



Inquiry Report

Environment Effects Statement
Big Hill Mine Enhanced Development Project

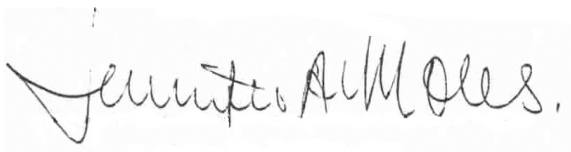
16 September 2014



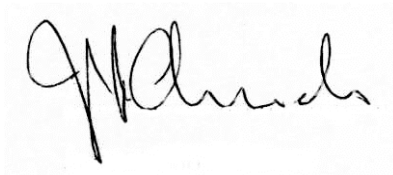
Environment Effects Act 1978

Big Hill Mine Enhanced Development Project

Report of Inquiry Panel pursuant to Section 9 of the Act

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Jenny Moles, Chair

A handwritten signature in black ink that reads "Jack Chiodo". The signature is written in a cursive style with a large initial 'J'.

Jack Chiodo, Member

A handwritten signature in black ink that reads "Lyn Denison". The signature is written in a cursive style with a large initial 'L'.

Lyn Denison, Member

A handwritten signature in black ink that reads "Ian Harris". The signature is written in a cursive style with a large initial 'I'.

Ian Harris, Member

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List of Abbreviations

Aboriginal Heritage Act	<i>Aboriginal Heritage Act 2006</i>
ADWG	<i>Australian Drinking Water Guidelines, 2011</i> (latest version), developed by NHMRC in collaboration with the Natural Resource Management Ministerial Council
AQIA	Air Quality Impact Assessment
ASC NEPM	<i>National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013)</i> , National Environment Protection Council
Blasting Guidelines	<i>Ground Vibration and Airblast Limits for Blasting in Mines and Quarries</i> , Minerals and Petroleum Victoria 2001
CHETRE	Centre Health Equity Training, Research and Evaluation. NSW.
CHMP	Cultural Heritage Management Plan under Aboriginal Heritage Act
DEPI	Department of Environment and Primary Industries
DoH	Department of Health
DSDBI	Department of State Development, Business and Innovation
DTPLI	Department of Transport, Planning and Local Infrastructure
EE Act	<i>Environment Effects Act 1978</i>
EES	Environment Effects Statement under EE Act
EMP	Environment Management Plan
enHealth	Environmental Health Standing Committee, a standing committee of the Australian Health Protection Principal Committee
EP Act	<i>Environment Protection Act 1970</i>
EPA	Environment Protection Authority
EPA Buffer Guidelines	EPA Publication 1518: <i>Recommended Separation Distances for Industrial Residual Air Emissions – Guideline</i> , March 2013
EPBC Act	<i>(Commonwealth) Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
EWS	Expert witness statement
FFG Act	<i>Flora and Fauna Guarantee Act 1988</i>

FOS	Factor of Safety
Geotechnical Risks Guidelines	DSDBI <i>Earth Resources Guide for the Assessment of Geotechnical Risks in Open Mines and Quarries</i> , updated February 2014
GHG	Greenhouse gas
GRP	Gross Regional Product
GWMWater	Grampians Wimmera Mallee Water Corporation (trading as GWMWater)
IHD	Ischemic Heart Disease
ITR	Independent Technical Reviewer
LPPF	Local Planning Policy Framework
LULU	Locally Unwanted Land Uses
MEA	Maximum Extent Achievable
Mineral Resources Act	<i>Mineral Resources (Sustainable Development) Act 1990</i>
Mineral Resources Regulations	<i>Mineral Resources (Sustainable Development)(Mineral Industries) Regulations 2013</i>
MSS	Municipal Strategic Statement
NEPC	National Environment Protection Council
NEPM	<i>National Environment Protection (Ambient Air Quality) Measure</i> , includes variation made 2003.
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
ng/m ³	Nanograms per cubic metre
NGSC	Northern Grampians Shire Council
NHMRC	National Health and Medical Research Council
NIRV	EPA Publication 1411: <i>Noise from industry in regional Victoria</i> , guidelines, 28 October 2011
NIRV Existing industry note	EPA Publication 1413: <i>Applying NIRV to proposed and existing industry</i> , 28 October 2011
NIRV Explanatory notes	EPA Publication 1412: <i>SEPP N-1 and NIRV explanatory notes</i> , 28 October 2011
PAHs	Polycyclic Aromatic Hydrocarbons
PAN	Pollution abatement notice issued under s 31A of the EP Act
PEM	EPA Publication 1191: <i>Protocol for Environmental Management: Mining and Extractive Industries</i> , 6 December 2007, an incorporated document of SEPP (AQM)

PM _{2.5}	Particulate matter with an equivalent aerodynamic diameter of 2.5 microns or less
PM ₁₀	Particulate matter with an equivalent aerodynamic diameter of 10 microns or less
RAP	Registered Aboriginal Parties
RXS	Respirable Crystalline Silica
SEPP (AAQ)	<i>State Environment Protection Policy (Ambient Air Quality)</i> , gazetted 1999
SEPP (AQM)	<i>State Environment Protection Policy (Air Quality Management)</i> , gazetted 2001
SEPP (Contaminated land)	<i>State Environment Protection Policy (Prevention and Management of Contamination of Land)</i> , gazetted 2002 and amended 2013
SEPP (GoV)	<i>State Environment Protection Policy (Groundwaters of Victoria)</i> , gazetted 2002
SEPP N-1	<i>State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No N-1</i> , 31 October 2001 (most recent version)
SEPP (WoV)	<i>State Environment Protection Policy (Waters of Victoria)</i> , gazetted 2001 and varied 2004
SGM	Stawell Gold Mines Pty Ltd
SPPF	State Planning Policy Framework
TDS	Total dissolved solids
TOR	Terms of Reference for EES Inquiry
TRG	Technical Review Group for EES preparation
TSF	Tailings storage facility
TWRS	Temporary waste rock stockpile
µg/m ³	Micrograms per cubic metre
VHI	Victorian Heritage Inventory
VPP	Victoria Planning Provisions
WHO	World Health Organisation
Wildlife Act	<i>Wildlife Act 1975</i>
WP	Work Plan under s40 <i>Mineral Resources (Sustainable Development) Act 1990</i>
WPV	Work Plan Variation

Executive summary and response to Terms of Reference

Summary

This is the report by the members of the Inquiry Panel appointed under section 9(1) the *Environment Effects Act 1978* to consider and advise on the environmental effects of the proposed Big Hill Enhanced Development Project at Stawell in western Victoria.

The project is for the open cut mining of gold from a ridge running generally north-south at the eastern edge of Stawell township, the northern end of which is known locally as Big Hill. The hill is largely in public ownership and used for informal recreational purposes. It contains a number of monuments and memorials; utility installations relating to telecommunications, fire observation and water supply; two arboretums; and three public roadways and a car park. The top of the hill provides 360 degree views of the surrounding countryside including the Grampians to the west. The area also contains a number of historic gold mine shafts and associated structures from the nineteenth and early twentieth century, as well as more recent mine workings. Towards the south, there is an area of remnant Box Ironbark forest.

The Environment Effects Statement (EES) indicated that approximately 169,000 ounces of gold has been identified under Big Hill and the area to the immediate south, of which 121,000 ounces is located within approximately 85 metres of the surface. It was estimated that 108,000 ounces would be recovered by the project after processing.¹ This information was updated in June 2014. It is now indicated that the gold resource is 167,000 ounces with an estimated recovery of 131,000 ounces of gold.²

The project proponent is Crocodile Gold Corporation, a Canadian owned company of which Stawell Gold Mines Pty Ltd (SGM) is a subsidiary company. SGM have been extracting gold in the area generally east of the town as well as under it, mainly by underground mining, since the 1980s. The mining operations have been transferred in ownership on five or six occasions in recent years and underground workings are now coming to an end.

The project, which is intended to be completed within five years, would involve sequential open cut mining of two pits on the western side of the ridge, establishment of a temporary waste rock storage facility to the east and use of the existing ore processing facility and tailings dam, both to the south of the ridge. Following excavation, the pits are proposed to be backfilled and the hill would be restored to approximately its previous form with revegetation and restoration of some or all monuments and a public roadway. The 50 metre high temporary waste rock stockpile would be removed in backfilling the pits.

Notably for the issues under investigation, the open cut pits, which combined are approximately 200 metres generally from east to west and one kilometre from north to south and between 50 and 95 metres deep would be located within 40 metres of town

¹ EES Main Report volume 1, p1-1.

² Updated June 2014 in P2.

dwelling. There would be some 35 dwellings within 100 metres of the pit boundaries, and 160 within 250 metres³ which is the recommended separation distance for gold mines from housing.⁴

A similar project at Big Hill was subject to an EES that resulted in an unfavourable Minister's Assessment, issued in October 2000. The current proposal differs in several respects from the earlier proposal, with some changes responding to issues identified in the Minister's Assessment.

The project requires a limited number of statutory approvals, most notably variation by the Department of State Development Business and Innovation to SGM's existing Work Plan for its mining activities in the area.

On 23 April 2013, the Minister for Planning determined that an EES should be prepared for the project to inform the statutory decision making. The EES was prepared by URS consultants for SGM in response to Scoping Requirements issued by the Minister for Planning on 4 October 2013.

The EES was placed on public exhibition from 28 March until 13 May 2014.

In response to exhibition, some 359 written submissions were received (of which 15 were duplicates). Nine submissions were from eight government agencies.⁵ Of the non-government (and non-duplicate) submissions, some 233 were in support, 202 of these being in the form of proforma letters. The remainder were individually expressed supporting submissions. The supporting submissions raised the following matters:

- The project will retain employment
- The current operations attract tourists
- The mine will be rehabilitated
- Long term benefits for Stawell will result from maintaining employment in the town.

Some 103 opposing submissions were received. None of these were proforma submissions. The objections to the proposal included:

- Potential dust emissions and impacts on air quality
- Impacts on health of residents and proximity of the proposed site to residential properties
- Impacts on water quality
- Impacts on the visual landscape of Big Hill and that it represents the 'identity' of the town
- Impacts on flora and fauna
- Property devaluation
- The fact that the mine is a 'short term' project and the jobs created by the project will not be permanent.

³ Figures derived from mapped information by Department of Health, see submission to Panel hearing (document DoH61).

⁴ EPA Publication 1518: *Recommended Separation Distances for Industrial Residual Air Emissions – Guideline*, March 2013.

⁵ These have not been counted in our analysis of supporting and objecting submissions.

The Inquiry Panel was appointed by the Minister for Planning on 7 May 2014. The Inquiry is to hear and consider submissions in respect of the EES and give general advice in accordance with issued Terms of Reference approved on 15 April 2014. The Terms of Reference require the Inquiry to *'to inquire into the potential effects of the proposed Big Hill Enhanced Development Project'*, to *'consider and report on the potential effects of the project'* as well as *'address matters relevant to the design and implementation of the project.'*

The members of the Inquiry Panel are:

- Ms Jenny Moles (Chair)
- Mr Jack Chiodo (Member)
- Dr Lyn Denison (Member)
- Mr Ian Harris (Member).

A Directions hearing was held by the Inquiry Panel on 2 June 2014 in Stawell. The Inquiry Panel then conducted hearings over twelve days between 2 July and 18 July 2014 in Stawell. The Panel made an accompanied site inspection on 17 July 2014 and several previous unaccompanied site inspections.

During the course of the hearing, the Inquiry heard presentations by 44 submitters including local residents; the Environment Protection Authority; Department of Health; Department of State Development, Business and Innovation; Grampians Wimmera Mallee Water and Northern Grampians Shire Council. The Proponent called ten expert witnesses (with a report from a further expert witness who was not able to present in person to the hearing), and individual submitters called two expert witnesses.

