
PORGERA'S IMPACT ON RIVERS

Porgera gold mine in the Enga Province of Papua New Guinea has always measured itself against world best practice. The compliance criteria for the Porgera operation were based on international water quality guidelines.

Porgera discharges waste to the river system and has operated in compliance since start-up.

In 1996, an independent review of the mine's impact on the river system confirmed the original prediction that the mine does not have significant impacts on people and the environment.

The Porgera Joint Venture now presents the results of the review and its actions to further protect the local people and environment downstream of the mine.

THE ENVIRONMENT

The Porgera gold mine is located in rugged terrain at the head waters of the Fly River System in the Lagaip / Strickland rivers catchment, where there are fast flowing, turbid rivers. The area is subject to landslides, seismic activity and abnormally high rainfall. Building a mine in this environment is considered to be one of the outstanding engineering feats within the Placer Dome group of companies.

In such conditions constructing a tailing impoundment and containing waste was very difficult and the risk of a tailing dam failure was high. Therefore, on a risk basis, the PNG Government approved the Porgera Joint Venture (PJV) preferred option of riverine disposal as the most appropriate method of disposing the mine's waste material. Using this method, treated tailing and soft waste rock are discharged into the river system. Approximately 6 million tonnes of tailing and up to 20 million tonnes of waste rock are discharged to the river annually.

Approvals and compliance

Despite the stringent water quality criteria set by the Papua New Guinea Government, Porgera gold mine has remained in compliance.

In the early stages of seeking government approval for development of the mine, the PJV prepared a 'Proposal for Development' which contained a detailed Environmental Plan. The Environmental Plan identified the major issues associated with riverine discharge as sediment impacts and increased metal levels in the water. The Environmental Plan was reviewed by both the PNG Government and an independent international consultant before receiving final approval from the government.

The PNG Government requested that an Environmental Management and Monitoring Program (EMMP) be developed as one of its conditions of approval. The EMMP was also reviewed by the Government and the same independent consultant before consent was given for the project to proceed.

The consent imposed strict compliance criteria for monitoring station SG3 in the Strickland River, against which PJV performance would be compared. These compliance criteria are based on water quality guidelines from around the world and are significantly more stringent than PNG's normal water quality requirements.

Ownership

The PJV consists of:

- Placer Dome Inc (50%) which manages the mine
- Goldfields Limited (25%)
- Orogen Minerals Limited (20%)
- Yuwai No. 65 Limited (5%) a company owned jointly by the Enga Provincial Government and Kupiane Yuu Anduane Limited (a company owned by the Porgera landowners).

THE REVIEW

Independent, international experts

In 1995, five years after mining operations began, Porgera Joint Venture commissioned an independent review of its down-stream impacts, to determine how good the predictions made in the original Environmental Plan had been - and to answer concerns that had been raised about the impacts on the local people and the environment.

To manage the review, PJV commissioned the Commonwealth Scientific & Industrial Research Organisation (CSIRO), an Australian-based independent research organisation with a reputation for integrity and scientific excellence.

The CSIRO brought together an independent team of experts in human health, toxicology, aquatic biology, sediment transport and hydrology.

The team's research spanned several months and involved site visits to Porgera and the communities downstream of the mine site to determine health and environmental impacts, water quality and the adequacy of operational practices.

This publication outlines what was studied and why, the findings of the review team - including what Porgera does well and what could be improved - and what changes have subsequently been made, to further monitor and minimise the impact of Porgera's operations on the river system. The review was released publicly in December 1996.

What was studied and why?

The health of local villagers

A medical team visited twelve villages potentially affected by riverine discharges. The villages were scattered over a distance of several hundred kilometres along the river system downstream from Porgera to Lake Murray. The team carried out a comprehensive survey of the human health conditions of the villagers. One of the most important aspects of the survey was the testing for motor nerve development (which is sensitive to metal poisoning) in children living along the Strickland River.

Chemical impacts in rivers

The team recognised the importance of evaluating the potential effects of metals in the environment in terms of the forms in which the metals were found. The different forms of metals and the potential for their release were scrutinised in some detail.

