

Amphibole veinlets are dark, commonly up to 0.5 mm width, hard spot by naked eye.

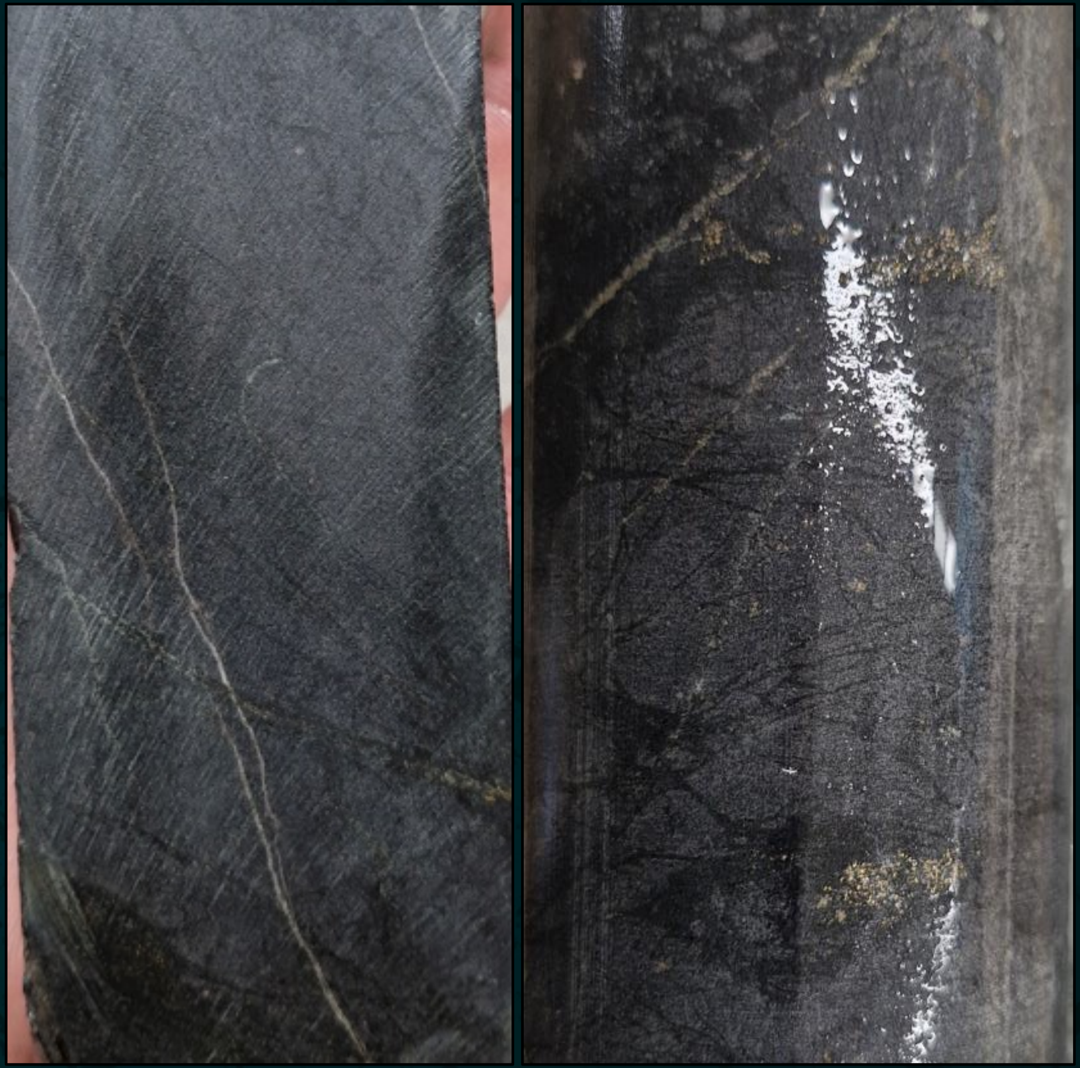
Accessory quartz and chalcopyrite occurs (associated with Au hydrothermal enrichment?).

Closely associated with crosscutting bleached quartz-chlorite-carbonate-chalcopyrite-pyrrhotite veinlets.

- High-likely host gold grades too, VG not observed.

Abundant biotite alteration of mafic volcanic host rock observed.

VG hosted in amphibole veinlets observed in drill holes ME02.



*Details of dark amphibolite networking veinlets and crosscutting quartz-sulphides veinlets.*

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## -[ Mineralization style 2 ]-
### Quartz veins

<u>Quartz dominant + chlorite + sulphide veins ± native gold.</u>

Clearly hosts highest grade gold zones in inspected core, observed in all checked drill holes.

Always brecciated or brittle fractured.