The Panel has considered the EES and the written submissions and submissions and other evidence from the hearing.

The EES covered a range of environmental effects all of which have been assessed by the Panel. The principal matters influencing the Panel's decision have been air emissions, noise and health as well as the economic benefits of the project.

Inquiry findings

The Inquiry Panel has found overall that, in the circumstances of the close siting of this project to the town dwellings, off site emissions of noise and arsenic laden dust will not be able to be satisfactorily managed so that statutory standards can be met.

The Panel considers that it would not be satisfactory to proceed with the project on the assumption that some exceedances of air quality and noise criteria would be acceptable. Not only have the statutory air quality criteria been derived from a consideration of the protection of public health in general, but this particular community in Stawell is acknowledged as having relatively poor existing health and other characteristics which make it especially vulnerable in terms of the health effects of pollutants and stress.

The Panel consider that there are some further negative impacts of the project including effects on natural and archaeological heritage values, social impacts and risks associated with water management. These also recommend against the project and some of these adverse effects are not repairable.

The Panel does not consider that the benefits claimed for the project should be assessed as outweighing its negative environmental impacts. The net economic effects have not been fully explored including the negative costs of public health impacts; and the limited analysis which has been undertaken overstates the benefits especially to the local area. This includes the argument that the project would buy time to find other enterprises to replace mine employment in the town. The claimed 'other benefit' of the project of improvement to the Big Hill land use and community facilities is not universally agreed. The required rehabilitation plans for the site remain unresolved.

Inquiry Panel Response to Terms of Reference

Specifically, our response to the substantive requirements of the Terms of Reference is:

- i. The Panel finds that the likelihood and significance of environmental effects and associated risks of the project are that unacceptable environmental effects would occur. No project alternatives were suggested as feasible in the EES.
- ii. The Panel concludes that it is not feasible that the project could achieve acceptable environmental outcomes in the context of the applicable legislation, related policy, relevant best practice, and the principles and objectives of ecologically sustainable development.
- iii. Concerning recommendations on any modifications to the project and any specific measures that are needed to prevent, minimise or compensate for adverse effects in order to achieve acceptable environmental outcomes, in the context of relevant standards, objectives and guidelines established under relevant legislation; see the secondary recommendations discussed in Chapter 18.
- iv. Concerning recommendations on the framework for environmental management for the project, including in relation to the necessary Environment Management Plans required in association with different approvals; see the secondary recommendations discussed in Chapter 18.
- v. Concerning recommendations on any conditions or matters that should be incorporated in the approval of a work plan or in any other statutory instrument applying under Victorian law, if the project is to be approved, in particular under the *Mineral Resources (Sustainable Development) Act 1990*; see the secondary recommendations discussed in Chapter 18.

Inquiry recommendations

The Panel therefore makes the principal recommendation that the project should not proceed. Our full reasons for that conclusion are set out in this report.

This is not a recommendation made on the basis that the weight of negative factors only marginally exceeds that of benefits. This project has major difficulties which cannot be addressed by mitigation.

However, mindful of our advisory role and the possibility that decision makers may consider that the balance of negative and positive effects of the project is not as we see it, we have made **secondary recommendations concerning conditions and requirements which we believe must be applied to statutory approvals if the project were, contrary to our**

recommendations, to proceed. We are nevertheless not persuaded that the requirements we have set out are all capable of achievement or would satisfactorily ameliorate the environmental and health impacts which we regard as unacceptable.

Those secondary recommendations as set out in Chapter 18 of this report.

PART A: BACKGROUND AND INQUIRY PROCESS

1 Background

1.1 Introduction

This report sets out the findings and recommendations of the Inquiry Panel conducting the Environment Effects Inquiry into the Big Hill Enhanced Development Project – a proposed open cut gold mine at the edge of Stawell township.

1.2 The subject site and surrounds

Stawell is located some 240 kilometres north west of Melbourne and is the most populous town in Northern Grampians Shire. In 2011, the population of Stawell was nearly 5,800 residents.⁶

The town was first settled in 1853 at the time of the Victorian gold rush. A legacy of shafts and adits from nineteenth century gold diggings and mines is found across parts of the township, as well as scattered above ground built elements associated with early gold extraction such as engine mountings and a poppet head.

The modern production of gold commenced in 1981 when the Stawell Gold Mine, a partly open cut but largely underground operation, was reopened by WMC/Central Norsemen Gold. The mine changed ownership on a number of occasions in subsequent years until acquired by the Crocodile Gold Corporation in 2012.⁷ Crocodile Gold Corporation owns Stawell Gold Mines Pty Ltd (SGM) which is the mining licence holder for a large area, of which much of the town as well as the present project area form part (mining licence MIN 5260, expiring on 30 May 2020). The SGM underground mining continues today but the company have said that current economic reserves are anticipated to be worked out by 2015.

The open cut mining is proposed on part of the ridge running along the north eastern edge of the township. The ridgeline rises to approximately 40-50 metres above the town centre of Stawell which is located less than half a kilometre away to the west. The lower western slopes of the ridgeline contain residential streets including Fisher Street which is the closest street to the western side of the proposed open cut pits. Upper Main Street runs along the northern and north-western side of the proposed project area and Crowlands Road which is flanked by residential and rural-residential lots runs along the part of the northern and eastern perimeter of the site.

The part of the ridgeline immediately south of Upper Main Street is known as Big Hill. The ridge area is largely in public ownership and is developed partly for open space and partly for utility services such as water towers and tanks, transmission towers, and the like. Big Hill also houses a DEPI fire observation tower. There are two arboretums on the northern and western slopes of Big Hill and the top of the hill contains a number of memorials and historic monuments. Towards the southern end of the area proposed to be mined, the land is somewhat lower in elevation and supports an area of Box Ironbark forest. This area has been disturbed by previous mining activities.

⁶ EES Main Report volume 1, p1-7.

⁷ EES Main Report volume 1, p1-8.

Figure 1: View from Big Hill to Stawell township and Grampians
Source: Panel



Figure 2: Telecommunications infrastructure on Big Hill
Source: Ms Byass



Three Council roads (Scenic Road, Reefs Road and Big Hill Road) pass through the area to be mined. There are also a number of 19th and early 20th century gold mining shafts and tunnels and other relics.

The area to be mined as two open pits is approximately one kilometre from north to south by 200 metres from east to west. The north pit would be excavated to 95 metres below the highest point of Big Hill and the south pit to 50 metres below Fisher Street. The overall project area, which also includes a proposed temporary waste rock stockpile area (TWRS) of in excess of 20 hectares on largely cleared GWMWater land to the east of the proposed southern pit; Mt Micke (an earlier waste rock stockpile of around 13 hectares in area) some kilometres to the south; three proposed sediment basins downslope of the proposed pits; as well as the haulage road between the pits and Mt Micke and the existing processing facility; and a stores access road is approximately 65.6 hectares in area. This does not account for the areas already in use for the processing plant and associated storage and treatment facilities nor the 100 hectare tailings dam further south of Mt Micke which would be an integral part of the new project.

1.3 The project

A short summary of the proposed development project is included in this section of the report. More detail is provided as relevant to the issues in the following chapters.

For the past 30 years, SGM has operated at its current location at the eastern edge of Stawell township approximately one kilometre south of the proposed south pit and the proposed TWRS. Gold has been progressively mined in a series of above ground pits and extensive underground mine workings which extend beneath the town. The current proposal is for a gold resource to be accessed within and beneath Big Hill via an open cut process, in a location immediately adjacent to the current SGM operation, and within the boundaries of the current SGM mining lease area.

The Environment Effects Statement (EES) prepared by SGM indicated that approximately 169,000 ounces of gold had been identified in the Big Hill and former Davis pit area, of which 121,000 ounces is located within approximately 85 metres of the surface and 108,000 ounces is estimated would be recovered by the project after processing.⁸ This information has been updated. It is now indicated that the gold resource is 167,000 ounces with an estimated recovery of 131,000 ounces of gold.⁹

The EES describes the key elements of the project as being:

- *Open cut mining of two pits (North Pit and South Pit) located in and around Big Hill adjacent to the Stawell township;*
- *Transportation of ore via an internal haul road to the existing licensed SGM processing facility;*
- *Storage of waste rock generated from the Project at a temporary waste rock stockpile (TWRS) on adjacent previously disturbed land and pasture land;*
- *Full reinstatement of Big Hill to its approximate original topography.¹⁰*

The EES describes the project objectives as follows:

- *Provide SGM with an essential source of mill feed and cash flow which will enable processing to continue for a further four years;*

⁸ EES Main Report volume 1, p1-1.

⁹ Updated June 2014 in P2.

¹⁰ EES Main Report volume 1, pE-1.

- *Extend gold mining operations at Stawell for about four years (plus an additional year to complete backfilling and rehabilitation, resulting in a total Project time of approximately five years).*

SGM states that in undertaking the project, the complementary objectives are:

- *Providing a further four years of employment for 80 to 100 employees;*
- *Continuing to contribute to the local, regional and State economies through capital expenditure, multiplier benefits to local businesses and employment;*
- *Provide a rehabilitated surface area (Big Hill) and potential enhanced community facilities to the Stawell community post closure.¹¹*

The purpose of the project, as stated in the EES:

...is to fully utilise the last known commercially viable gold resource within the SGM mining licence area. The Project will prolong the mine life enabling continued gold production as SGM works towards the planned closure of underground mining operations. In the event that the Project does not proceed, it is envisaged that all mining and processing activity will cease during 2014-15.¹²

Chapter 6 of the EES describes the proposed mining method:

The Project encompasses the development of two open cut pits to mine the upper portion of the same mineral deposit as the current underground operations. Both the North and South Pit areas were also previously mined in the late 1980s, and the southern area again in the 1980s (Davis Pit).

The mining of Big Hill will remove voids created by previous mining activities, which will improve public safety of the rehabilitated landform and allow future development of the site.

The ore body will be mined in an open pit top down sequence. Mining of the North and South Pits will be completed from east to west, with multiple benches shielding adjacent residents from noise and dust emissions. Two distinct mining methods will also be applied: the first one of free dig and the second drill and blast. The mining sequence of each pit will be in a cutback style, with multiple benches in operation. This will reduce activity on the upper bench to a practical minimum assisting with noise and dust control.¹³

It is proposed to extract the northern pit first. This would involve land clearing and the removal of the historic monuments and memorials as well as the directly affected utility facilities such as the fire tower and various pieces of telecommunications infrastructure. Other utilities such as two of the water tanks on the hill would be temporarily decommissioned and a nearby water reservoir would be drained or relocated. The ore from the north pit would be trucked to the existing SGM processing facility and the TWRS via widened internal haul roads; the process tailings would be piped to and disposed of at the existing tailings storage facility (TSF) to the south; and the waste rock would be stored at the

¹¹ EES Main Report volume 1, p1-6.

¹² EES Main Report volume 1, pE-1.

¹³ EES Main Report, p6-29.

new TWRS. Recovered top soil would also be stockpiled at the TWRS. Two sediment basins would be constructed near the north pit, one to the west to the rear of the Fisher Street housing and the other near Upper Main Street. A flood storage basin would also be constructed to the east of the TWRS. It is expected that mining of the north pit, and backfilling of that pit utilising waste rock from the south pit, would take some 2.5-3 years.