Sediment build-up in rivers

The effects of riverine discharge on the sediment load of the river and on the lifestyles of local communities were investigated. The study distinguished between the upland river system closer to the mine and the lower flood plain and Lake Murray area.

Monitoring and compliance

The review team evaluated the monitoring program for the mine including the type and suitability of the equipment being used, the data collected and how they were being interpreted and whether we were collecting the right information to determine actual impacts. The adequacy and capabilities of the PJV environmental laboratory and equipment were also evaluated.

THE FINDINGS

What we do well

Health of local villagers

The testing for motor nerve development showed no clinical or epidemiological evidence of heavy metal effects on children.

As a further safeguard, PJV has installed water tanks in villages along the Strickland River to improve availability and quality of drinking water.

Chemical impact on rivers

The review concluded:

The potential for acid conditions in the Lagaip and Strickland rivers is very low and hence impacts of metals on people would be low.

The PJV collects significantly more monitoring data than required by government to allow for early detection of mine impacts. This data includes:

- total metals in water and total suspended solids in water to help understand the river water chemistry
- metals levels in fish to assess potential health effects
- Research into mercury levels at Lake Murray to determine if PJV activities will have any long term effects.

Sediment build-up in rivers

The review concluded that there is unlikely to be large scale or over-bank deposition of sediment in the river system but some scouring and deposition may occur in the upper reaches as predicted in the Environmental Plan.

Monitoring and compliance

The review concluded that:

- PJV has been in compliance since the project start-up.
- Sampling and analysis techniques used for the monitoring program are appropriate.
- Predictions made in the Environmental Plan about the impact of riverine disposal on the upper river system, have proved to be reasonably accurate.
- Detailed sediment information is collected at SG3.

Where we can improve

Health of local villagers

Measure metal residues in village foods that have not been previously defined to allow better assessment of potential exposure pathways.

Chemical impacts on rivers

Undertake risk assessment of the floodplain and Lake Murray to assess potential impacts.

Review the effect of increased production on residence time in the neutralisation system and the effect on metal levels in tailing.

Sediment build-up in rivers

Develop a model of total sediment transport in the river systems.

Undertake a sediment coring program to determine if mine derived sediments are evident in the lower Strickland River flood plain.

Monitoring and compliance

- Additional resources are needed to undertake the more vigorous monitoring program recommended.
- Revise the existing EMMP to focus on potential impacts rather than just compliance.
- Consider moving compliance point upstream from SG3 on the Strickland River to SG2 on the Lagaip River.
- Expand data collection to include control sites for comparison with data collected from the Strickland River system.
- Expand the biological program to include invertebrates living in the river sediments.
- Upgrade the hydrological status network to improve the quality of

What steps are we taking

Health of local villagers

PJV is introducing an expanded project to collect all food substances used by the local community and subject them to metal analysis.

Chemical impacts in rivers

A risk assessment of Lower Strickland and Lake Murray is being undertaken in early 1998.

A detailed neutralisation study is underway and is expected to be completed in June 1998.

Sediment build-up in rivers

Development of a model for sediment transport through the river system is underway.

A sediment coring program has been undertaken and results are expected in early 1998.

Monitoring and compliance

- PJV has employed five additional staff in the Environment group and retained specialist consultants.
- A new EMMP has been submitted to the PNG Department of Environment and Conservation for review and approval.
- Monitoring at SG2 has been increased to evaluate its suitability for compliance monitoring.
- Control sites have been established for different areas of the Strickland River system.
- The biological monitoring program is being expanded to include invertebrates in 1998.
- The hydrological network improvement program has commenced and should be completed in early 1998.

VISION FOR THE FUTURE

The PJV acknowledges the concern expressed by downstream communities and special interest groups over its mining activities. Accordingly, it has formed the Porgera Environmental Advisory Komiti (PEAK) which comprises representatives from the PNG government, Australian and PNG NGOs, independent technical experts and the PJV. The committee will oversee the implementation of the independent review's findings and consult with the PJV on other relevant issues.

Porgera's vision is that the rivers and the mine environment will return to their natural states after mining ceases.

Porgera's vision for the local people is that their health and living standards will be better than before the mine began, as a result of the company's sustainable development practices.

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