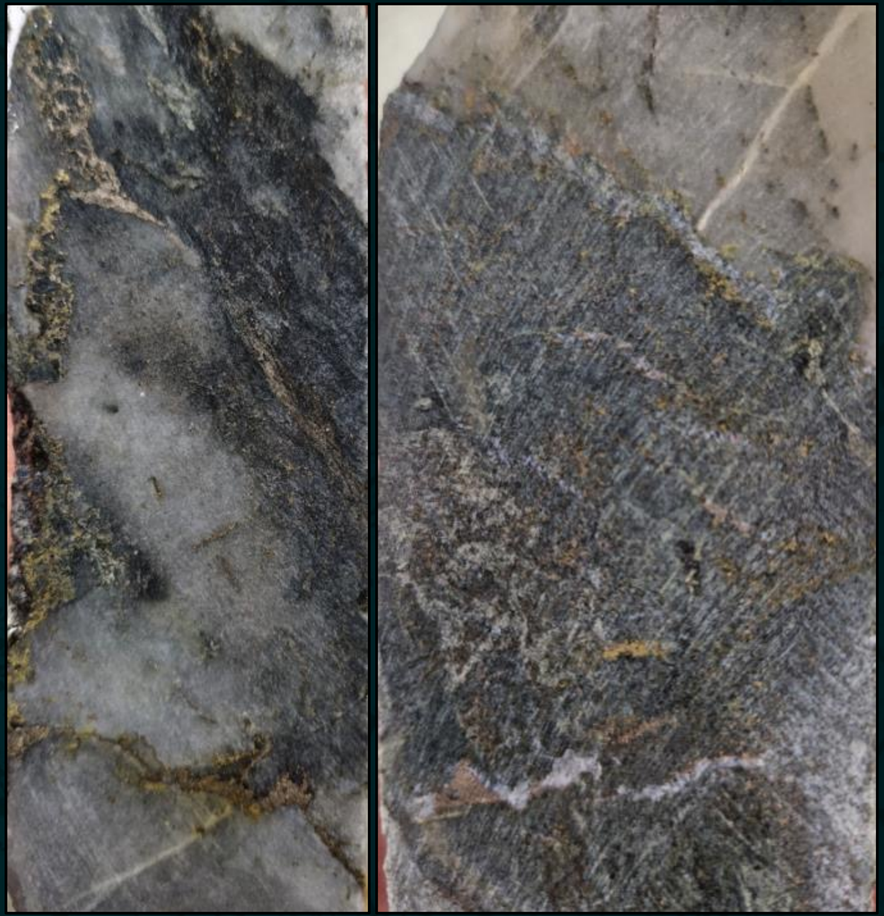
- Thickness often from Xcm to 30cm, max. observed 1.3m
- Common qtz patches within brecciated zones.

These zones represent central parts of the deformation zones with transitional contacts to wall rock deformation with related networking veinlets

In assemblage with free gold (hole MW09).

Chalcopyrite as main sulphide, pyrrhotine accessory.

- Sulphide mineralization controlled by brittle fractures.
- Sulphides intensively disseminated in near host rock contact zones and vein alteration halos.



*Left image: Brecciated quartz vein with chalcopyrite infill of fractures, 1.0m @ 17.9 gpt Au from 370m (DH MW03). Right image: Contact of mineralized quartz vein with host rock and near contact veinlets and disseminated sulphides; 1.0m @ 50.6 g/t Au from 376m (DH MW03).*


*High-grade quartz vein, 1m wide; 1.0m @ 39.7 gpt Au (DH NW09).*

## -[ Mineralization style 3 ]-
### Brecciated intervals with rich sulphide mineralization

<u>Strongly brecciated and fractured intervals with quartz and sulphide infill.</u>

Mineralization comprise of quartz patches and sulphide fracture infill of breccia. Sulphides also as stringers, patchy and locally semi-massive.

Mineralization related to silicification, quartz patches and sulphides comprise of chalcopyrite, pyrrhotite, and associated disseminated magnetite.

Significantly higher content of chalcopyrite than in observed low-grade massive pyrrhotite intervals, ca 50:50 with pyrrhotite.

- Chalcopyrite related to higher-grade ore zones or VG?

Located outside of the high-deformation strain zones

*Breccia with chalcopyrite stringers filling the fractures; 0.9m @ 6.38 gpt Au. Real thickness of mineralized zone is 15 cm and hosts majority of mineralization in interval.*

*Strongly brecciated interval with quartz patches, Semi-massive pyrrhotite and chalcopyrite with disseminated magnetite; 1.0m @ 31.7 gpt Au from 408m (DH MW09).*
*Top image: Detail of semi-massive sulphides.*

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## -[ Mineralization style 4 ]-

### Low-grade mineralized intervals

Based on inspected core, other mineralization styles seem to be related to longer, low-grade gold intervals:

- Thin veinlets and stringers of pyrrhotite and more rare chalcopyrite in host rock.
    - Strongly structurally controlled: infill of fractures in host rock.
- Semi-massive sulphides zones in host rock with no deformation or silica alteration.
    - Pyrrhotite dominated, chalcopyrite accessory.
    - No correlation with shear zone controlling the high-grade zone mineralization.
    - No correlation with higher-grade intervals.
    - In general, low in gold .