The larger southern pit would be excavated commencing quarter 5 of the project and would be fully excavated between the second and fourth year of the project. Again vegetation clearing would be required and an additional sediment basin would be constructed close to the southern end of the fully excavated pit. The ore would be trucked to the processing facility to the south and the waste rock would be used to complete the back filling of the north pit. Residual waste rock as well as top soil would be stored at the TWRS. The waste rock from the TWRS together with some rock from Mt Micke would later be used to backfill the south pit. The proponent advised that the backfilling of the south pit would occur in year 5 between quarters 15 and 20.

There was a suggestion in Mr Tim Power's opening submission for the proponent (document P2, Paragraphs 167-170) that a decision may be taken by the time the south pit would be half mined, whether to extend the south pit further to the south. He noted that further approvals would be required. Later in the hearing, however, he indicated that there was no intention to extend the south pit further southward.

Figure 3: View towards south pit location from Big Hill
Source: Panel



The nearest part of the northern pit workings, under the latest iteration of the project plans (see Section 2.1 of this report), would be approximately 40 metres from dwellings (other than those which are proposed to be acquired by SGM)¹⁴. The north pit would also extend to around 20 metres from Upper Main Street. The southern pit would be some 37 metres from the nearest dwelling to the west in Fisher Street (near the intersection with Holt Street). There would be some 35 dwellings within 100 metres of the pit boundaries and 160 within 250 metres¹⁵.

It is proposed that Big Hill would be rehabilitated to a form similar to the existing natural land form with a drainage network and vegetated cover. The proponent has indicated that the historic monuments and memorials would be reinstated where possible and Big Hill Road reconstructed. The potable water supply facilities would be recommissioned. Information about rehabilitation of the south pit is less detailed but we understand it would be refilled and revegetated. No detail was provided about the rehabilitation of the TWRS site.

The site preparation, mining and rehabilitation works would involve use of between two and six 90t haul trucks; one to two 120-190t excavators; three D9 or D11 dozers; pit floor and road maintenance equipment such as graders, compactors and water distributors; utility vehicles such as a fuel and lube truck, blasting trucks, drill rigs, and ancillary vehicles; and a Cat330D-RB or similar rock breaker.

1.4 Previous EES proposal

This is the second proposal to develop an open cut gold mine of this general scale at Big Hill.

In the late 1990s, SGM proposed the Big Hill Development Project which was a similar but more extensive project than the current Big Hill Enhanced Development Project.

On 30 June 1998, the then Minister for Planning and Local Government, Robert Maclellan MLA, determined that an EES for the project was required. The EES was placed on public exhibition from 12 October to 12 November 1999. Submissions received were referred to an independent Inquiry Panel. Forty-four of the 237 persons making written submissions appeared at the Inquiry hearing.

The Inquiry Panel recommended that the project should be given conditional support. A key matter of concern to the Panel, however, was that no backfilling of the southernmost of the two pits was then proposed. The Panel said:

...[A] void location in immediate proximity to a city, and situated within the limits of the city's major landscape feature and adjoining residential areas, with a minimum distance separation in some instances in the order of 40 metres, does not represent either sound planning or a reasonable environmental solution.

In particular, the Panel was concerned about the landscape and safety implications of this arrangement and the loss of the pit area to the public domain. The Panel recommended

¹⁴ SGM propose to purchase at least two dwellings in Upper Main Street, the sites of which would be impacted by the mining activities. They are referred to in Section 1.5.

¹⁵ Figures derived from mapped information by Department of Health, see submission to Panel hearing (document DoH61).

approval should be given but conditional upon filling of this pit to 80 per cent. The Panel acknowledged that this might render the project uneconomic. The Panel otherwise accepted that environmental measures may be available to ensure that noise, dust and blast vibration effects on adjoining residents would be within acceptable limits - noting the challenge of rigorous implementation of the mitigation measures.

In November 2000, the new Minister for Planning, the Hon John Thwaites, resolved not to support the Panel's recommendation. The Minister's assessment included that the acceptability of the Big Hill proposal depended on one or other of the following tests being satisfied:

1. *Minimal net environmental impacts, including anticipated impacts on ecological and heritage values as well as risks to human health and social well-being;*
2. *Expected net environmental impacts being within limits set by available legislative standards (or reasonable proposed standards or equivalent policy guidelines);*
3. *Expected net environmental impacts being judged by Government as acceptable relative to expected economic benefits.*

The Minister accepted that control measures were available to ensure that the air quality, noise and blast vibration effects met the legislative requirements and that the second test could be satisfied. He found, however, that there would be some loss of residential amenity as a result of significant visual impact, and some increase in dust, noise and vibration. He also acknowledged that it would be difficult to establish public confidence that the environmental control measures would be technically feasible. He said that therefore some level of social impact was to be expected.

He also found that there were some environmental impacts which individually or collectively could not be adequately avoided, mitigated or compensated:

- *Establishment of compensating habitat for the loss of Box-Ironbark Forest and Heathy Forest associated with the Big Hill open cut proposed waste rock emplacement would be difficult to achieve;*
- *Several monuments of heritage value could be temporarily relocated and then replaced after the reconstruction of Big Hill, though the heritage values of the assemblage of monuments and remnants of nineteenth century mining operations could not be satisfactorily maintained;*
- *Compensation for diminution of property values of adjoining residences is possible, as is some compensation for loss of amenity during mining operations – though the stress to which affected residents may be subject may not be able to be fully acknowledged or compensated;*
- *The proposed Southern Void, if unfilled, would create a permanent and unacceptable safety hazard in this urban fringe location, with residents living in close proximity.*

On this basis he found that the first of the three tests above was not met.

The Minister then considered whether the project should proceed (with mitigation/compensation measures) on the basis of the third of the above tests. He said that this depended on being satisfied that the project is economically viable with the mitigation measures incorporated and whether there would be significant or sufficiently outweighing economic benefits.

He considered that the backfilling of the southern void was a minimum requirement given the proximity of the mine to dwellings and acknowledged that he had been advised that this filling would render the project uneconomic. He said that this was an important factor weighing against approval.

Regarding the second issue of economic benefits, he considered that they would not outweigh the residual adverse impacts. In particular he considered the direct economic benefits were not great and that the extraction of the underground reserves did not depend upon approval of open cut mining.

The Minister concluded:

... the impacts of the proposed Big Hill open cut gold mine are not justified in relation to the principles of ecologically sustainable development, especially in terms of impacts on economic and social well-being, biodiversity, heritage values and the interests of future generations. It is therefore my assessment that the proposed Big Hill mine not be approved.

The current proponent considers that it has addressed the concerns raised in the previous EES, in particular by committing to a shorter mining life of the project, fully reinstating Big Hill after mining to address amenity and safety issues, and protecting more of the Box Ironbark forest.

1.4.1 Proponent submissions on previous EES outcomes

In his opening submissions at the Inquiry hearing, Mr Power addressed the matter of the relevance of the findings from the earlier EES to our task. He first outlined the key differences between the previous and current project which he said afforded the present proposal its 'enhanced' description. The enhancements are:

- Both pits would be fully backfilled and rehabilitated
- Relocation of the TWRS to a cleared site, reducing clearing from 9ha to 2ha, and 4.49ha overall
- Use of real-time air and noise¹⁶ monitoring is now proposed
- A reduced time frame for the project due to a changed mining schedule and the extraction material being now proposed to be the principal feed to the mill.

Mr Power also noted that the positive employment effects under the present proposal would be greater.

Most relevantly, Mr Power, relying on a number of planning decisions by the Victorian Civil and Administrative Tribunal, said that it was an established principle of planning law that a

¹⁶ In his closing, however, Mr Power indicated that there would not be real-time monitoring of noise.

decision-maker should be reluctant to reverse an earlier decision unless there is a change in circumstances which warrants a different view, for example due to:

- (a) *significant changes in the application itself;*
- (b) *changes in the circumstances of the land and its surrounds;*
- (c) *changes in planning controls or policy;*
- (d) *further new evidence as to the effect of the use or development; or*
- (e) *changes in the interpretation of the relevant facts or law.*

He said that while the Minister for Planning's decision in relation to the 1999 proposal was not a final decision, but a recommendation as to whether approval should be given by other decision makers, it might be considered that the principle was relevant here.

1.4.2 Panel comment

The Panel accepts that this legal principle has relevance to the past and present Minister for Planning's decisions in the environmental assessment process. We further consider that it has relevance to the past and current Inquiry Panel's recommendations. We acknowledge the differences between the projects, but also consider there are other changes of circumstance.

The projects are not identical and this factor obviously has a bearing on potential differences in the recommendations concerning the two projects. With respect to the project changes, we do not disagree that it can be considered that there is some improvement in the environmental effects of some elements of the project.

We consider, however, that the tested evidence and submissions in the Inquiries, and their policy context, differ. These are in our view of key importance in the potential recommended outcomes.

With respect to changed policy context, we note that since the last EES Inquiry, a very large number of relevant statutory instruments have been introduced or updated. They include:

- *Aboriginal Heritage Act, 2006*
- *Australian Drinking Water Guidelines, 2011*
- Department of State Development, Business and Innovation: *Earth Resources Guide for the Assessment of Geotechnical Risks in Open Mines and Quarries*, updated February 2014
- EPA Publication 1518: *Recommended Separation Distances for Industrial Residual Air Emissions – Guideline*, March 2013
- *Ground Vibration and Airblast Limits for Blasting in Mines and Quarries*, Minerals and Petroleum Victoria, 2001
- *Mineral Resources (Sustainable Development)(Mineral Industries) Regulations 2013*
- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (amended 2013)
- *National Greenhouse and Energy Reporting Act 2007*
- EPA Publication 1411: *Noise from industry in regional Victoria, guidelines*, 28 October 2011
- EPA Publication 1191: *Protocol for Environmental Management: Mining and Extractive Industries*, 6 December 2007, an incorporated document of SEPP (AQM)

- *State Environment Protection Policy (Air Quality Management)*, gazetted 2001.
- *State Environment Protection Policy (Groundwaters of Victoria)*, gazetted 2002
- *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No N-1*, 31 October 2001 (most recent version)
- *State Environment Protection Policy (Waters of Victoria)*, gazetted 2001 and varied 2004.

These extensive changes made to the decision making framework recommend against placing much weight on the earlier decisions.

It is of course also appropriate, as Mr Power submitted, that the present case should be decided on its merits. We have therefore focussed on the submissions and evidence which were presented to us in the current hearing rather than the material from and Panel findings in the earlier case.

We have nevertheless reviewed the earlier Panel report and have noted some relevant departures from it as well as consistencies.

1.5 Relevant approvals

The EES included that under Victorian law, the current project requires the following approvals:

- *Work Plan for work under the Mining Licence and a Work Authority, under the Mineral Resources (Sustainable Development) Act 1990;*
- *An approved Cultural Heritage Management Plan under the Aboriginal Heritage Act 2006 to manage works in areas of cultural heritage sensitivity;*
- *Consent to remove protected flora under the Flora and Fauna Guarantee Act 1988;*
- *Authority to take or disturb wildlife under the Wildlife Act 1975.*¹⁷

It was also indicated that as the mining project is subject to an EES and Minister's Assessment under the Environment Effects Act, under section 42(7) of the *Mineral Resources (Sustainable Development) Act 1990* (Mineral Resources Act), mining works within the licence area are exempt from requiring a planning permit under the Northern Grampians Planning Scheme.¹⁸

Advice was also provided that the project was referred to the former Australian Government Minister for Sustainability, Environment, Water, Population and Communities, and was determined not to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

At the Inquiry hearing, Mr Power corrected two elements of the earlier outline of approvals.

He indicated that no approval was required under the *Flora and Fauna Guarantee Act 1988* (FFG Act) because the project was to be processed as a Work Plan Variation (WPV); but that consents would be required to be obtained under section 129 of the *Heritage Act 2006* (Heritage Act) for the disturbance or destruction of archaeological material.

