PAC Meeting for Rocky Hill SSD 5156.

Presentation by David Marston

I read with interest the DPE Assessment of the Rocky Hill Proposal and commend them for their forthright analysis of many of the problems associated with this concept for a mine. My career has been in soil and water conservation and vegetation management, so I was keen to see what they had to say about the final landscape.

When I read that the Department supports the GRL commitment to develop a final landform that reflects the original landscape I was concerned. Concerned because the GRL proposal does not indicate any detail of how this will be achieved, or the risks associated with this. Concerned because the proposed final landscape is potentially an environmental disaster that has not been assessed by GRL or the Department.

Yes, if there needs be a mine, let's support the concept of not leaving a void but this must be designed properly and the GRL proposal gives no indication that they know how to do this. It's a joke and Gloucester will be left with the problem. In this case it would be much better to simply leave the landscape as it is and continue agriculture.

If this was any other development proposed that would entirely change 832ha of landscape and move 126million cubic metres of soil (some of it twice), it would require a level of investigation not seen in this proposal. But this is a mine and therefore it seems, the landscape proposal can be very light on detail and not adequately assessed. For example, some of the sediment dams at the foot of the barriers will be constructed on the flood plain so that if they overflow or are breached in a flood, there will be a major pollution event in the Avon River.

It might be suggested that all of these issues will be addressed in the Mine Operations Plan but this is not acceptable because approval to mine will have been granted before the rehabilitation is assessed. The risk of not being able to rehabilitate is high in this proposal and this issue must be addressed as an integral part of any initial approval.

Then I read that the Department thinks that the landscape "proposal represents contemporary best practice". This caused me to look at what "contemporary best practice" might be and I consulted an Australian Government publication developed in association with the mining industry. It is called:

"Mine Rehabilitation – Leading Practice Sustainable Development"

Published by Australian Department of Industry, Tourism and Resources 2006 & 2016.

This publication has been around long enough that GRL should have read it. Maybe their environmental consultants who prepared the EIS did know about it but GRL would not let them use it because it might cost more and even indicate the real problems.

The Australian Government "Leading Practice Manual" says:

> Despite suggestions that reconstructed mined landforms should, wherever possible, mimic natural landforms within the region of the operation, it should be understood that most waste landforms are essentially large mounds of unconsolidated materials that may—in their properties—bear little, if any, relationship to the rock and weathered material making up nearby natural landforms. Nor, unlike on natural slopes, is there potential for any incision that occurs to be constrained by underlying bedrock. Consequently, mimicking natural landforms without any consideration of material properties has a very high probability of failure, particularly where erosion risk is high.

The GRL proposal has not considered this issue. In fact, the proposal is to place a new landscape 47m high on top of 100m of filled void without any risk assessment.

The proposed "amenity barriers" will be up to 57m high with up to 18^0 slope. This puts them in the 'high risk' of erosion category according to the Leading Practice manual. This means that there should be analysis of erosion risk for various rainfall events, soil properties and vegetation profiles. The original soil analysis in the EIS indicated that the soils are dispersible and highly erodible. This information has not been used in a risk assessment of the barriers or final landscape. GRL has not assessed the risk of an east coast low pressure weather system with rainfall at 100mm/hr occurring within 1-2 years of constructing the earthworks. Similarly, there should be analysis of the erosion impacts of various vegetation types, establishment patterns, and growth rates for various weather patterns over the total period of rehabilitation through to stability. This has not been done.

The Leading Practice manual says:

> However, where landform risks are high, there is a considerably greater requirement to develop designs very closely attuned to site materials, climate and revegetation outcomes. Generally, this requires careful material characterisation and the appropriate use of run-off/erosion and landform evolution models.

Exactly the same issues apply to the proposed "final landscape". There is an added risk in this situation because GRL proposed to establish drainage streams across the landscape to carry the water from the area to the east when the diversion banks are removed. There is no analysis of the operation of these streams, yet the Leading Practice manual provides information on formulae and processes for assessing runoff volumes and velocities, infiltration rates and capacity, engineering options and vegetative impacts. Why has the analysis not been undertaken by the proponent or the Department?