*Interval comprise of mainly massive sulphides with dominant pyrrhotine; returned only 1.0m @ 0.94 gpt Au from 315m (DH ME03).*

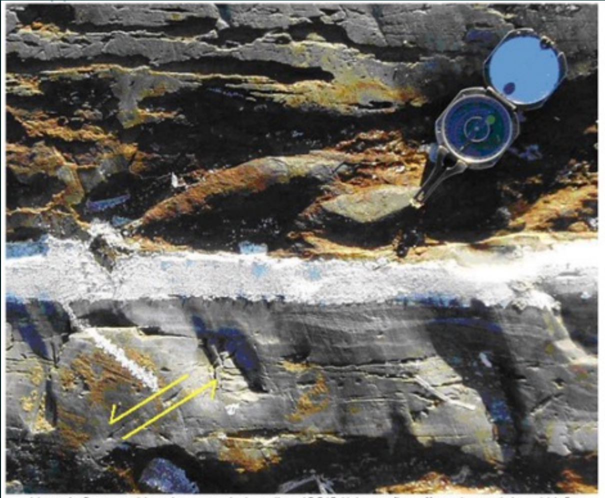
# -[ SHEAR ZONE ]-

Core inspection confirmed the structural control of the high-grade Au mineralization, which is held in the NNE-SSW striking, steeply dipping (60-70°) shear zones.

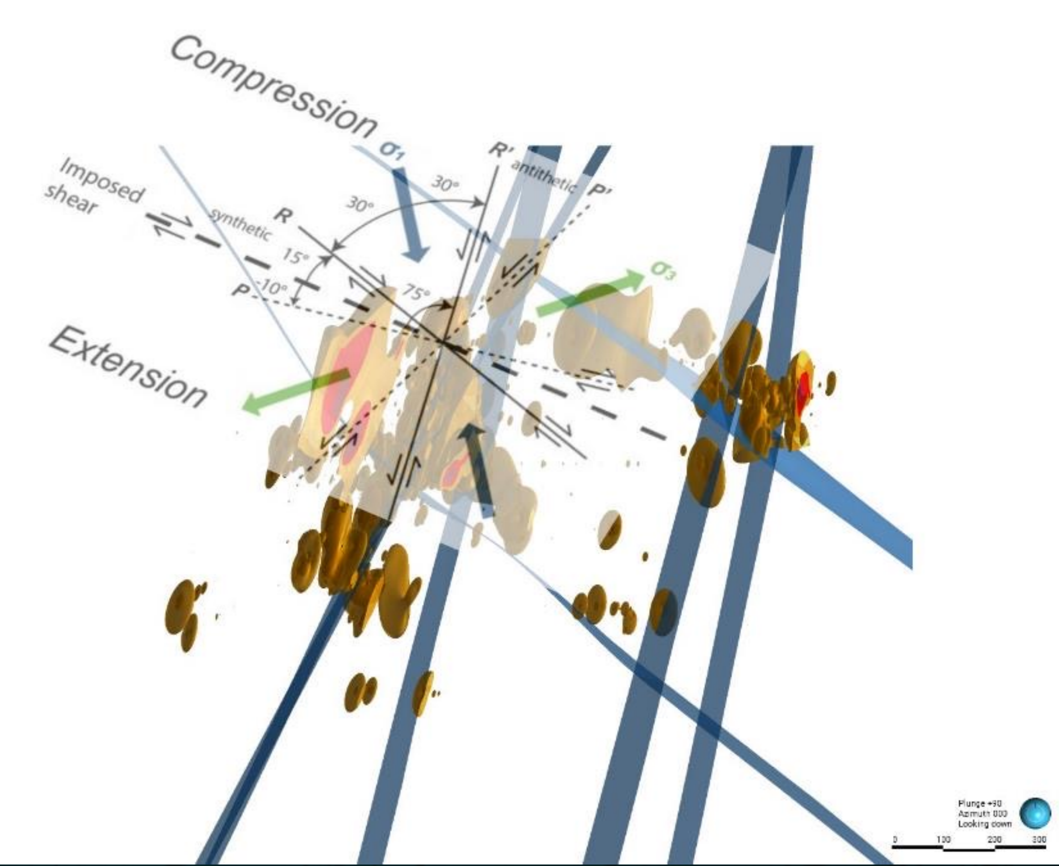
These brittle shear zones formed highly probable in a Riedel orientation during later dextral reactivation episode on the main shear zone. These Riedel-style deformation (D2) overprints the older ductile deformation (D1).

In the Riedel optics, the NNE-SSW striking faults might be interpreted as conjugate R' shear fractures, and the NW-SE striking 'regional' faults as R shear fractures. The whole system is a right-lateral strike slip (with sinistral movement along the R' faults).

The shear structures are associated with mylonite zones, which are preferable for Au-bearing fluids.



Haveri: Compositional cm-scale banding (S0/S1) in mafic tuff cut by a sinistral N-S fault (D2). Stripped outcrop area west to the open pit at Haveri. Compass pointer toward N. Photo Juhani Ojala. From Eilu et al. (2004).