¹⁷ Terms of Reference paragraph 11.

¹⁸ There is a complication around this due to forthcoming changes to the Mineral Resources Act to remove reference to a work authority. See document P2 at Paragraph 134.

The Inquiry Panel understands that there are therefore essentially four approvals required for the project:

- Approval of a Cultural Heritage Management Plan (CHMP) under the *Aboriginal Heritage Act 2006* by the Registered Aboriginal Party or Secretary of the Department of Premier and Cabinet (DPC)
- Approval under the *Wildlife Act 1975* (Wildlife Act) which would be considered by the State Department of Environment and Primary Industries (DEPI)
- Approval under the *Heritage Act* to be considered by Heritage Victoria
- Approval of the Work Plan Variation under section 41 of the *Mineral Resources Act*.

Under the current Mineral Resources Act there is a requirement that a work authority must be issued by the Department of State Development, Business and Innovation (DSDBI) before mining works can commence. As set out by Mr Power, this:

...can only be issued if the Department Head is satisfied that SGM has an approved work plan, has entered into a rehabilitation bond, has obtained all the necessary statutory consents required under other legislation for the Project, and has the required public liability insurance.

We understand that there is also a requirement to address any environmental offset requirements and obtain written consents or compensation agreements with owners or occupiers of affected private land where entry is required.¹⁹ This has led, Mr Power said, to purchase of the property at 206 Main Street, a conditional contract to purchase 204 Main Street and discussions with GWMWater concerning use of their land and effect on their assets.

Mr Mitas from DSDBI and Mr Power, however, provided advice at the Inquiry hearing that the work authority requirement is to be removed from the legislation on 1 November 2014, though the conditions precedent which are to be met before a work authority currently can be issued, would remain²⁰.

We note that a CHMP for the project was approved by the Director Heritage Services at the Office of Aboriginal Affairs Victoria, acting under delegation from the Secretary of the Department of Premier and Cabinet, on 12 June 2014 (document P26).

We also note that no proposed or draft Work Plan Variation was included in the exhibited EES (only an indicative table of contents at Appendix D), but we were advised that draft one was separately placed on the SGM website when the EES was exhibited. A copy of a draft WPV for the project, dated 27 March 2014, was also provided to the Inquiry Panel as document P24. The Panel understands that the WPV would be submitted for approval to the Earth Resources Regulation Branch of DSDBI who would consider the assessment made by the Minister for Planning and other material and information which emerged during the EES process.

¹⁹ See section 42(2) of Minerals Resources Act and document P2.

²⁰ See document ERR 58.

We were advised by Mr Power that the final WPV would contain a range of management plans including the following:

- Noise Management Plan
- Blast Management Plan
- Air Quality Management Plan
- Ground Control Management Plan
- Surface Water Management Plan
- Rehabilitation Plan
- Updated Community Engagement Plan.

The Panel understands that the outcomes of the Inquiry process will also be made available to DEPI and Heritage Victoria to inform their decision making responsibilities.

1.6 Inquiry process

1.6.1 Preparation of the EES

On 23 April 2013, the Minister for Planning determined that an EES was required to be prepared for the project.

Scoping requirements were prepared and issued on 4 October 2013.

A Technical Reference Group (TRG) to assist the process was also appointed. Membership of that group comprised: representatives from the Department of Transport, Planning and Local Infrastructure; DSDBI; Environment Protection Authority (EPA); Department of Environment and Primary Industries (DEPI); Department of Health (DoH); Northern Grampians Shire Council (NGSC); Office of Aboriginal Affairs Victoria (AAV); Heritage Victoria and Grampians Wimmera Mallee Water (GMMWater).

URS Australia (URS) consultants were engaged by the proponent to coordinate and largely prepare the EES.

1.6.2 Exhibition and submissions

The EES was completed in March 2014 and was placed on public exhibition between 28 March and 12 May 2014.

Some 359 written submissions were received. Fifteen of these were duplicates. Of all the submissions, nine were from eight government agencies.²¹ A full list of all submissions received is included in Appendix A to this report.

Of the 336 non-duplicate and non-government submissions, some 233 were in support. Of these, 202 were in form one of two proformas²² (a limited few had additional notations). The remainder were individually expressed supporting submissions. The supporting submissions raised the following matters:

- The project will retain employment
- The current operations attract tourists

²¹ These have not been counted in our analysis of supporting and objecting submissions. One government submission was a duplicate.

²² There were 185 copies of one of the proformas sent in and four of with additional notations.

- The mine will be rehabilitated
- Long term benefits for Stawell will result from maintaining employment in the town.

Some 103 opposing submissions were received. None of these were proforma submissions. The objections to the proposal included:

- Potential dust emissions and impacts on air quality
- Impacts on health of residents and proximity of the proposed site to residential properties
- Impacts on water quality
- Impacts on the visual landscape of Big Hill and that it represents the 'identity' of the town
- Impacts on flora and fauna
- Property devaluation
- The fact that the mine is a 'short term' project and the jobs created by the project will not be permanent.

1.6.3 Inquiry Panel

The Inquiry Panel was appointed by the Minister for Planning on 7 May 2014.

The membership of the Panel is:

- Ms Jenny Moles (Chair)
- Mr Jack Chiodo (Member)
- Dr Lyn Denison (Member)
- Mr Ian Harris (Member).

1.6.4 Terms of Reference

The Terms of Reference (TOR) for the Inquiry were approved on 15 April 2014. These are attached as Appendix B.

The Paragraph 3 of the Terms of Reference states that the Inquiry is to:

- *Consider and report on the potential effects of the project, taking into account the procedures and requirements the Minister specified for the preparation of the Environment Effects Statement (EES) under section 8B(5) of the EE Act; and*
- *Address matters relevant to the design and implementation of the project.*

Paragraph 18 of the Terms of Reference states that the Inquiry's report is to address:

- *Findings on the likelihood and significance of the environmental effects, and associated risks, of the project and alternatives documented in the EES;*
- *Conclusions on the feasibility of the project achieving acceptable environmental outcomes in the context of applicable legislation, related policy, relevant best practice, and the principles and objectives of ecologically sustainable development;*
- *Recommendations on any modifications to the project and any specific measures that are needed to prevent, minimise or compensate for adverse effects in order to achieve acceptable environmental outcomes, in the*

context of relevant standards, objectives and guidelines established under relevant legislation;

- *Recommendations on the framework for environmental management for the project, including in relation to the necessary Environmental Management Plans required in association with different approvals;*
- *Recommendations on any conditions or matters that should be incorporated in the approval of a work plan or in any other statutory instrument applying under Victorian law, if the project is to be approved, in particular under the Mineral Resources (Sustainable Development) Act 1990;*
- *Relevant information and analysis in support of the Inquiry's conclusions and recommendations;*
- *A description of the proceedings conducted by the Inquiry and a list of those consulted and heard by the Inquiry.*

No consideration of existing operations

An issue which arose in terms of the extent of the Inquiry Panel's investigations was whether the existing mine's operations are under review as part of this Inquiry. The proponent resisted this²³ and the Panel noted that the Scoping Requirements for the EES in a footnote at page 1 indicate that *'use of existing mine infrastructure, in accordance with current approvals, will not be reviewed as part of this EES'*. Mr Krohn's submission for the Department of Transport, Planning and Local Infrastructure also made reference to the Inquiry not addressing the existing processing plant and tailings dam.

The Panel accepts that it is not the intent that the Inquiry will review the existing mine operations. We have, however, felt it necessary to consider how those operations interact with the current proposal. For example, the TSF2 tailings dam is proposed to be use for the present project and we were advised that approval has already been given to add height to the dam wall to accommodate the additional waste from the project. The effect of the additional deposition on the current seepage problems associated with that facility is a matter we have addressed. Similarly, the interaction between the permitted noise levels for the existing mill and the proposed project operations have been considered.

1.6.5 Inquiry hearings

A directions hearing was held in relation to the Inquiry on 2 June 2014 at Stawell. The Inquiry Panel gave a number of directions concerning the conduct of the main hearing including about the supply of further information by the project proponent. Those directions were complied with.

The main Inquiry hearing took place in Stawell on 2, 3, 4, 7, 8, 9, 10, 11, 14, 16, 17 and 18 July 2014. Persons presenting to the Panel are listed in Table 1. Other interested persons were also in attendance on most days, including from SGM.

²³ See for example paragraph 91 of the opening submissions (document P2).

Table 1: Parties to the Inquiry hearing

Proponent/ Submitter	Represented by
Stawell Gold Mines Pty Ltd	<p>Mr Tim Power of Herbert Smith Freehills assisted by Ms Heide Asten and Ms Hannah Corcoran. Mr Power called the following expert witnesses:</p> <ul style="list-style-type: none"> - Mr Christophe Delaire on noise - Mr Stephen Darmawan on geotechnical – settlement and compaction - Dr David Jasper on rehabilitation - Mr David Lucas on geotechnical issues and landform voids - Mr Glenn Weston on social impact assessment - Ms Victoria Lazenby on health impact assessment - Dr Harry Grynberg on air quality modelling - Mr Frank Fler as peer reviewer of air quality modelling - Mr Robin Ormerod on real-time monitoring - Dr Martin van Bueren on economic impact assessment <p>Mr Power also presented an expert witness statement by Mr Lance Wackett on heritage who was unavailable to attend to give evidence at the hearing.</p>
Department of Transport, Planning and Local Infrastructure	Mr Jack Krohn, Principal Environmental Assessment Officer, Environment Assessment Unit
Department of State Development, Business and Innovation (Earth Resources Development Division)	Ms Bessie Abbott, Acting Operations Manager, South West Region, Earth Resources Regulation Branch; Mr John Mitas, General Manager, Earth Resources Operations; and Mr Anthony Hurst, Executive Director, Earth Resources Development Division
Department of State Development, Business and Innovation (Minerals Development Victoria)	Mr Wayne Morgan, Principal Facilitator for Big Hill Project, Minerals Development Victoria
Department of Environment and Primary Industries	Mssrs Grant Hull, Manager Strategic Land and Environmental Planning, Grampians Region, and Stewart Dekkar
Department of Health	Mssrs Tom Niederle, Regional Director, Grampians Region, and Graeme Gillespie, Director, Health Protection
Environment Protection Authority	Dr German Ferrando-Miguel, Strategic Adviser, and Mr Tony Robinson, Manager, Major Projects Unit
Grampians Wimmera Mallee Water	Mr Bernie Dunn, Senior Natural Resources Officer, and Mr Andrew Rose, Acting Manager Water Authority Construction
Northern Grampians Shire Council	Ms Justine Linley, Chief Executive Officer
Ms Trudy Scott Decosta	

Mr Ben Martin	
Mr Peter Baker	
Mr Roy Fox	Mr Fox called Associate Professor Barry Noller on mining emissions
Ms Helga Saunders	Ms Saunders called Mr Ian Magee on revegetation and bonds
Mrs Wendy Melbourne	
Ms Lesley Bennett	
Ms Marion Kossowski	
Mr Juliusz Kossowski	Ms Marion Kossowski
Mr Donald Pohlner	
Ms Marion Byass	
Mr Norman Kenyon	
Ms Kerry and Mr Fred Kingston	
Mr Ben Kimber	
Ms Karen Ware	
Mr Stephen Ware	Ms Karen Ware
Mr Dean and Ms Selena Cameron	Ms Sherrie Hunt
Ms Sherrie Hunt	
Mr Trevor Hunt	
Mr Brad Hunt	
Ms Rosalind Byass	
Mr Jason Lewis	Ms Kylie Murtagh
Mr John McMahon	Mrs Wendy Melbourne
Ms Margaret Johnston	
Mr Greg Cameron	
Ms Marlene Kay	
Ms Maureen Knight ⁹	
Mr John Knight ²⁴	
Dr Goff Letts	
Gary Raeburn and family	Ms Diane Raeburn
Mr Noel Raeburn	Ms Diane Raeburn

²⁴ Despite requesting to be heard, Ms Maureen and Mr John Knight did not appear at the hearing.

