

CHAPTER 4

SYNTHESIS

In the discussion it becomes clear that there is an urgent need to conserve the gold-mining activities as well as the granite quarries for future reference, either for scientific or educational purposes. Some of the sites have the potential to be used for geotourism purposes, while others can be kept as they are for scientific purposes, but there are also those that should be recommended for selective closure.

The main concern is the fact that all of these mining activities are still seen as “active” mining operations with no closure certificates issued. A more detailed discussion of the conclusions and recommendations follows below.

4.1 CONCLUSIONS

4.1.1 MINING ACTIVITIES AND THEIR GEOLOGY IN THE VDWHS

A surprising number of 112 excavations were identified and investigated in the VDWHS, of which 97 were gold-mining activities and 15 were granite quarries.

Existing information on the mining history and geology of the sites and reefs is very sparse. An attempt was made to describe the geological features as far as possible without disturbing the outcrop for geoconservation considerations and personal safety.

Gold-mining activities

The observation is made that all possible conglomerate exposures seem to have been investigated by gold prospectors between 1888 and 2007.

The gold-mines were concentrated on three main reef horizons, which were considered to carry economic gold concentrations at the time.

These reefs are:

- Amazon Reef, also referred to as Cullinan, South, Rous, Jumbo, and Great Western Reefs at different geographical locations in die Vredefort Goldfield.
- Main Reef, also referred to as Odin, Meisters Series, Red Reefs or Witfontein Leader at different localities in the Goldfield.
- The Veldschoen Reef. No alternative names were encountered.

Poor knowledge of the Witwatersrand stratigraphy culminated in the abandoning of the mines, as is illustrated by faulting out of reefs and no attempted to locate the faulted reef, or the incorrect assumption that the “bottom” part of the conglomerates was in reality the upper part due to overturning of the layers as is known today.

Granite quarries

The granite quarries were all located in the younger OGG (Parys granite) of the granitic core of the impact crater. Apart from the noise and dust pollution caused by the mining of the dimension stone blocks, unwanted cracks, as well as black pseudotachylite, due to the meteorite impact, contributed to the closing down of the dimension stone quarries.

4.1.2 SUITABLE SITES FOR GEOTOURISM AND THE GEOCONSERVATION THEREOF

Mining and quarrying have exposed undisturbed rocks, unlocking a treasure chest of the earth, that have ignites sparks of inquisitiveness in people. The opportunity presents itself to use this to introduce the geotourism concept.

In the belief that some of the mines and quarries can be made safe to tourists, the recommendation of sites with geotourism potential has been done following a classification on the basis of accessibility, safety and geodiversity.

In selecting sites suitable for geotourism the main objective was to choose sites that will enrich the historic and geological value of the area, namely:

- representative time horizons of the Earth’s history;
- the full stratigraphic sequence from the basal conglomerate through the overlying quartzite to the shale layers ending a sedimentary deposition cycle;
- faulting of various ages can often be seen in underground developments; age relationships of faulting and intrusives;
- the transfer of knowledge of historic mine engineering, gold metallurgy and beneficiation;
- environmental contamination;
- the stimulation of interest in natural science and specific geology;
- concepts of geoconservation and geodiversity with well-presented information notice boards – overdue in SA;
- display of multifaceted rock faces; and

- mining design compared to modern techniques and equipment.

According to the set of proposed criteria a representative set of 16 gold-mining and 13 quarries were identified with geotourism and geoconservation potential.

Geoconservation is overdue as the first signs of geovandalism are evident, i.e. indiscriminate sampling for research purposes defaces outcrops or quarry walls, “rock” graffiti, and removal of rock material –just to have a souvenir of the VDWHS is evident. The removal of geological specimens has been stopped in all geoparks internationally acknowledged by UNESCO and especially those that have been incorporated into the global or European Geoparks Network. The Management Authority will have to implement strict regulations for sample-taking by scientists, as well as implementing reasonable policies preventing the removal or disturbance of geological samples.

The extensive assemblage of photographs (available to the Management Authority as soon as a scientific officer is appointed) taken during this study can be used as a base line for the current state of the condition of mines and quarries.

Oosterhuis (1998) refers to “the black, glassy veins of pseudotachylite as an unusual and attractive geological feature of the Parys Granite”, illustrating how scientific knowledge can add to the intrinsic value of Earth materials and geological processes.

4.1.3 LEGISLATIVE SITUATION WITH REGARD TO SAFETY AND REHABILITATION OF SITES

Due to increasing tourism in the VDWHS, sites that are not earmarked as geosites have to be made safe. The presence of diverse fauna and flora hosted by the excavations necessitates the input of nature conservationists, zoologist and botanists.

The accessibility of the mines varies from easy and visible from roads to secluded and bounded by fenced-off private game farms. The danger of continued use of the mines as tourism attractions is evident from this study and it is therefore recommended that urgent attention be given to this aspect. The onus rests with the present landowner to ensure that the provincial DMR and Management Authority are approached when considering using sites as tourism attractions. Costs for tourism safety, and geoconservation of sites used as tourism attractions are for the beneficiary’s account. The rehabilitation and safeguarding of sites left by companies who no longer exist, should be covered by government. The urgency of providing for funds to initiate closure of sites cannot be overemphasized. With visitor numbers increasing the risk of accidents related to relic gold-mines and granite quarries is increasing.

4.2 RECOMMENDATIONS

The geodiversity of the Vredefort Dome is evident in every study undertaken in this area. Even from this study of the World Heritage Site's mines, a diverse array of reefs and other geological elements could be identified.