*Riedel shear diagram snapped on high-grade ore bodies and faulting derived from the Leapfrog model. The ore bodies are parallel with the NNE striking faults (R'), the regional NW striking faults interpreted as R features.*

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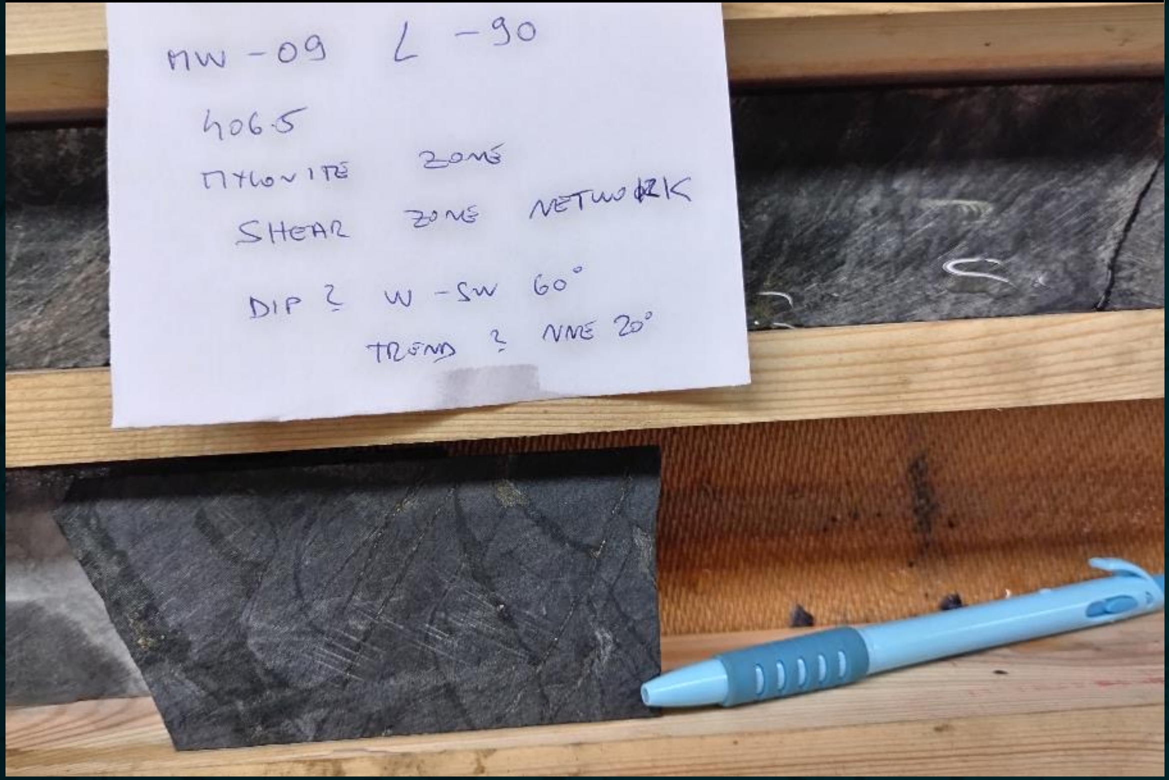
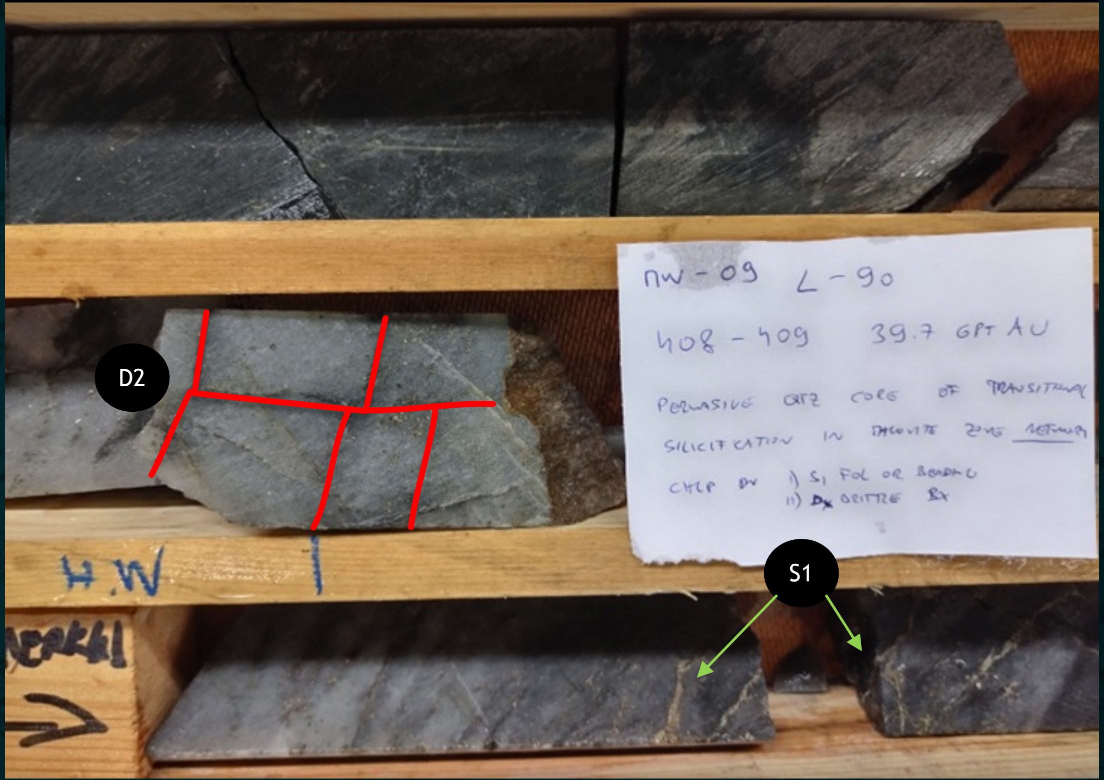
# -[ CORE OBSERVATIONS ]-