Ms Diane Raeburn	
Mr Ross Lumley	Ms Diane Raeburn
Mr John Pollock	Ms Diane Raeburn
Ms Yvonne Watson	Mrs Wendy Melbourne
Mr Keaton Sellers	Mrs Wendy Melbourne
Ms Margot Gardner	
Ms Jennifer Collins	
Dr Gary Saunders	

1.6.6 Inspections

The Inquiry Panel made numerous unaccompanied inspections of the Big Hill area and surrounds including after the directions hearing, on the day preceding the hearing, and before and after a number of other sitting days during the hearing period.

An accompanied inspection with representatives of most of the parties took place on the afternoon of Thursday 17 July 2014. While this was quite late in the hearing process, the Panel preferred to make the accompanied inspection after the issues had been clearly set out by most or all of the parties at the hearing. Presentations by all or most parties were only completed late in the hearing process because the proponent's presentation occupied the first half of the scheduled hearing time. The Panel in any case had informed itself by the unaccompanied inspections described above.

1.6.7 Further directions

During the hearing, the Inquiry Panel raised a large number of questions and requested various items of further information from the project proponent. A number of the proponent's witnesses volunteered to supply supplementary information in response to the Panel's queries.

The information was largely supplied during the hearing process. An additional day of hearing was scheduled on 14 July 2014 to allow the presentation of some of this material and replies to it at the last day of hearing were allowed by submitters who had presented before it was made available.

By the close of hearing there remained an outstanding request for supply of certain isopleths from the revised air emissions modelling.

Some of the information was supplied promptly but the Panel was obliged to make repeated requests in an endeavour to obtain all of the material it required. On 4 August 2014 the proponent supplied the third of a series of isopleths in purported compliance with the Panel's directions. Other parties to the Inquiry hearing were permitted to provide further comment on that material by 12 August and the proponent was afforded a response by 15 August 2014. This material and the manner of its provision are discussed further in Chapter 3.

1.7 Structure of this report

For the convenience of the reader, this report discusses the environmental effects and provides the Inquiry conclusions generally under the same headings used in the EES. The headings have been re-ordered from those in the EES so that the key issues are dealt with first.

Part B of the report deals with the environmental effects issues under the following headings:

- Air quality
- Noise
- Health
- Social
- Potable water
- Surface water
- Groundwater
- Geotechnical issues
- Rehabilitation, post mining management and bonds
- Blasting
- Heritage
- Visual and landscape
- Flora and fauna
- Economic
- Other issues.

Preceding the chapters on the individual environmental effects, Chapter 2 in Part A of the report makes some general comments about the EES process, the previous EES outcome, the consultation processes undertaken and public involvement. We also comment on the matter of the ability of the project to be regulated satisfactorily.

Following the chapters on individual types of effects, we provide an overall evaluation of the project and the Inquiry recommendations in Part C.

The appendices to the report include the list of submitters, the Terms of Reference and the list of Inquiry hearing documents.

2 Comments on EES process and regulatory framework

2.1 Changes to project

Late in the hearing it became apparent to the Panel that the depiction of the pits on plans in the EES and other documents differed. We pointed out that the pits appeared to have moved further westward and northward, and were closer together in recent plans produced post EES. There was a considerable discrepancy in terms of the relationship of dwellings to the west of the pits, especially the south pit, of some tens of metres.

We were advised by the proponent that plans of the project design as at June 2013 had been used in the EES and these were different plans from the ones which had been used during the consultation phase before the EES preparation. We were also told that any maps produced post March 2014 would be of the latest project proposal and the changes identified by the Panel and described above were acknowledged.

Somewhat inconsistently with this advice, we were also told that the project was still developing and the final layout was yet to be determined. Matters which it was said would be addressed post the Inquiry process included the resolution of the tailings dam seepage, the final rehabilitation outcome for Big Hill, greater detail about the rehabilitation of the south pit, and a noise plan with implications for work practices. Moreover, Mr Power commented that additional modelling of air quality and noise would be done once the design of the operations was complete and completed as part of the work plan variation approval process handled by DSDBI. He said in submissions on Day 4 that *'the project is currently conceptual'*.

We consider that the changing nature of the project has served and will serve to undermine the effectiveness and fairness of the public assessment process. It is possible that an unknown final design may have a larger impact if the pits continue to extend closer to residences. The Panel is being asked to make recommendations on a project design that, as advised by the proponent, will change. Also, any assessment of the impacts of the revised design will be done outside the EES process and input from affected persons will be precluded. In other words, all of these aspects of the project are proposed to be considered and resolved outside the regime of public scrutiny and involvement.

We consider that while it may generally be the case with major projects assessed through an EES process that the project is expected to evolve as it is developed and implemented, in the circumstances of this project, which was described by DoH and EPA as having no margin for error due to the proximity to the urban area, such changes and unresolved components are unacceptable. As the successful reinstatement of Big Hill is a key outcome of the project, we consider that the lack of certainty about the final outcome and the hill's future management causes difficulties with the process. We consider that it was critical in this case that the project was fully resolved so that the effects assessment could be made with some exactitude given the closeness to dwellings. We have found it quite unsatisfactory that so many aspects of the project remain yet to be resolved.

The changing and unresolved nature of the project also makes it extremely difficult and hence unfair for persons wishing to participate in the assessment processes to deal with unannounced and impending changes.

Critically, it also means in this case that some aspects of the information and modelling in the EES will not be totally accurate in terms of the project intended now to be pursued.

The Panel has noted this and this has led us to be conservative in our assessment of the impacts as expressed in the EES.

2.2 Community engagement

There were a number of issues raised around this general theme.

The limited ability of lay persons to engage in the EES Inquiry process and to understand the multivolume technical EES was a matter raised both at the directions hearing and the hearing itself. Even though the persons opposing of the project called two witnesses in support of their opposition, the submitters nevertheless indicated that they felt that they were disadvantaged in dealing with matters such as air emissions and noise modelling. At the directions hearing there was a request for adjournment of the main hearing on the basis that it would allow the submitters to be better prepared. One submitter requested that the Panel direct the preparation of a 'plain English' summary of the EES.

As was commented by the Panel at the directions hearing, however, this is not an adversarial court proceeding reliant only on input by competing parties and bound by the rules of evidence, which might have the potential to disadvantage unrepresented parties; but it is a non-judicial inquiry by an expert panel or tribunal to be conducted in accordance with the rules of natural justice. Accordingly, the outcome of the Inquiry will not turn only on what is presented by persons appearing before the Inquiry but the Inquiry Panel itself has a role to raise matters at the hearing not introduced by any of the parties and to interrogate those issues. While some weight must be given to the expert evidence called, it does not mean that it will always be preferred to submissions and will not go untested by the Panel itself.

So far as the suggestion for a lay person's plain English summary of an EES is concerned, while it was too late in the directions hearing for the current Inquiry to direct that one be prepared for this EES, the Panel commends the concept to the Environment Assessment Unit of DTPLI to consider making such a requirement for some or all future EESs in the interests of public accessibility to the information.

Another community engagement matter is that of future public involvement in the implementation of the project as envisaged by the proponent and regulatory agencies.

One of the requirements of a Work Plan for mining projects, as set out in the *Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013* (Mineral Resources Regulations) is that there is to be a community engagement plan for a mining project. A community engagement plan was supplied with the EES in this case but it was retrospective in content rather than prospective.

There was concern raised by some submitters at the Inquiry hearing about the community engagement which had already occurred. One submitter²⁵ commented that the community meetings in relation to the project or the social impact component of the EES were held at night in the middle of winter which made it difficult for some community members to attend. She also indicated that one of the meetings was held in Donald which is an hour's drive from Stawell, making it impossible for some people to attend. She commented that the fact that meeting was held in Donald had led some in the community to question whether SGM were serious about the community engagement.

The Panel is concerned that the prospects for meaningful community input to implementation of this project if it were to proceed are not favourable. To begin, there has been no genuine attempt to prepare a community engagement plan. When questioned at the hearing about what was planned, it seemed that no forward planning had been undertaken by the proponent. Indeed it seems that some of the areas where meaningful input had been sought by the community and might most usefully be made, such as the future land use and revegetation intents for the rehabilitation of Big Hill, had already been predetermined by discussions only with the prospective management agencies (see later discussion in Chapter 11). This is despite the EES indicating that community engagement in rehabilitation planning was to take place (see for example Section 10.4 in Volume 1 of the EES). Also it is our observation that relations between the mine and certain members of the community concerned about the project have been fractured. There is, regrettably, community division in the township as recognised by the social planner for the proponent.

2.3 Compliance with conditions

As part of his opening submission for the proponent (document P2), Mr Power argued that it was appropriate that the Panel make its assessment upon the assumption that any conditions which would be recommended and applied, would be complied with.

He said:

...under planning law, permits are granted on the assumption that conditions will be met; recognising that, if this presumption did not exist, virtually no planning permits could be issued. It is respectfully submitted that a similar presumption should be applied to SGM's compliance with conditions to be imposed through the Work Plan Variation for the Project.

We agree that this is an assumption that is usually applied in the consideration of planning permit applications and other exercises of statutory discretion. While the Panel does not disagree with this view, it is in our view tempered in this particular case by a number of factors.

The first is the principle which sits alongside the assumption of compliance with conditions, is that the decision maker must also be satisfied that the condition(s) to be imposed must be reasonably capable of being complied with.

In this respect we refer to the views expressed in the decision by the Victorian Civil and Administrative Tribunal in *Martyn Holland and Others v Colac-Otway Shire Council Appeal*

²⁵ Mrs Melbourne (document M76).

No. 1996/35706 by Deputy President Macnamara and Member Moles. The Tribunal was considering whether to grant a permit for a tourist establishment in the Otway Ranges. In that case, much of the information required, in order to assess the possible environmental and other impacts of the use and consequential operations, were proposed to be submitted after the grant of a permit. The Tribunal said:

The applicants submit that all of these matters can be dealt with by proper conditions to the permit. The Shire imposed some 39 conditions which deal amongst other things with these issues. The conditions included, for example, that before the development would commence, a development plan was to be prepared to the satisfaction of the Department of Natural Resources and Environment and the Shire; building plans and elevation were to be submitted; vegetation to be removed was to be approved and effluent disposal details confirmed. Mr Gobbo submits that it is sufficient for permit conditions to be included which require each of those issues properly to be dealt with. It is not necessary, at this stage, he submits, to provide absolute proof that a particular measure will be successful to deal with the problem. If the measures contemplated by the applicants do not deal with the problem, either an enforcement proceeding could be taken in the Tribunal or perhaps the development would be prohibited from being completed and occupied.

Conditions are a potent solvent of difficulties and conflicts in planning matters. They are not, however, a panacea. It would be wrong for instance, to issue a permit, subject to conditions which upon reasonable analysis were unlikely to be capable of being met. So to do would amount in substance to the grant of a permit to make omelettes upon condition that no eggs are broken.

