NELSAM progress report, September 16, 2004

I visited South Africa for an intensive week (Sept 2-10, 2004), and I will appreciate your input in two main topics (details below):

1. The location of the first site (see details below). We will also discuss this point in the planned meeting in USGS Menlo Park, 12:00, Oct. 7, 2004.

2. Suggestions to improve our standing with the NRF-DST (see below and my separate letter of two days ago). Contributions to the education of students of previously disadvantageous groups in South Africa are VERY important.

Thanks,

Ze'ev

A proposed change in location of site on the Pretorius fault

Originally, we selected a site on Pretorius fault in Mponeng mine at 104-42 to 109-42 (Fig. 1, from the proposal). This selection was based on the fault geometry, the planned mining production at the time, and the nearby Japanese project (NELSAM proposal). This is not a promising site today. The main reason is that Mponeng mine significantly reduced its production in that region probably due to concerns about the stability of the fault; obviously, the potential for instability attracted us to this location!

Together with Gerrie van Aswegen, and in consultation with rock engineers in Mponeng mine and TauTona mine, I searched for more promising sites along the Pretorius fault. This fault is still a very promising structure for all the reasons mentioned in the proposal, which were further substantiated during this visit. We found two possible sites that I visited; they are briefly described here and more details in Menlo Park, Oct. 7.

SITE 120-18 IN TAUTONA MINE

TauTona mine has started recently major development toward its deep gold deposits, and this site is part of this development. It is currently the deepest production site in the world (3665 m), and it appears the best choice to Gerrie and me. The map of the site in Fig. 2 includes some annotations for clarification. The site is located on the Pretorius fault with a throw of 30-40 m, width of ~50 m and it contained several distinct fault zones. These zones are up to 30 cm thick filled with fine grain well cemented material that looks like devitrified pseudotachyllite (Figs. 3-4); we are working to identify this rock. There is a continuous core across the Pretorius fault about 500 m away; I examined it and found 8-10 fault zones with similar pseudotachyllite.

Strong points:

1. Large earthquakes are expected at this site (and generally in TauTona mine due to their style of mining [long-wall]). An M= 2.2 event occurred on the Pretorius fault ~50 m from the site two days before I visited it! Gerrie calculated a displacement-stress model (Boundary element program of MAP3D with all the mining included) for the expected displacements now and in the future. We are already at a 7 cm slip

deficiency here and this site remains with the largest slip deficiency for the entire Pretorius fault.

2. Excellent options for drilling design (Fig. 2)
3. Plans for relatively fast production around the site. Note that this is also a weak point if we do not act fast enough in installations!
4. Excellent collaboration and relations with the mine professionals (Shaun Murphy and Pieter van Zyl).
5. Likely option that the mine will drill the two long holes for free (not finalized)
6. Already available cores of the entire fault-zone.

Weak points:

1. Plans for relatively fast production around the site- and the main events could come too early.
2. Working conditions are rough: far from elevators, hot and humid
3. The area is relatively noisy due to mining and shaft building activities

SITE 94-65 IN MPONENG MINE

This site is on the east part of the mine. The Pretorius fault zone is well exposed and well recognized between the 99 and 94 levels, and it was well mapped by the mine geologists (my copy of the section was ruined and I wait for a new one). The dimensions are similar to those in TauTona mine (above) with a few different features: no pseudotachyllite, 2-3 clear fault-zones, the largest fault-zone contains ~ 20 cm thick mineralized qz (Fig. 5), AND distinct perfect horizontal slickensides that indicate left-lateral motion (Fig. 6).

Strong points

1. This site is likely to generate the largest earthquakes in Mponeng mine. Two M>2.0 events already occurred about 150 from it. The above-mentioned model indicates that this site will have the largest slip on the Pretorius fault in Mponeng mine, second only to the site mentioned above.
2. Excellent access that allows good site design.
3. Good collaboration with mine professionals and manager.
4. Production plans fit well our instrumentation capabilities.

