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## PAPAU NEW GUINEA

*by Dave Chambers*

### Ok Tedi Mine

The Ok Tedi Mine is a large copper-gold mine in western PNG operated by Broken Hill Proprietary Ltd. (BHP), a large Australian conglomerate. The mine has been in operation for 15 years, and utilizes riverine disposal for both its waste rock and tailings. Riverine disposal is the dumping of both waste rock and tailings directly into the river system below the mine. The waste rock, which is removed to access the ore, is dumped at the edge of the mining operation, and flows downhill as a rock glacier into the river. The tailings, which consist of finely ground particles of rock and residual process chemicals used to concentrate the ore, are piped from the mill directly into the Ok Tedi River.

The mine is located in a mountainous area, and rocks in the local area are generally soft sediments. The combination of steep terrain, over 300" of annual rainfall, and soft country rock make it geotechnically impractical to build a tailings impoundment near the mine. Similarly, waste rock storage areas are difficult to find, and tend to be geologically unstable. As a result, the mine-design engineers chose to utilize riverine waste disposal.

The riverine disposal of the waste into the Ok Tedi River increases the base sediment load of the river 140%. Some of this waste is acid generating, and acid seeps from waste rock in the river can be seen from the air. 100 miles or so downstream from the mine, past the point where the Ok Tedi River

joins the larger Fly River, all of the larger pieces of waste rock have ground themselves into sand-size, or smaller, particles. As a result, large amounts of sediment are deposited in the river. This is creating an elevated riverbed, and raising the water table in the land surrounding the river accordingly. 170 km<sup>2</sup> of vegetation that bordered the river has died due to the elevated water table. This area could increase to 1350 km<sup>2</sup> over the next 20 years.

In addition, contamination from metals in the tailings released in the milling process, and the possibility of metals that could be released in the future by oxidation of sulfides in the waste rock and tailings, are also of concern.

BHP has publicly stated that they will not build a mine utilizing riverine waste disposal again. They would also like to close the mine, or give their interest to the PNG government. However, this mine generates 10% of the GDP of PNG, and provides virtually all of the financial, logistical, and technical infrastructure for the region. The social costs of closing the mine would be as great, or greater, than the environmental costs of continuing operation, which makes closing the mine impractical.

BHP is in the process of analyzing the costs of mine closure, with the goal of closing the mine as soon as possible while minimizing both the social and environmental costs of mine closure.

### Porgera Mine

The Porgera gold mine is a large open pit mine located in the mountains of central PNG, and is operated by Placer Dome Ltd. Like Ok Tedi, the mine utilizes riverine waste disposal for both tailings and waste rock. The river system at Porgera is larger, and the amount of waste being dumped into the river is less than that at Ok Tedi. As a result, the impacts to the river system are less, but nonetheless dramatic. PNG water quality standards, which are similar to those in the US, are being met at a point 100 miles below the mine – a 100-mile mixing zone.

Placer Dome, like BHP, has also indicated that they would not operate the mine with riverine waste disposal if they had the opportunity to begin mine planning again. Placer Dome has had more success than BHP in building waste rock dumps, and is conducting some innovative research on blending the tailings into waste rock dumps as a means of permanent tailings disposal, but at the present time all the tailings and a large quantity of waste rock are still being dumped into the river.

*(Continued on page 3)*

## Misima Mine

Placer Dome also operates an open-pit gold mine on the Island of Misima in eastern PNG. From 1988 to 1994 “soft” waste rock was dumped off the beach into the ocean. As a result, over 5 km of coral reef have severe or transitional impacts. The tailings from the mine are being dumped into the ocean via a pipeline with a discharge point of 116 meters below the surface. The tailings (and the soft waste rock), flow down a steep (> 45°) submarine slope into a deep trench. Even though there is minimal chance of metals oxidation at these depths, there has been some metals accumulation measured in shellfish and crustaceans, possibly associated with mine-derived sources of sediment.

## Future Waste Disposal Practices in PNG

There are too many instances of environmental harm, and the possibility of long-term problems from riverine disposal is too great, to justify any new mines that utilize this waste disposal method. The Center is working with a number of other organizations to press the mining industry to publicly state that riverine waste disposal will not be used at any future mines. There is significant resistance within the industry to this proposal because it would foreclose the exploration and development of some ore bodies. Likewise, governments of some developing countries are willing to entertain the risk of creating environmental sacrifice areas because of the large sums of money that would be generated from mines using riverine waste disposal (which is, coincidentally, the cheapest method of waste disposal).

The Center is also helping the environmental community evaluate the pros and cons of submarine waste disposal. It can be argued that submarine disposal of wastes, if they are discharged at depth, may have advantages over on-land waste disposal. However, the potential long-term risks associated with submarine waste disposal are more difficult to quantify than those of on-land disposal. The Center has already been involved with analyzing the potential impacts from submarine tailings disposal for a number of years, mainly in the context of proposals for disposal into deep fjords in Alaska, and from analysis of data from actual disposal operations in British Columbia. We will continue to work on the difficult matter of weighing the benefits, i.e. low probability of acid generation and allowing economic development, versus the risk of high mobility of the waste and the inability to access the waste if problems should develop.

## *From the Executive Director*

The articles in this issue all come from a trip to Papua New Guinea that I took in May, accompanying Steve D’Esposito of the Mineral Policy Center (and a **CSP** board member) to look at riverine and submarine waste disposal practices being employed at mines in that country.



*Dave Chambers is the Executive Director of **CSP***

I decided to devote the entire issue to describing my observations from this trip. Not only are the impacts from riverine waste disposal so egregious, but some of the lessons learned by the mining companies operating these mine, Placer Dome and Broken Hill Proprietary, Ltd., also put them in the forefront of addressing some of the social problems that arise when large industrial projects move into a relatively undeveloped area. We face some of these same problems with mining here in North America.

Even as an experienced professional who has seen many mines, the site of tailings being discharged into a river appalled me. With a coalition of environmental groups, we are working directly with Placer Dome and BHP to get their management to adopt a corporate policy that would prohibit the development of any future mines utilizing riverine disposal of mine waste. If we are successful, we hope to extend this policy to all mining companies.

I apologize for the lack of pictures in this issue, but even without the photos, there still wasn’t enough room to adequately describe the interesting environmental and social issues at these mines.

## **CSP** WEBSITE

Finally, **CSP** has a web site! While it won’t win any awards for design, it is functional. The web site contains information about the organization, board and staff members, copies of newsletters, and most importantly, publications from the Center that can be downloaded as Adobe Acrobat® files. Please take a look, and let me know if you have suggestions for improvements or additions.

A handwritten signature in black ink that reads "Dave Chambers". The signature is stylized and cursive.



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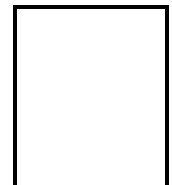
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