Planning law requires a responsible authority or an appeal tribunal to consider a large number of matters which belong particularly to other specialities. Most of the particular issues relating to this proposed development just listed, fall into that category. At the planning stage therefore, it would be wrong to expect total and complete answers to be furnished on all these technical issues when the adjudication was being made by a body other than a specialist in that technical area. It is sensible, therefore, at least partly, to deal with these technical issues by the inclusion of conditions that perceived problems must be dealt with in accordance with the requirements of a particular specialist authority. This process is formalised in planning law by the nomination of referral authorities.

In our view, however, where there are serious grounds for doubting that a particular technical problem is soluble, it is wrong to grant a permit and regard the particular issue as dealt with by requiring solution of the problem to the satisfaction of a particular specialist authority. If the problem proves insoluble, either the applicant developer has been sent on a fool's errand and wasted a large amount of time and money or more likely, once development has commenced, the impetus will be such that solution of the particular problem which has proven impossible has to be compromised, so that ultimately a revised planning approval is granted which would not have been granted at the outset had the ultimate result been known. In that case, objectors and appellants are

proven right but nevertheless have to live with the adverse effects of the development which they warned against. (Inquiry Panel emphasis)

In our consideration of the environmental effects of this project and whether they might be adequately mitigated, we have found there to be instances where non-compliance with reasonable conditions to protect health and amenity and reduce risk are predicted. Indeed, in his closing submissions, Mr Power said that exceedances of prescribed standards (in terms of air emissions and noise) would occur and have to be accepted by the Inquiry Panel in formulating its recommendations. This submission does not sit well with the assumption of compliance urged by Mr Power, unless of course the relevant conditions allowed for (a specified number or unspecified number of) breaches of statutory standards. We do not think that that approach should be regarded as appropriate.

We also record that we requested at the directions hearing that we be provided with complaints records over recent years by DSDBI, NGSC, EPA and the proponent. It was clear that there has not been a large number of complaints. In the main they relate to and blasting and vibration. Noise from the existing processing plant at night and dust deposition were among the lesser complaints. We requested the information because we believed it might assist us in understanding whether there may be future compliance issues. Given the comments above about having to accept breaches of statutory emission standards, this matter has become less relevant.

The Panel also considers that there has to be some real doubt about the ability of the regulator, being the regional office of the Earth Resources Regulations Branch of DSDBI, to enforce conditions which might be applied to the project. Some conditions, such as might relate to noise limits (see Section 4.3) are acknowledged to be difficult to draft and assess for compliance even with expertise available. Also, examples of Work Plan Variations (documents P24, P52 and P93) provided to the Inquiry Panel indicate that the crafting of enforceable requirements upon mining operations is not to a high statutory standard.

The Work Plan Variation for Wonga Pit (document P52), a partially refilled open cut which is within the subject area, for example, includes in relation to plant and equipment at Clause 4.3 that the '*plant anticipated to be used in the mining of the Wonga NCB are excavators, trucks (and a list of other vehicle types)*' (Panel emphasis). This is not in any sense a requirement which could be enforced. There are numerous other examples of unenforceable requirements which are qualified in such a way that they are uncertain as to their operational effect.

It seems that much of the material in Work Plans or Work Plan Variations (and Environmental Management Plans as discussed in Section 17.6) amounts to descriptive material. Other requirements are expressed simply as aspirational objectives.

We were particularly concerned about the expressed reluctance on the part of DSDBI to apply timeframes in requirements (saying they were supportive of the resource being exploited over whatever timeframe was necessary), given the context of the Big Hill project being said to have only a short term impact.

In addition to the limitations of the Work Plan conditions themselves, we are concerned about the statutory relationship between Work Plan Variations and Mining Licence

conditions. We note in relation to document P23, a Variation of Mining Licence 5260 of May 2011, attaching a new schedule of conditions that Conditions 1.1 and 1.2 provide:

- i. *The licensee must carry out work in accordance with the Approved Work Plan and any subsequent Approved Work Plan Variations.*
- ii. *Where any inconsistency occurs between an Approved Work Plan and/or an Approved Work Plan Variation or the associated Approved Work Plan conditions, and other licence conditions and/or regulations, **the licence conditions and/or regulations have precedence.** (Our emphasis)*

We have reviewed the conditions of Mining Licence 5260 as at 3 May 2011 (document P23). They appear to be generic in nature. Our concern is that if a particular provision is included in the Work Plan Variation for the current project, such as imposition of a particular noise limit or required achievement of a particular air emission criterion, that this might be viewed as inconsistent with a generic provision in the Mining Licence. Such generic and other potentially conflicting conditions in the licence include:

- A requirement at Clause 17.3 to comply with State Environment Protection Policy N1 in relation to noise.
- A requirement at Condition 23.2 that roads are to be constructed in accordance with a direction by the DSDBI inspector, Crown land manager or private land owner.
- A requirement at Clause 30.1 that the licensee must ensure that all reasonable measures are taken to prevent adverse impacts of drilling operations.

We have given consideration to the mining licence conditions and how they might interact with any Work Plan Variation conditions in making our assessment and recommendations.

Further to this issue of compliance and enforcement are the limited inspection resources available to the relevant South West Regional office of DSDBI. We were told that the regional staff resources comprise a manager (currently Ms Bessie Abbott is acting manager) and two inspectors (sometimes only one). We were also told that the staff have responsibility for some 600 mines (and we assume quarries). We have made a recommendation that if the project is to proceed, that an EPA monitor/auditor should be appointed for the duration of the project to overcome this staffing limitation in relation to compliance.

PART B: ENVIRONMENTAL EFFECTS OF THE PROJECT

3 Air quality

3.1 The issues

Air quality is one of the key issues for the project. The potential for emissions from the mine to impact on residents living close to the proposed mine site was identified early in the assessment process. It is a key element of the Scoping Requirements of the EES and is the first of the impacts recognised in the Minister's reasons for requiring an EES of 23 April 2013.

Two sets of air emissions modelling by the proponent have been undertaken as input to the EES and Inquiry process. The initial modelling, which appears in the EES, used background and meteorological data from Bendigo, which was considered by the proponent to be representative of the subject site. This modelling found that there would be limited exceedances of the air quality standards. The modelling later done with Stawell background data, following the Inquiry directions hearing and presented in evidence at the hearing, predicted more exceedances than the previous modelling and that the maximum concentrations would be higher.

Both modelling exercises were conducted assuming a range of control measures for dust. The statutory framework in Victoria requires emissions to be controlled by application of best practice measures or to the maximum extent achievable. Evidence presented to the Inquiry was that the measures that have been proposed meet these requirements, that no further clearly quantifiable measures could be identified to reduce emissions, and that it was expected that cessation of work on the site would need to occur from time to time. However, it was not demonstrated that this would achieve compliance with the relevant air quality standards. Only some of these measures were evaluated in the air quality modelling reduce emissions. Even with these measures in place, exceedances of the air quality standards for PM₁₀ and arsenic are predicted.

3.2 Regulatory context

Air quality in Victoria is managed by two State Environment Protection Policies (SEPPs):

- SEPP (Ambient Air Quality) (SEPP(AAQ))
- SEPP (Air Quality Management) (SEPP (AQM)).

The SEPP (AAQ) adopts the air quality standards and monitoring and reporting protocols contained in the National Environment Protection Measure (Ambient Air Quality) (NEPM)²⁶. The standards are used to assess general air quality across a region arising from emissions from different types of sources.

The SEPP (AQM) establishes the management framework for the control of emissions to the air environment to ensure that the ambient air quality standards contained in the SEPP (AAQ) are met and that continuous improvement in Victoria's air quality is achieved.

²⁶ Sets standards, goals, monitoring and reporting protocols for six common pollutants: carbon monoxide (CO), nitrogen dioxide (NO₂), photochemical oxidants (as ozone), sulphur dioxide (SO₂), lead and particles as PM₁₀.

These policies are statutory policies and provide the legal framework for assessment and management of air quality in Victoria. The aims of the SEPP (AQM) are to:

- a) ensure that the environmental quality objectives of the State environment protection policy (Ambient Air Quality) are met;*
- b) drive continuous improvement in air quality and achieve the cleanest air possible having regard to the social and economic development of Victoria; and*
- c) support Victorian and national measures to address the enhanced greenhouse effect and depletion of the ozone layer.*

The policy is guided by the principles of environment protection as set out in the *Environment Protection Act 1970* (EP Act), including consideration of the precautionary principle and the wastes hierarchy with avoidance being the main aim.

The relevant policy intents set out at Clause 8 of the SEPP (AQM) include the following:

Emissions to the air environment will be managed so that the beneficial uses of the air environment are protected, Victoria's air quality goals and objectives are met, our air quality continues to improve and we achieve the cleanest air possible, having regard to the State's social and economic development...

Class 3 indicators²⁷ will be managed at source to achieve the best practicable outcome irrespective of the ambient levels due to the extremely hazardous nature of these pollutants.

Proposals for new or substantially modified industrial sources of emissions will be designed to minimise their operational impact...

The SEPP (AQM) classifies air pollutants into three classes based on their toxicity and/or odorous properties. For the Big Hill mine, the key pollutants are:

- PM_{10} ²⁸, Nitrogen dioxide (NO_2) and Carbon Monoxide (CO) – these are classified as Class 1 indicators. They are ubiquitous in the environment and are a subgroup of pollutants used to describe regional air quality as they arise from a wide range of sources. These pollutants are covered by the NEPM and have ambient air quality standards set to describe general air quality within a region.
- $PM_{2.5}$ ²⁹ – Class 2 indicators. Also ubiquitous in the environment and arise from many sources. The NEPM contains ambient air quality standards for $PM_{2.5}$.
- Arsenic, polycyclic aromatic hydrocarbons (PAH), respirable crystalline silica (RCS) – Class 3 indicators. These substances are all carcinogenic. Class 3 indicators are the most toxic pollutants covered under the SEPP.

The SEPP (AQM) at Clauses 18 and 19 requires that all generators of emissions must be control their emissions by the application of best practice which goes beyond the application of technology controls.

²⁷ This includes arsenic.

²⁸ Particulate matter with an equivalent aerodynamic diameter of 10 microns or less.

²⁹ Particulate matter with an equivalent aerodynamic diameter of 2.5 microns or less.

Clauses 19 and 20 require that emissions of Class 3 indicators be controlled to the maximum extent achievable (MEA) which goes beyond best practice. The aim is to minimise these emissions due to their toxicity.

These levels of control apply to all generators of emissions in Victoria not just industrial point sources (Clause 18(2) SEPP (AQM)). Proposals for new or substantially modified industrial sources (such as the proposed open cut mining operations) must be designed to minimise their operational impact.

Clause 15 of SEPP (AQM) provides for the making of Protocols for Environmental Management (PEMs) as incorporated documents to the SEPP (AQM).³⁰ As incorporated documents, PEMs have the same statutory status as the SEPP (AQM). Clause 15 also states that:

Generators of emissions must manage their emissions in accordance with any relevant protocol for environmental management developed in accordance with this policy.

Clause 40 of the SEPP (AQM) makes specific reference to the preparation of a PEM for mining and quarrying, and under Clause 40 (3) states that:

A protocol developed under sub-clause (1) sets the conditions that apply under this policy to an industry or activity for which that protocol is developed.

The PEM for mining and extractive industries was made in 2007 (document P37). It sets out the statutory requirements for assessment and management of air emissions to the air environment from mining and extractive industries. It is intended to be applicable to both new developments and existing developments where significant modification or expansion is to occur. All mining and extractive industries have a requirement to comply with SEPP (AQM).

The PEM focuses on the requirements of the SEPP (AQM) and ensuring that the beneficial uses of the air environment defined in the policy are protected. These beneficial uses include:

- Life, health and well-being of humans
- Life, health and well-being of other forms of life, including protection of ecosystems and biodiversity
- Local amenity and aesthetic enjoyment
- Visibility
- The useful life and aesthetic appearance of buildings, structures, property and materials
- Climate systems that are consistent with human development, the life, health and well-being of humans and the protection of ecosystems and biodiversity.