Weak points

1. The Mponeng mine design is to prevent earthquakes > 3.0 by having wide pillars and avoid long-wall mining.
2. Mponeng mine is known to have smaller earthquakes
3. No chance for free drillings

South Africa membership in ICDP

South Africa is required by ICDP to pay $20,000/year. The NRF (National Research Fund) and the DST (Dept. of Science and Technology) want to be convinced that the contributions to South Africa justify their expenses. During my visit, we had an important meeting on this subject. Participants were: Dr. Prins Nevhutalu, NRF; Dr. Busi Madolo, DST; Ms. Mmampei Mabusela, DST; Dr. Gerhard von Gruenwaldt, NRF, and Ze'ev, Ray Durrheim, Steve Spottiswoode and Ewan Sellers (CSIR). Followed this discussion, it became clear that NRF-DST will evaluate more favorably our project if we outline specifically our contributions to the EDUCATION of students of previously disadvantageous groups, and we make significant positive contribution to the Science and Technology of South Africa.

NRF is ready to match our investment in education of students of previously disadvantageous groups, so this may also help our effort.

Two days ago I sent a draft of a letter to NRF-DST and will appreciate your comments and suggestions.

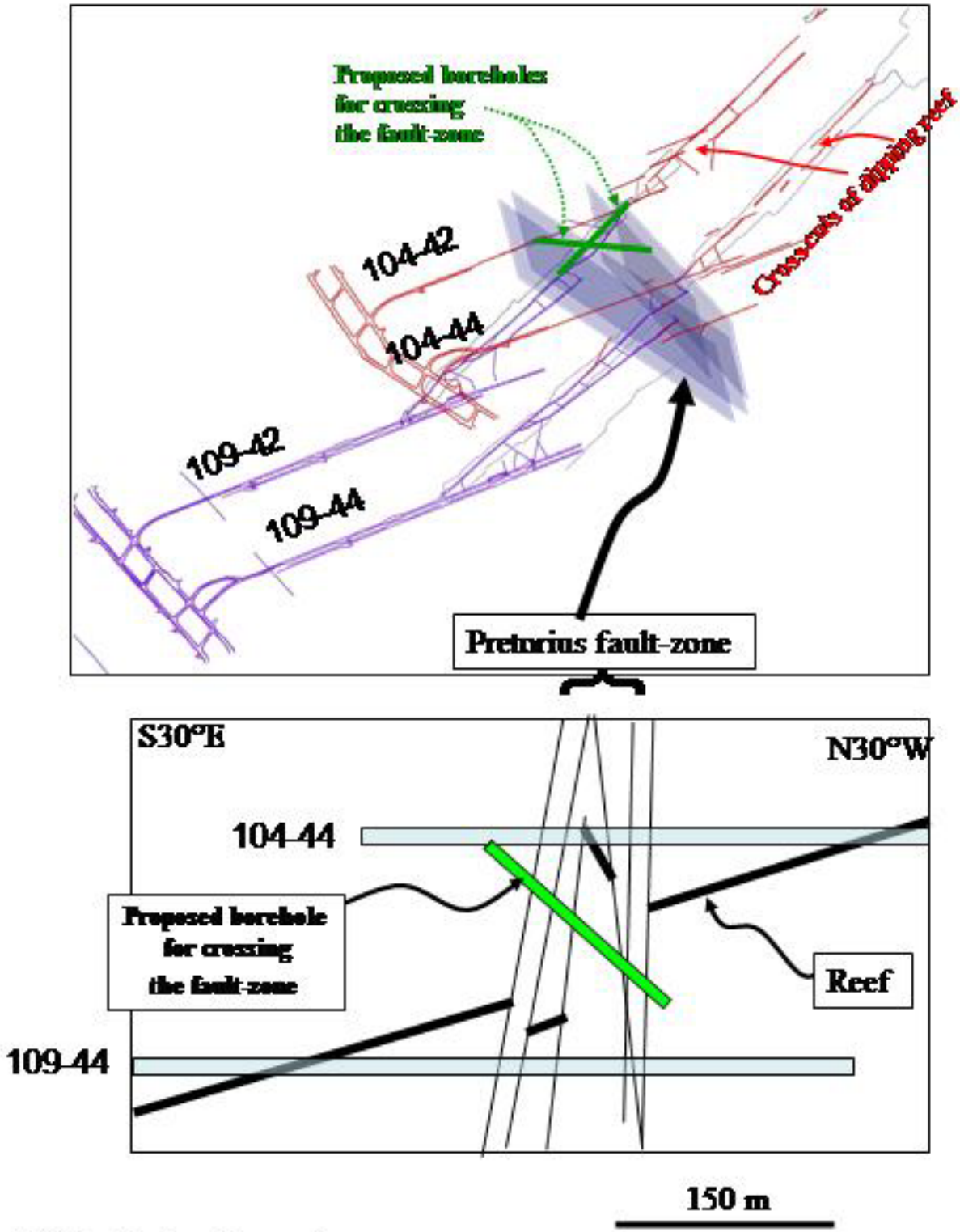
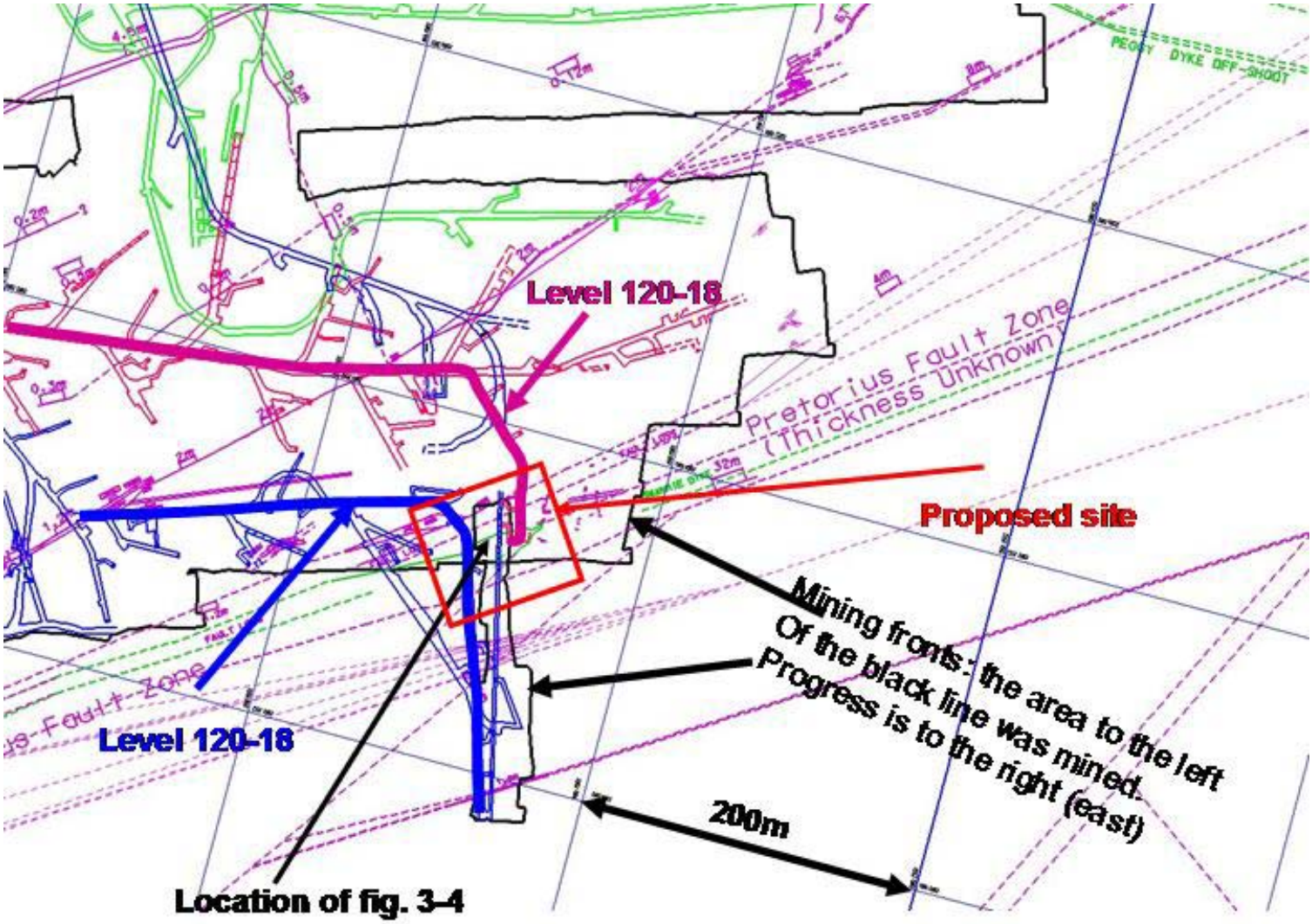
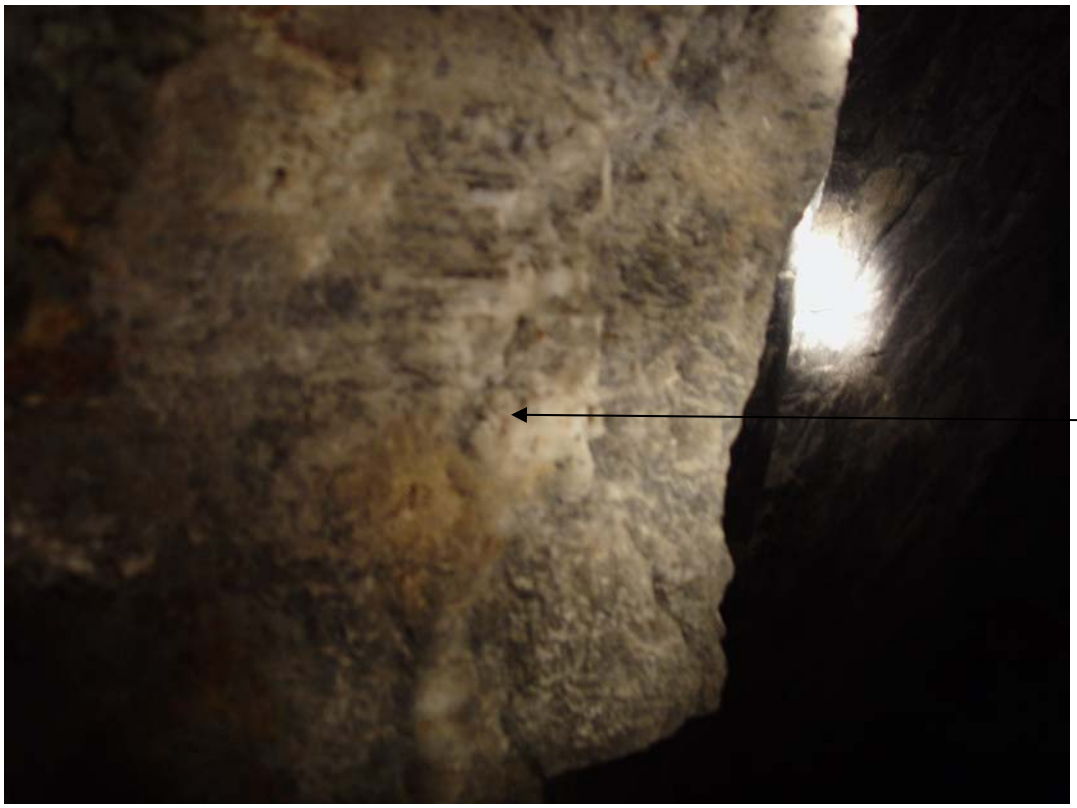


Fig. 9. (caption in previous page)


Level 120-18
Pretorius Fault Zone
(Thickness Unknown)
Proposed site
Mining fronts: the area to the left
Of the black line was mined.
Progress is to the right (east)
Level 120-18
200m
Location of fig. 3-4

Pseudotachyllite?

Figs. 3, 4



Figs. 5, 6