The Leading Practice manual also says that:

> Note also that the discharge of water from the top of waste dumps carries significant risk. In many situations, run-off from the top of the landform is concentrated so that some form of stable flow line is then needed to carry the water to ground level, where a controlled discharge point will be required. Rock drains or chutes are commonly used, but the rate of failure of these types of structures is extremely high.

If water is retained on the top of the waste dump or tailings storage facility, it is essential to consider the potential for prolonged ponding and damage to plants. There is also potential for water ponded on top of a landform to infiltrate and then cause subsidence within loosely dumped materials, creating sinkholes. For these reasons, the depth and duration of ponding at any point on the landform surface should be minimised. Keeping the top of the landform level, maximising surface roughness and installing bunds to create relatively small cells of 1–3 hectares can achieve this.

The "new" landscape will be up to 47m higher than the original land surface and some of this will be on top of 100m of fill in the void area. The concept of running water in a recreated stream over 150m of fill is technically nonsense. If GRL was serious about this visual concept, they should have provided evidence of how it was to be done and the erosion and water management risk analysis. In reality, water in the streams will infiltrate through the fill and accumulate in the void as a salty, acidic mass that then seeps out into the Avon River as surface or ground water.

It is highly likely that differential subsidence along the length of the constructed watercourses will result in the development of saline swamps. This will kill the vegetation and add to the risk of acid mine drainage overflowing the old void area. Why has this not been assessed?

The Leading Practice manual says:

A range of options is regularly adopted for 'managing' surface flows. Because such options may carry significant long-term risk, the decision to construct an engineered flow control or drainage network should be made with some care.

Decisions on how to manage excess rainfall on the top of a rehabilitated landform are influenced by perceived risks from deep drainage, by the prevailing climate and likely run-off rates, and by the soil and vegetation conditions able to be created on the landform top. The larger the flow that is collected into one

Erosion and even structural failure of the visibility barriers and the final landform is an issue not addressed. The Leading Practice manual says:

Current leading practice in Australia has made extensive use of soil erosion and landform evolution models to develop landform profiles that are site and goal specific (Howard et al. 2011) and in many cases incorporate most or all of the elements considered aesthetically desirable. Effective designs are based on:

- site climate and rainfall erosivity
- the erodibility of the materials used to construct the landform
- the likely vegetation cover and resultant changes in soil function.

GRL says it is committed to a very high standard of rehabilitation. It proposes to cover the reformed area with at least 15cm of topsoil. The problem is that the natural soils of the area only have about 10cm of topsoil so after stockpiling this for several years; there will not be enough topsoil to spread as planned. This risk has not been analysed; again, leading sustainable practice has not been followed. The pasture seed mixture proposed for sowing on the disturbed areas only contains introduced species for a dairy pasture. It does not contain any native pasture species and is certainly not a sustainable mixture for woodland grazing as proposed as the final landuse.

GRL suggests that its revegetation will be successful because it proposes to use methods proven in Hunter mines. However, these mines do not expect visibility barriers to be revegetated within 1-2 years and nor do they place streams across newly vegetated fill. If there are successful examples then GRL would have presented them in the EIS rather than their " trust us, it will work" attitude. GRL has not analysed the risks of their revegetation proposal and this is not acceptable – it is not Leading Practice.

The Department assessment states that:

> While the Department considers that GRL has addressed most issues associated with surface water in a comprehensive manner, there remain uncertainties that impact on the ability to recommend approval of the amended project, as currently presented. It may be that some of these uncertainties can be resolved simply, such as a commitment to construct water storages with either a clay or synthetic liner to ensure that they do not seep or leak their contents into the local surface water catchment.
>
> However, the design and operational reliability of the water treatment plant is still subject to significant uncertainties. These matters would need to be resolved prior to any approval of the project.

This conclusion is predicated on the concept that a water treatment plant cannot be designed until water quality is known during operations. This is unsatisfactory because there is a lot of data on groundwater and surface water quality from Stratford operations and AGL testing. To have this level of unresolved water quality management is unacceptable for such a level of serious potential pollution in the valley.