The PEM, at Clause 2.3, provides that generators of emissions of Class 3 indicators, such as arsenic, must consider opportunities for going beyond what is considered best practice for their premises to demonstrate that the requirement for MEA for control of emissions is being met.

³⁰ See also Clause 40 with specific reference to mining.

The PEM establishes assessment criteria which are air quality standards that have been developed based on the protection of human health (Clause 3.3 PEM, page 7). The assessment criteria relevant to the proposed Big Hill Development are shown in the following table.

Table 2: PEM criteria relevant to project

Pollutant	Averaging Period	Assessment Criteria
PM ₁₀	24 hours	60 µg/m ³
PM _{2.5}	24 hours	36 µg/m ³
Arsenic	Annual average	0.003 µg/m ³
Respirable Crystalline Silica (RCS)	Annual average	3 µg/m ³
Polycyclic aromatic hydrocarbons (PAH)	Annual average	0.3 ng/m ³
Nitrogen dioxide (NO ₂)	1 hour	0.14 ppm
Carbon Monoxide (CO)	8 hours	29 ppm

Importantly, as stated on page 7 of the PEM, the assessment criteria are used to assess the total concentrations of background plus emissions arising from the activities on the site. Emissions from the mine or quarry must be managed to ensure that the cumulative impacts of all sources in the local area do not pose a risk to the health and amenity of the local residents and that the beneficial uses specified in the SEPP (AQM) are protected.

The PEM also states at Clause 3.3, page 8, that in areas where background concentrations of arsenic are unknown³¹, a risk assessment may be undertaken to assess the potential impacts of the mining operation. In these situations, the risk arising from the emissions from the activities on the site must not exceed a lifetime cancer risk of 1 in a million.

The PEM also notes that it is important that emissions from industries, including mining and extractives, do not contribute to a deterioration of air quality in urban centres and regional towns and townships. The PEM states:

Although the assessment criteria have been established for mining and extractive industries there may be some situations where the assessment criteria cannot be met at the nearest sensitive location to the operation, no additional management practices can be practically applied and the predicted impact from the proposed expansion or operation extends into urban areas or townships.

In these situations assessment of the predicted emissions on the existing air quality within the urban area or township may be required. If required, the assessment should be undertaken at locations where the general population is likely to be exposed rather than the nearest residence. Background air quality data must be included in the modelling. Where such an assessment is required the air quality standards contained in the Ambient Air Quality NEPM apply. For particles these standards are:

³¹ See discussion of relevance of this provision at Section 3.3(iv), as background levels are known.

PM_{10} 50 $\mu\text{g}/\text{m}^3$ 24 hour average

$PM_{2.5}$ 25 $\mu\text{g}/\text{m}^3$ 24 hour average; 8 $\mu\text{g}/\text{m}^3$ annual average

The PEM goes further to say at Clause 3.3, page 9 that:

The Ambient Air Quality NEPM also establishes a goal for PM_{10} of no more than 5 allowable exceedances to be met by 2008. These exceedances allow for the impacts of prescribed burning, dust storms and bushfires on regional air quality and should not be interpreted as allowing individual industries to contribute to such exceedances. Such events must not be removed from background data files but clearly identified as arising from such events.

The EPA Publication 1518: *Recommended Separation Distances for Industrial Residual Air Emissions – Guideline*, March 2013 (EPA Buffer Guidelines) establishes recommended separation distances for sensitive uses from industrial premises. The role of separation distances is to provide a safety buffer in case of upset conditions on an industrial site so that they do not impact on the surrounding community. The recommended separation distance for mines, other than coal mines, is 250m. These buffer distances apply from the activity boundary to the boundary of the sensitive use which may include residential backyards, garages etc.

3.3 Evidence and submissions

As noted above, air quality was identified as one of the key issues for this project and an air quality impact assessment was prepared as part of the EES. This assessment used background air quality and meteorological data from Bendigo. At the directions hearing held by the Inquiry Panel, the proponent volunteered to undertake a revised air quality impact assessment based on Stawell background air quality and meteorological data. This was circulated on the second day of the Panel hearing as part of Dr Grynberg's evidence for the proponent and was subject to examination during the hearing. Also during the hearing, in response to questions posed by the Panel, additional air quality information was provided. By the end of the hearing, some information was still outstanding and, following a number of prompting letters by the Panel, was provided by 8 August 2014. Written submissions by other parties and a reply by the proponent were permitted after the receipt of this post-hearing material.

Evidence on behalf of the proponent was given by Dr Harry Grynberg on the Air Quality Impact Assessment (AQIA). Mr Frank Fleer provided a review of this as the Independent Technical Reviewer (ITR) and Mr Robin Ormerod gave evidence on predictive and reactive modelling and monitoring. Submissions were made by the EPA and Department of Health (DoH). A large number of the written submissions prior to the hearing made reference to air emissions issues. A number of the submitters also made presentations on the issue during the hearing process. After the hearing, a number of submitters who had attended the hearing, including the EPA and DoH, responded to the invitation to provide additional submissions following the post hearing circulation of material by the proponent. The proponent's response to these further submissions was in the form of correspondence from Freehills and URS.

3.3.1 Approach to modelling

The PEM requires that emissions are to be modelled using an EPA approved regulatory model after emissions have been reduced by the application of best practice measures or practices to reduce emissions to the maximum extent achievable (MEA)³².

If alternative approaches are proposed, then a modelling plan must be submitted to the EPA for approval. A modelling plan was submitted to the EPA in this case, and the use of CALPUFF for the modelling was approved. However, the EPA further recommended that additional modelling be undertaken using AERMOD which is the EPA regulatory model. This was not done.

Concerning inputs to the model, the EPA did not agree with the use of the Bendigo background data and meteorological data (Air Quality Impact Assessment, Technical Report 7, Appendix E), and commented that any modelling using this data could not be used to demonstrate compliance with the air quality standards. Nevertheless, this modelling formed the basis of the air quality impact assessment (AQIA) in the EES. Mr Power, in document P87, acknowledged that the original AQIA submitted as part of the EES did not comply with the requirements of the PEM. A revised AQIA which met the requirements of the PEM was subsequently conducted using Stawell background data.

Predictions about the impacts of proposed emission sources rely on model simulations that relate pollutant emissions and atmospheric processes. The accuracy of the predictions depends on the model itself and how it is used, and on the emissions input or inventory.

The evidence in relation to this was derived from submissions and presentations and questions in the Panel hearing process including the following documentation:

- Technical Appendix 7 – Air quality impact assessment of the EES
- Updated report – Air quality impact assessment dated 3 July 2014 (documents P18 and 19)
- Expert witness statement from Dr Harry Grynberg dated 18 June 2014 (document P41) and presentation (document P42) to the Panel
- Expert evidence report from Mr Frank Fler dated 5 May 2014 (document P43), addendum to EWS (document P20) and presentation to the Panel (document P44)
- Submission from EPA Victoria (submission 319) and presentation to the Panel (document EPA60).

(i) Model

The model used in the assessment was the CALPUFF air dispersion model. The meteorological input data required by the dispersion model are generated by CALMET a meteorological model that uses coarse grid data from the prognostic wind field model, TAPM; measured data from seven regional Bureau of Meteorology (BOM) stations; and data from the two automatic weather stations (AWS) in Stawell. Analysis and validation involved a comparison of model output and observed parameters at the AWS and BOM stations in

³² MEA applies in the case of respirable crystalline silica (RCS), arsenic and Polycyclic Aromatic Hydrocarbons (PAH).

Stawell. The CALMET output consists of 1-hour averaged data at a 50 metre grid resolution and is an input to CALPUFF.

Modelling was initially undertaken for PM₁₀ and PM_{2.5} for years 2 and 5 of the project as well as for year 1. Years 2 and 5 were the two years where the greatest amount of earth movement was planned to occur and hence the years in which emissions were expected to be highest. Modelling of year 1 was added on the recommendation of the ITR and EPA due to the proximity of residences to activities in the northern pit.

All modelling was undertaken assuming existing terrain, with 5% of estimated emissions being retained in the pit (flat top model). Output concentrations of 1-hour and 24-hour average PM₁₀ and PM_{2.5} were determined at more than 120 sensitive receptors, including individual residences and educational and other institutions. In addition, monthly average dust deposition, and annual average arsenic, respirable crystalline silica, and PAH concentrations were computed.

The location of the emission source was determined by where the activity generating the emission occurred. The emissions were modelled as either a point, an area (such as from a surface subject to wind erosion), a line volume (for example, a road), or a volume source (such as ore crushing).

Year 2 was also modelled using a terrain model with zero emission retention in the pit - that is the actual terrain for that period was used instead of the original terrain. Predicted concentrations were generally lower than those predicted using the flat-top model, but this was not pursued further.

The PEM requires that the results of the air quality modelling be represented in two ways:

- Time series plots showing the contribution from the mine alone, the existing background data, and the combined background together with the contribution from the mine. This is to be presented for the receptor predicted to have the maximum concentration from the mine.
- Contour plots showing the maximum predicted concentration from the mine alone across the whole receptor grid.

These plots were provided in the AQIA as part of the EES. However, the time-series plots did not contain the combined impact as required by the PEM.

The revised AQIA contained the time series plots for the most affected receptor, but again did not contain the combined graphs. Contour plots of the mine impact alone were provided after they were requested by the Panel. The Panel further requested that contour plots be provided that showed the daily varying background plus the mine contribution. These were not provided despite the revised impact assessment report of 3 July 2014 indicating that a daily varying background was modelled.

The EPA response to the further modelling results provided by the proponent was a recommendation for further graphical and tabular information for the three modelled years as well as for year 3, not previously modelled.

Some issues in relation to the model were raised in questions and submissions at the Inquiry hearing. In response to questions about the model accuracy, both Dr Grynberg and Mr Fleer indicated that models tend to err on the conservative side. The time resolution in the model

was stated to be one hour, the spatial resolution as 25 metres and sensitive receptors as being over 120.

(ii) Emissions inventory

Emission rates are a critical input to the model. Particulate matter is the key pollutant from mining and includes PM₁₀ and PM_{2.5} which contain RCS and arsenic. It is therefore important that particulate matter emissions be controlled to demonstrate that best practice and MEA controls are applied and emissions estimated accurately. Both RCS and arsenic need to be controlled to MEA due to their toxicity.

Emission estimates for particles were based on the activity rate and the emission factor for that activity. An annual emission rate was calculated for each activity and converted to an hourly emission rate by dividing by the production hours for that activity. For most activities, production hours were taken as 2,500 per year (10 hours per day, 5 days per week). The following activities were included:

Non-combustion sources

- excavators loading trucks with overburden/ore
- dozers
- drilling
- unloading (dumping) of overburden/ore
- loading/unloading ore at ROM Pad
- crusher
- blasting
- wheel generated dust from unpaved roads
- graders
- wind erosion from all exposed surfaces including the TWRS.

Combustion Sources

- Loading and unloading
- Drilling
- Hauling
- Ancillary equipment
- Blasting
- Carbon regeneration plant.

Emission factors were estimated using the USEPA AP 42 *Compilation of Air Pollutant Emission Factors*, the National Pollutant Inventory (NPI)³³ emission estimation manual, and site specific factors as appropriate. This is consistent with the requirements of the PEM.