*Mylonite shearing - vein networking*



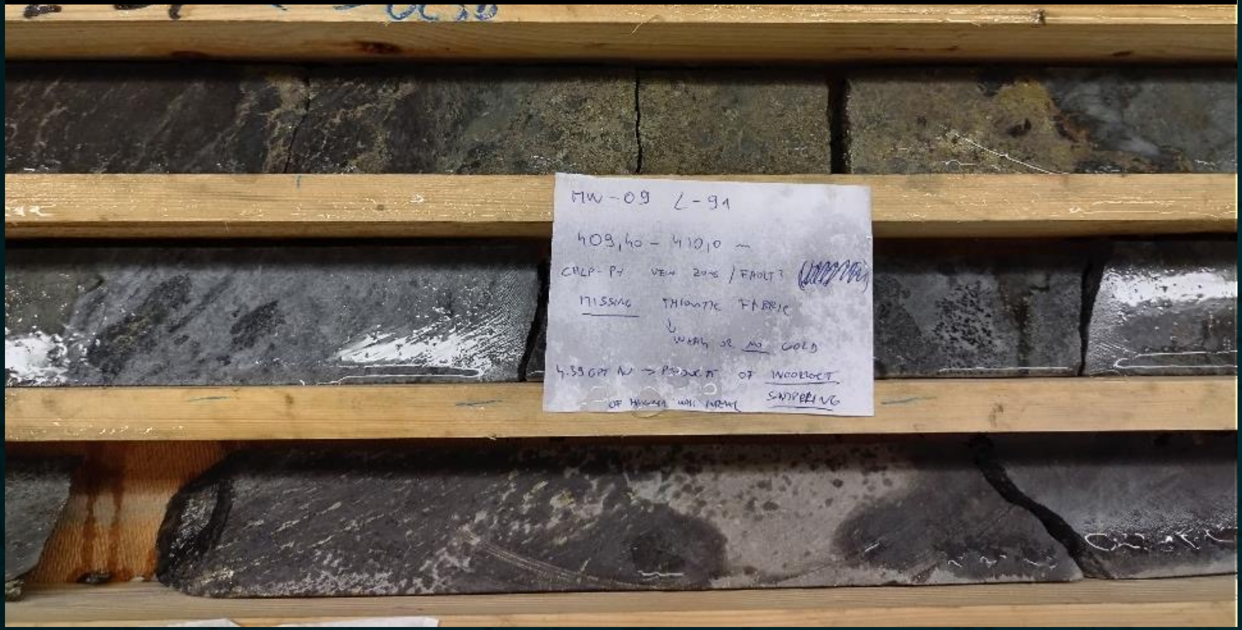

*Pervasive silicification in central part of mylonite zone*




- DH MW09, 401.5–410m: Mylonite zone with central pervasive qtz–Au alteration zone (408-409m), buffered by qtz-chl-amp vein networking typology zone(s) (406.5-408.0m)