These water quality matters are only presented for the period of mine operation. Issues associated with on-going pollution from the landscaped site are not addressed. The landscape will contain salts and heavy metals from the overburden and these will seep downhill and into the Avon. Why has this not been addressed – probably because the proponent does not want to?

There needs to be a time series of mass balance equations to assess the risks of salinity, acidity and toxic heavy metals. Why has this not been required or undertaken?

There is no consideration of water contamination from water flowing out of the mine pit and down the original land surface. This is a substantial risk because the pit will be full of rock and runoff from uphill (cut-off during mining but free flowing after mining) will add to groundwater flows into the pit and then over-flow into the valley. The Department has the following issues:

> The Department is also concerned that rainfall on unconsolidated overburden areas, either prior to or following their rehabilitation, would infiltrate vertically until the natural ground surface is reached and then migrate laterally and downslope. Should this occur, water seepage would occur at the toe of the emplaced overburden. This water is likely to increase in salinity as it migrates through broken overburden, resulting in saline seepage at the interface of the overburden and the land in proximity to, and within, the Avon River catchment. GRL does not share the Department's concerns as it believes the infiltrating water would be more likely to continue to migrate vertically, and even if it did flow over the former natural ground surface it would be impeded in its flow by the thick layers of overburden.

This appears to suggest that GRL does not believe that the surface watercourses will work: the Department's concern is real. However, GRL comes up with an unacceptable solution.

Nevertheless, GRL has acknowledged the Department's concerns and proposes to incorporate a drain along the toe of the overburden emplacements to collect any leachate and pump it into the mine's saline water management system. This should be effective while the mine is operational, but would need a different mechanism to be in place following completion of mining, provided that this proves to be an issue that requires ongoing management action.

Unfortunately, it is not acknowledged that the proposed drain along the toe would often be on the floodplain and subject to inundation. The leachate would then be washed into the river – this is absolutely unacceptable and certainly not best practice.

To say that it will require a different mechanism at the completion of mining, and not provide any analysis is also unacceptable. This is a major water and land contamination issue that has not been considered by the applicant or the Department assessment.

The Leading Practice manual says:

If the landform contains materials of concern (such as potential for acid drainage or the transport of some pollutant, such as high soluble salts or some specific element), the waste dump design needs to consider both the control of deep drainage (which could increase the potential for undesirable seepages) and the minimisation of erosion (which could ultimately expose the encapsulated material).[3]

In the case of the Rocky Hill proposal the risk of soil erosion and water quality degradation are high because the design and evaluation is inadequate. The Leading practice manual says:

However, where landform risks are high, there is a considerably greater requirement to develop designs very closely attuned to site materials, climate and revegetation outcomes. Generally, this requires careful material characterisation and the appropriate use of run-off/erosion and landform evolution models.

Current leading practice in Australia has made extensive use of soil erosion and landform evolution models to develop landform profiles that are site and goal specific (Howard et al. 2011) and in many cases incorporate most or all of the elements considered aesthetically desirable. Effective designs are based on:

- site climate and rainfall erosivity
- the erodibility of the materials used to construct the landform
- the likely vegetation cover and resultant changes in soil function.

Rocky Hill does not have the level of design or analysis that is listed in the "Leading Practice – Sustainable Mine Rehabilitation" manual.

In comments on dust and noise the EPA makes the comment that regulation would need "multiple layers of controls" which "may not be practical to implement....". This would also be the situation for soil and water conservation because the detail for sustainable management is not in the GRL proposal.

On the basis discussed above, there should not be any approval to mine this site because the design is flawed and the risk to sustainable soil and water management is unacceptable to the ecology, the environment, the resource users, and the community.

Australian Government

MINE REHABILITATION

Leading Practice Sustainable Development Program for the Mining Industry

September 2016

INDUSTRY.GOV.AU | DFAT.GOV.AU

Australian Government
Department of Industry
Tourism and Resources

MINE REHABILITATION

LEADING PRACTICE SUSTAINABLE DEVELOPMENT PROGRAM FOR THE MINING INDUSTRY

SOCIAL
ECONOMIC
ENVIRONMENTAL