This must be kept in mind when dealing with the Vredefort Dome's abundance of mines, quarries and prospecting trenches. One must realize that the meteorite impact has resulted in a geological wonder. The scenic value of the area is also becoming very attractive. The recreational activities like river rafting, abseiling, and mountain biking require specific geological environments.

Since the mines are all still classified as "open", risk assessment must be revised and refined prior to commissioning of any mining site for tourism activities and conducted at regular intervals as authorized by the Department of Mineral Resources. If sound risk management practices are applied consistently and comprehensively in each mining site, the following objectives could be achieved:

- Conservation of the health, safety and well-being of visitors and employees associated with the activity;
- Conservation of resources (geoheritage);
- Conservation of the environment and
- Preservation of assets.

In order to achieve these objectives the following are required:

- Identification, evaluation and control of all physical and financial risks;
- Participation by all individuals associated with the activity;
- The control of risks by taking risk avoidance measures;
- Instituting of risk prevention measures
- Applying of risk-reduction measures; and
- Implementing of physical and financial risk control measures.

It is recommended that the risk management policy of the Vredefort Dome Management Authority should include all aspects of the mining sites as identified in this study.

The mines identified with tourism potential must be revisited if a request is made by any party for use of such mine for any human activity. The risk rating of each mine can easily change if the land use or other variables change. For example, a mine site with low risk rating can change to high risk if the property is incorporated into a hiking trail. The alarmingly high results of the completed risk rating done on these sites (Table 5)

should be followed up. The fact that all the recommended mining sites have a current high risk ranking highlights the importance of urgently taking action.

The sites not to be used for tourism activities must be fenced off. This should be done in an ecologically sensitive way in consultation with the provincial nature conservation departments so as to enable access to fauna frequenting the mines. It is recommended that funding be made available for a project to have the sites closed off. A cost estimate can be drawn up to determine the cost involved in fencing the sites. This should be done by the Management Authority. An alternative would be to approach the Minister for allocation of funds available for use in rehabilitation of ownerless defunct mines. In this case the project will be run and managed from national level. Information and warning signs should be erected at the entrances to all mining areas.

It is important to have underground mine plans surveyed for all of the mines, especially the ones identified with tourism potential. This will assist in disaster management situations and public safety. Plans should be kept with the DMR and the Management Authority. An attempt should be made to recover or copy plans that may exist with the DMR keeping in mind the fire which is said to have destroyed most of the maps from the Mining Commissioner's Office in Venterskroon.

The identified rehabilitation areas should urgently be dealt with in terms of method of rehabilitation, funding thereof, and implementation of rehabilitation. Any rehabilitation measures must in the case of the VDWHS be done in consultation with specialists in the field of geoconservation as the mining relicts in this area plays an important role in the geodiversity of the area. Acid mine or rock drainage must be quantified and where mine effluent enters streams, groundwater (boreholes) or the Vaal River, like at the Great Western Mine at Elandslaagte 28 and the mines on Rooderand 510IQ and rock dumps in close proximity to the Vaal River, urgent rehabilitation and preventative actions should be implemented.

Extensive exploration drilling has been done through the Witwatersrand succession in the VDWHS by various mining companies. The drill core is probably stored by some or might have been discarded by others. It is recommended that, as a matter of urgency, the core of full stratigraphic successions from representative locations across the VDWHS be located. A request, where the mining companies can be identified, must be made for the donation of the core together with geological descriptions to the Management Authority, a local University and /or the Council for Geoscience in Pretoria

(National Core Library are stored here). It is crucial that the storage facility at the selected site meet the requirements of safe storage of the core and information.

It is proposed that this study be expanded to include an investigation into the remainder of the Vredefort Dome–mining sites. The Greenland’s greenstone gold-mining sites, copper exploration pit in the OGG, and others scattered outside the VDWHS, but part of the greater Vredefort Dome Structure and the Witwatersrand basin, will certainly add to the interesting history of the area.

The location of proposed borrow pits for upgrading of roads in the VDWHS should be chosen with care and not only considering financial gains. The involvement of scientists with local knowledge of the sensitive sites, and greater geodiversity should be enforced.

The idea of introducing a larger Vredefort Geopark to ensure the safekeeping of those valuable outcrops falling outside the proposed VDWHS is recommended.

With tourists purposefully or innocently removing geological specimens (e.g. shattercones, pieces of granophyre) for their own collections or memorabilia sensitive sites will be spoiled. Such sites should be protected and signage erected to inform visitors first of the value of the conservation of the site (education) and, secondly, that it is a criminal offence in the VDWHS to remove any samples from the area. Any research conducted in the VDWHS must be tabled for approval by the Management Authority and scientifically reviewed. A site conservation plan must be drawn up and managed by the Management Authority. Regular inspection visits are then also recommended.

Procedures to conserve the geodiversity against vandalism must form part of the risk assessment conducted prior to use of any mine or quarry for tourism activities. The conservation aspect of the risk assessment plan must follow the same approval and regular monitoring guided by regulation.

To ensure that the information gathered during this study does not go unnoticed and will be available for future continued studies, a GIS database was handed to the North West Province and should be maintained and used as part of the Management Plan of the VDWHS to monitor geoconservation. This report should not be considered as containing coordinates of all mines, but rather as an attempt to cover the majority of the sites especially those accessible to tourists. It is advised that as fieldwork and studies in the area continue, new sites be added to the database. This should be the responsibility of the scientific officer at the Management Authority, but in the meantime the responsibility will rest with the researchers working in the VDWHS to report new findings regarding mines to JM Jansen van Rensburg (the author).

Once destroyed a specimen or view can never be repaired or replaced. It all boils down to education, as aptly illustrated by the words of Baba Dioum, an African conservationist:

For in the end we will conserve only what we love.

We will love only what we understand.

And we will understand only what we are taught.