# -[ Core observations ]-

*Massive sulphide vein missing mylonitic fabric*



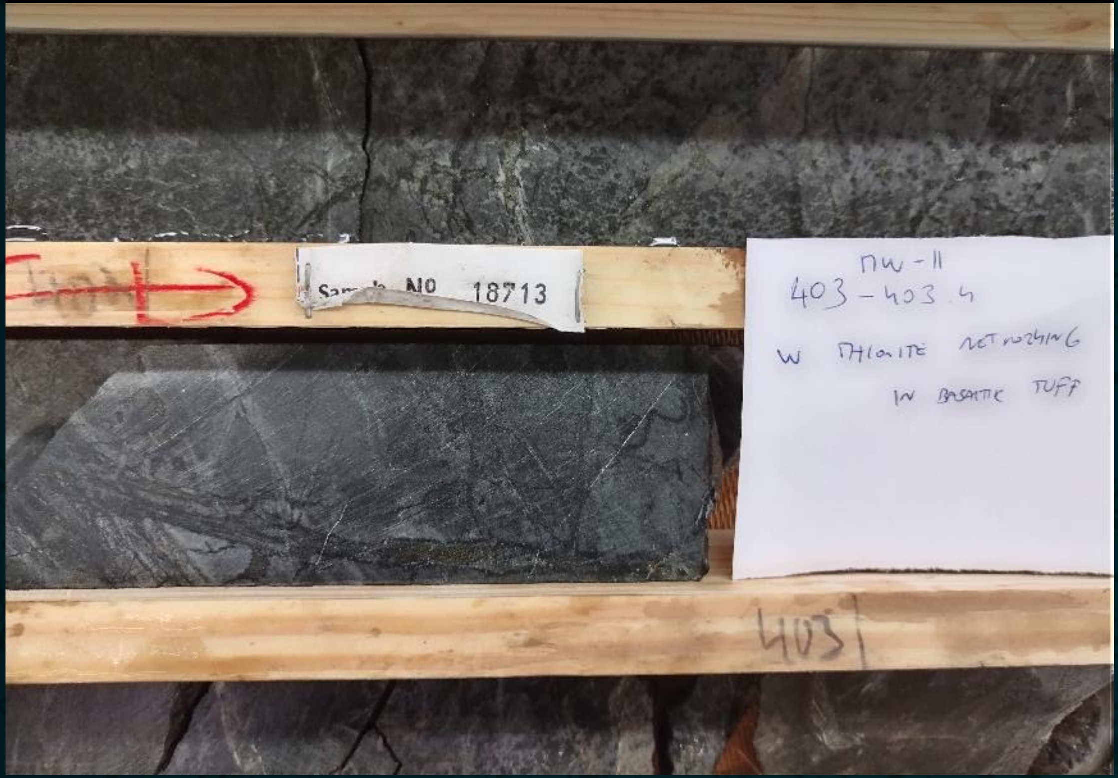

- DH MW09, 409-410m: Chlpy-py vein interval missing mylonitic shearing (and networking) fabric; elevated gold content in this interval caused by incorrect sampling mixing up shear zone (pervasive silicified zone/quartzite) with semi-massive sulphide zone.

*Isoclinal folding in bleached mylonite*


- DH MW09, 429.8m: Bleached mylonite zone with isoclinal folding indicating for sinistral kinematics striking NNE, dip W 60-70?;
- Resembles structures observed in pit…?

## -[ Core observations ]-

*Mylonite qtz-chl-amp Bx*




- DH MW11, 403m: Moderately silicified mylonite zone (Bx-like), bleached fragments of mafic volcanics.
- TWO SYSTEMS of chlpy-mineralized qtz veining (not possible to spot without hand lens) orientation unclear.

*Pervasive silicification in central part of mylonite zone*

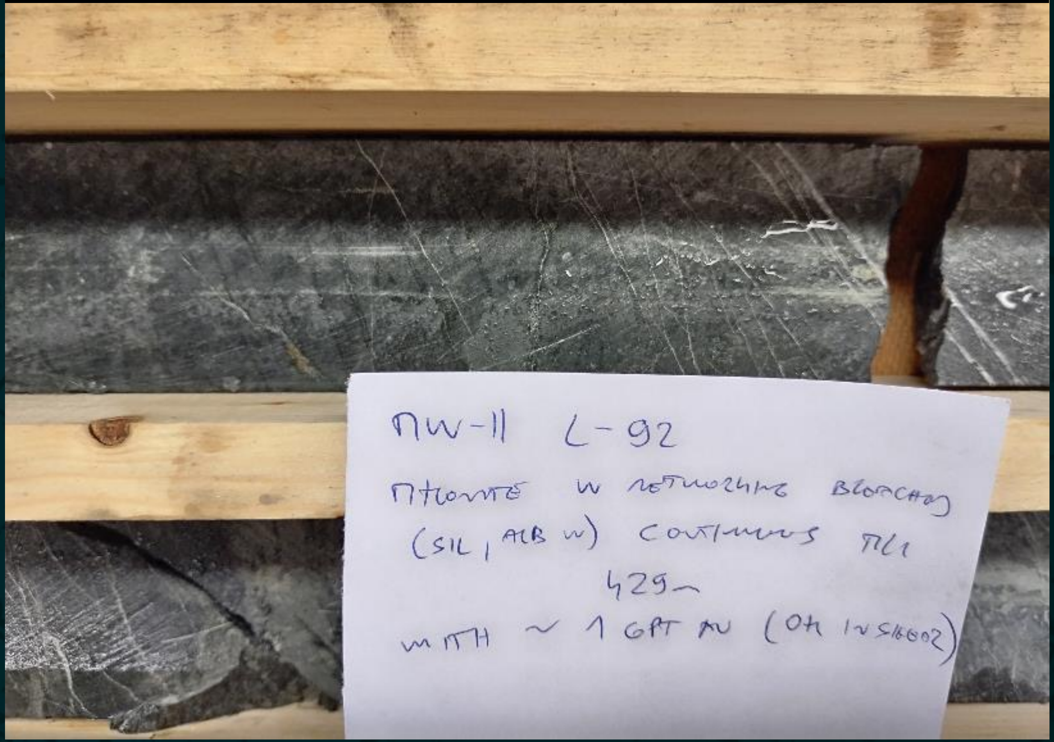

- DH MW11, 404.8-405.3m: Well-developed secondary quartzite vein (pervasive silicification) forming central part of the mylonite zone.
- Importantly, the quartzite zone (historically might be assumed as qtz veins) transits to bleached mylonite with decreasing qtz-chl-amp vein networking outwards from mylonite quartzite.
- Poor sampling mixing quartzite with networking mylonite might affect gold grades significantly, resulting in wider mineralized zone.

## Core observations

*Massive sulphide vein missing mylonitic fabric*


- DH MW11, 412-413.4m: Massive chlpy-py vein similar to MW-09 (409-410m) located just above the vein networking mylonite zone.
- Typical low-grade gold in massive sulphide veins supports the interpretation of gold mineralization as a separate event linked to shearing rather to massive sulphide rare veins

*Thick but poorly developed mylonite zone*




- DH MW11, 414-429m: Thicker zone of simple mylonitic rock with weaker deformation, no networking veins, low-grade gold, missing pervasive alteration.
- Poorly developed mylonite zone, lower-grade of shearing, and lower-grade of silicification resulted in gold-grade drop (around 1gpt/Au per sample in this interval)

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# -[ Core observations ]-

*Alb-Qtz moderate alteration in cg porphyrite tuff*

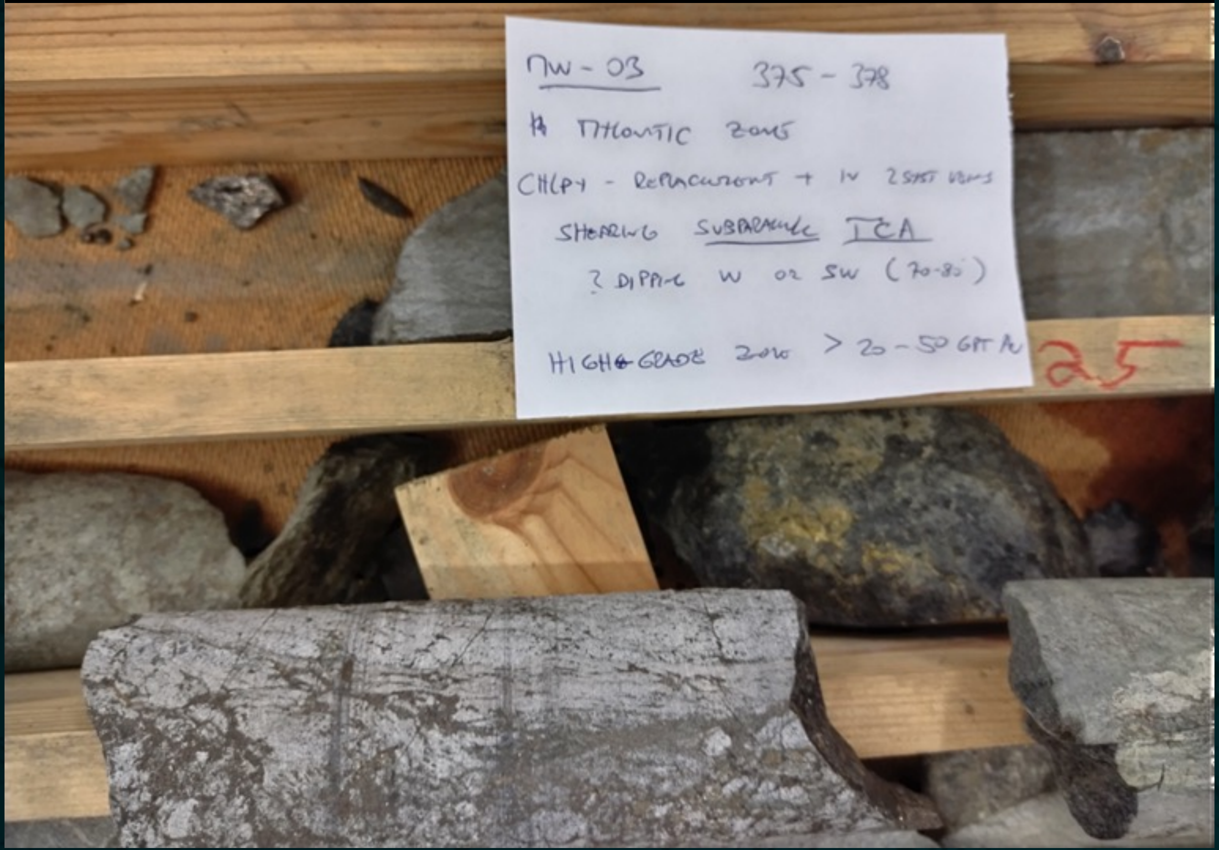

- DH MW3, 351.6-370m: Weak vein networking or mylonitic fabric in cg porphyritic tuff, moderate albitization, silicification.

*Missing core (secondary quartzite zone?) of high-grade in vein networking mylonite*


- DH MW3, 370-372m: Interval of well-developed mylonitic fabric with qtz-chl-amp vein networking on both sides of core missing sample interval.
- Mylonite zone dips 60-70° towards SW or W (striking NNE), thus core not oriented or orientation line is missing.
- Very much orogenic gold-looking core intervals in this hole.

## -[ CORE OBSERVATIONS ]-

*Mylonite deformation with chlpy-py TWO Systems*




- DH MW3, 375-378m: A good example of well-developed mylonitic shearing, typical look of orogenic gold deformation.
- Chlpy-py mineralization in two systems parallel to shearing and other planar features (crenulation cleavage or foliation? not clear).
- Shearing subparallel TCA (dip 70-80° towards W or SW)
- High-grade gold interval hosted in ductile deformation of mylonitic rocks.

# -[ CORE OBSERVATIONS ]-

*Mylonite shearing parallel TCA*


- DH MW3, 279.2m: TCA parallel well-developed mylonite shearing.
- Adjacent to VG and 7.78 gpt Au interval.
- Bleached silicified rock with moderate vein networking.

*Kinematics indicators*


- DH MW3, 304.8m: Kinematic indicators for sinistral (left lateral strike-slip folding).
- Jogs opening along the drilling orientation (??), indicating a NNW-SSE or N-S compression? (σ1).

## -[ Core observations ]-

The shear zone is pronounced by transition zones of strongly to pervasively altered rocks with common vein-networking and locally ductile folding (dipping 70° towards W-SW) controls the high-grade gold mineralization (photo on left).

Rocks have a low deformation degree although massive sulfide veins are not Au mineralized and represent only low-grade Au mineralization when compared to compact mylonite zones.

Parallel mylonite zones are likely to be discovered along the strike of the main shear

*Mylonite vein networking in high-grade gold zone*


- DH MW3, 312-314m: Well-developed qtz-chl-amp (? gold and sulphides) vein networking in bleached strongly silicified mylonite zone.

*Massive sulphide low-grade gold vein*


- DH SZ3, 241m: Massive py-clphy-pyrrhotite vein with low grade gold (0.31 gpt Au)
- Presence of no shearing.

**Not sheared = no high-grade gold!!**

# -[ Historic sampling ]-

Poor sampling standards often observed, not respecting geological boundaries cause (most-likely) dilution to the main high-grade shear-hosted zone with the low-grade host rock.

Two main issues observed:

1. Sampling doesn't respect lithological contacts and geological boundaries → mixing up of high-grade ore with low grade host rock in one sample
2. Longer samples (>1m) over clearly mineralized intervals (to the contrary standard 1m samples in barren or very low-grade intervals)

Incorrect sampling causes a dilution of high-grade gold zones to longer intervals, giving false higher grade to host rock and lower grade to high-grade intervals.

The high-grade intervals would be probably thinner but more juicy. However, this assumption cannot be 100% verified without resampling.

Moreover, a nugget effect has to be considered, since high-grade zones are clearly associated with free gold.

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# -[ Incorrect sampling: case example ]-

Drill hole MW11; interval from 403.5-407.5m

High grade gold mineralization hosted in Qtz-chl-sulphide ± gold vein

- Sulphide mineralization controlled by brittle fracture, also disseminated grains in fractures halos
- 5cm thick rim of semi-massive pyrrhotite and disseminated chalcopyrite developed on a contact with hanging wall
- No VG observed by naked eye or hand lens

Sampling clearly not respecting lithological contacts and boundaries

- High-grade zone is split into two samples and vein material is mixed with low-grade hanging wall host rock, which results in a dilution of the high-grade zone


| DH ID | From | To | Sample ID | Au (gpt) | Comment |
|---|---|---|---|---|---|
| MW11 | 404.3 | 405 | 18714 | 4.08 | Probable dilution of high grade zone |
| MW11 | 405 | 406 | 18715 | 16.51 | High-grade zone |
| MW11 | 406 | 407.5 | 18716 | 1.36 | Footwall, correct sampling |

# Missing core

Practically all best intervals with highest Au grades, which probably hosted visible gold and carried the best grades are completely missing.

It is assumed that it was historically sampled, high likely for mineralogical studies etc.

# - [ CONCLUSIONS ] -

According to core observations, following statements can be made:

- High-grade zones well-correlate with mylonitic-shear structures (striking NNW-SSE, steeply dipping to the NW), which represent a pathway for the Au-bearing fluids and high-grade shoots.
- Shear consists of bleached, quartz-chlorite-amphibole-chalcopyrite-gold tiny networking veins hard to spot by eye or lens.
- High-grade gold shear shows occasionally native visible gold (VG), the nugget effect is significant.
- Massive sulphide zones are low in gold and do not correlate with shearing (gold controlling structure).
- Networking veinlets zones and qtz-chl-gold zones (veins) have commonly transitional contacts and associates deformation history
- Sulphide mineralization shows no clear correlation with gold. However, chalcopyrite seems to be more associated with higher Au grades than pyrrhotite.
    - Chalcopyrite present in majority of high-grade intervals along with the VG, and is apparently related to hydrothermal processes and enrichment of gold.
    - Massive pyrrhotite is generally associated with intervals low in gold. The primary mineralization with pyrrhotite was probably remobilised during regional deformations.
- Biotite alteration locally observed in mafic volcanic rocks hosting high-grade, thin networking veinlets hosting occasionally VG

- All above supports well shear-zone hosted gold (? orogenic gold) model rather the re-worked VMS systems. Didn't see much evidence for VMS quite frankly.

# - [ RECOMMENDATIONS ] -

As the shape of the high-grade Au mineralization bearing shear zone is known (NNE striking, dipping 60-70°). For the representative intersections, new drill holes should be oriented with an azimuth 80-120° and dip 50-75°.

The character and morphology of mineralization seems to be well-understood. The high-grade intercepts shall be most likely thinner but with higher Au grades.

Because of a nugget effect, a fire screen assay analytical method should be used for the expected high-grade zones during the next drilling campaigns (determination of Au size distribution).

Re-assaying of the historic drill core should be considered, as a serious sampling issues were identified during the core validation process.

All new holes should be drilled for an oriented core.