Core samples from the site were analysed for deriving the heavy metals and RCS content. The predicted ambient concentrations were determined by applying the percentage of the

³³ Australian Government, *National Pollutant Industry Emission Estimation Technique Manual for the Mining Industry*.
National Pollutant Inventory Emission Estimation Technique Manual for Gold Ore Processing, Department of the Environment and Heritage, December 2006

contaminant in the core samples to the modelled concentrations of PM₁₀ and PM_{2.5}. Gravimetric analyses for these were subsequently conducted for PM₁₀ and PM_{2.5} samples taken over 1 week periods, and analyses of heavy metals, including arsenic, and RCS.

Mr Fleer had raised a number of issues about emission inventory assumptions and made recommendations for changes which were addressed in the original and updated air quality impact assessment.

The EPA commented that the emission factors needed to represent worst case emissions with best practice/MEA controls applied (Appendix E, Technical Appendix 7). No information was provided if this was done. Mr Power (document 87) stated that the modelling was conducted using the years when the maximum emissions would occur and therefore represented the worst case emissions. He also commented that the proposed control measures did meet the requirements for the best practice and control to the maximum extent achievable.

Mr Fleer and Dr Grynberg responded to questions from the Panel and presenters, including EPA about the emissions inventory at the hearing. Dr Grynberg also responded to issues raised in submissions on this matter in his witness statement.

Mr Fleer and Dr Grynberg were both asked by the Panel whether the time varying emission rates included variations in activity during the day and responded that they were not aware of inventories that included this detail.

Mr Robinson from the EPA questioned Dr Grynberg about the confidence limits in the emission estimates, and specifically whether the emission estimates could be in error by plus or minus 50% for example. This was put in the context of mine emissions contributing 30%-50% to the PM₁₀ load in ambient air. Thus, any significant error in the emissions would affect compliance with ambient air quality standards. Dr Grynberg responded that a robust process had been employed in selecting the emission factors and that modelling generally overstates results.

In response to questions by the Panel relating to the importance of sources included or omitted in the inventory, Dr Grynberg referred to the source apportionment slide in his presentation (document P42) showing that source contributions mainly come from earth moving and hauling operations and the total from lesser sources was small. In relation to emissions from collapsing pit walls and from blasting, these were stated to be short lived. He said that a minimum of blasting would be conducted over small areas at the bottom of pits for a short period each day. Therefore emissions from blasting were not modelled.

Dr Grynberg was questioned by the Panel about the silt content of unsealed roads since correspondence attached to Mr Frank Fleers expert witness statement (P43) pointed to the fact that the average silt content of the parent soil averaged 42% which is much higher than that assumed for estimating emissions³⁴. Dr Grynberg stated that the 4.3% limit would be included in construction specifications. He also confirmed that truck speed had been included in the emission estimates.

³⁴ Emissions from unsealed road are directly related to the silt content of the road.

(iii) Emission management practices

The proponent emphasised that all available best practice management practices were being proposed for the project (document 87). The measures were listed in the EES and described by Dr Grynberg in his presentation (document P42). Two categories were indicated, those that had been explicitly modelled and those that had not. The following lists apply:

Modelled management practices

- Watering of unsealed haul roads up to a rate of and above 2L/m²/hr combined with use of a chemical suppressant to achieve 84% dust reduction
- Use of larger trucks
- Use of low silt content materials in construction of unsealed in-pit ramps
- Emissions from all on-site vehicles to comply with relevant regulations
- Drill rigs to use dust curtains and fabric filters
- Watering to be applied to the drill area
- Watering of active work areas up to a rate of up to and above 2L/m²/hr and supplemented with a chemical suppressant
- Watering walls of the TWRS
- Active work areas to be kept to a minimum
- Watering and chemical suppressants to be applied to stockpiles (TWRS, ROM pad)
- Chemical suppressants and sprinklers applied to overburden to minimise wind erosion
- Wetting of loads during truck loading / unloading
- Minimise drop heights to less than 1.5 metres.

Management practices not modelled

- All diesel trucks to be fitted with particle filters and catalytic converters
- Staging multiple benches in the north and south pits to reduce particle emissions from the pits
- Maintaining a moving outer bench around workings for the purpose of shielding and reducing potential generation of particles
- Waste material at the TWRS to be dumped along the outer edge first to provide a shield for particles
- During land form reconstruction, the outer portion of the land form will be constructed first to shield particulate matter generated
- Rip and dig approach to extraction with minimal blasting that reduces particle generation
- Blasting to take place during favourable meteorological conditions
- Blasting to be stemmed to maximise efficiency
- Blasting area to be minimised
- External walls of the TWRS to be mulched, seeded and watered
- Sealing of selected haul roads and in-pit ramps
- Processing plant to minimise cyanide emissions through adherence to International Code for Cyanide Management
- The use of a meteorological forecasting tool that determines potential future adverse weather conditions that may give rise to elevated particulate concentrations as described by Mr Ormerod (document P45).

The source emission estimates are the primary input to the model and these depend on the level of pollution control applied. Emissions from sources in the second list were also included, but potential reductions that could be achieved by applying those practices were not. No discussion was provided on MEA measures as required to control arsenic and RCS emissions and it appears that MEA controls were not modelled. Mr Power (document P87) stated that as best practice measures had been modelled and that if no further measures could be implemented then control to the maximum extent achievable had been demonstrated.

A number of the non-modelled measures rely on some shielding effect, for example multiple benching, which are difficult to quantify. Dr Grynberg stated that emission factors for the non-modelled practices were not available in the NPI handbooks or in USEPA AP42 emission factor handbook³⁵. Dr Grynberg stated that the additional level of emission control that would be available from implementing these measures is unknown. Some indication of the potential effect of shielding could be gauged by the results of the tentative terrain modelling referred to by Dr Grynberg. As earlier noted, the terrain model uses the actual topography of the hill as it changes progressively during mining rather than the original topography of the flat top model. This affects modelled dispersion.

It was acknowledged by Dr Grynberg that all major source emission control methods rely on strict adherence to management practices and not physical controls. They are therefore prone to human error. The EPA and DoH strongly emphasised that the proximity to residences leaves no room for error in the operation. The EPA emphasised that given the proximity of the site to residences that better than best practice controls would be required. This is due partly to the fact that the buffer has been reduced from the recommended 250m in the EPA Buffer Guidelines to approximately 35m from the closest residence. The AQIA as part of the EES stated that the assessment of best practice for the project was determined by benchmarking against practices used in NSW coal mines that usually have greater buffer distances. A review was conducted by URS of the information in a report³⁶ done for the NSW EPA as part of an assessment of managing the impacts of coal mines in the Hunter Valley. This report was used by URS in determining what they considered as best practice for the Big Hill development.

Both Dr Grynberg and Mr Fleer were asked by the Panel if there were any further measures that could be implemented that would reduce emissions further than proposed. Both were of the view that they were not aware of any other measures and that ceasing work when exceedances were expected was the only additional measure accepted by SGM that could reduce the impact on nearby residences.

³⁵ AP 42 are a US EPA compilation of emission factors for estimating emissions from different industries which are updated at various times. A number are cited in the ITR's review including:

- *Western Surface Coal Mining, AP-42 Section 11.9, 1998*
- *Unpaved Roads, United States, AP-42 Section 13.2.2, 2006*
- *Industrial Wind Erosion, AP-42 Section 13.2.5, 2006.*

³⁶ Katestone Environmental Pty Ltd, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*, prepared for Office of Environment and Heritage, June 2011.

Dr Grynberg and Mr Fler were also questioned on the degree of dust control possible for roads. Dr Grynberg suggested that sealing of roads could achieve close to 100% dust mitigation. Mr Fler in his evidence stated that for roads, bitumen sealing was best practice. The Panel pointed out that this would require frequent cleaning of roads and pointed out that during its inspections³⁷, the Panel had observed wet and muddy bitumen roads near the mine. The Panel questioned Dr Grynberg on how much water could practically be applied to the roads to control dust and still have them in a usable condition. He responded that he believed that the levels modelled could be applied in practice. He was also asked by the Panel whether wheel washers on the site had been considered to reduce the off-site tracking of mud. He responded that they had not.

The Panel understands that the proponent intends to seal some roads in bitumen and a plan was provided showing these late in the hearing. This has been stated as best practice. A practical issue pointed out by Ms Bennett, a submitter, however, related to the road into the TWRS which must rise as the stockpile grows to 50 metres in height. This may require a different standard of sealing. The Panel expects that, if a lesser sealing standard was to be applied here, it would be the exception and that more robust bitumen sealing would be the standard applied to all other haul roads.

3.3.2 Predictive/reactive management

The predictive and reactive management system proposed by the proponent is a recognition that management practices can go wrong and/or conditions may occur that risk air quality reaching unacceptable levels.

The modelling of emissions had indicated that there are likely to be a number of occasions when PM₁₀ and arsenic emissions from the mine would cause air quality at one or more locations to exceed the PEM criteria for these pollutants, and operations may need to be modified or suspended to avoid this. A system based on a trigger action response plan (TARP) was proposed and the issue is whether this would be effective in ensuring compliance with the relevant air quality criteria.

The requirement for real-time predictive and reactive monitoring and management is established in the PEM for a Level 1 site. A level 1 site is one where the development is located close to residential areas and has the potential to give rise to significant off-site impacts. These require the most stringent levels of assessment and management.

Evidence on this issue came from Mr Robin Ormerod's expert witness statement dated 18 June 2014 (document P45), addendum 1 dated 3 July, 2014 (document P21) and his presentation to the Panel (document P46). The expert witness statement of Dr Grynberg (document P41) and his presentation to the Panel (document P42) are also relevant.

The management system proposed by Mr Ormerod is the EnviroSuite System. The predictive component relies on predetermined values of forecast or measured meteorological variables to trigger management action. With the reactive component, management action would be triggered by preset values of measured air quality parameters.

³⁷ Also observed to a lesser extent on the later accompanied inspection.

As explained by Mr Ormerod, the EnviroSuite system has been developed over a number of years and is based on the following elements:

- Weather forecasting system based on the Weather Research and Forecasting (WRF) model which provides the input data for CALPUFF
- The CALPUFF air dispersion model. This is used for both reactive and forecast pollution alert systems
- User defined emission rates from the emissions inventory. These are based on site activities and the location of these activities on the site
- Real time ambient air quality monitoring data
- Real time meteorological measurement data.

In the forecasting mode, the system predicts the weather conditions and the associated site meteorological input data for the air dispersion model three days in advance. These data are fed into the model which then predicts the concentration of particles at various receptors and establishes the weather conditions and site activities associated with high ambient levels. Forecasts of conditions conducive to potential exceedances of air quality criteria allow for proactive measures, such as rescheduling of activities or suspension of high emission operations, to be anticipated and planned for. A system of alerts, developed from modelling and from experience, is developed and communicated directly to action personnel to allow a timely response to forecast exceedances.

In the reactive mode, real time monitoring, meteorological, and emissions data based on the activity in progress, are used in conjunction with modelling to assess what action is required to avoid air quality criteria being exceeded. Real time meteorology and site emissions and locations are input to the model which computes predicted values at various receptors. Real time monitoring determines pollutant levels at the monitoring sites, and is used to validate and tune model predictions. Measured and predicted data are then used to guide the development of appropriate short-term trigger alert levels, that if exceeded require additional actions to be implemented to avoid the 24-hr average health based criteria from being exceeded.

Trigger alert levels for action for PM₁₀ and PM_{2.5} at three levels (TRL1, TRL2, and TRL3) for each of 1-hour and 24-hour rolling averages were listed in Table 8.4 of the EES main report. These trigger levels were:

Table 3: Proposed trigger levels
Source: Table 5.11 EES

	TRL1	TRL2	TRL3
PM10 1-hour	80	100	150
PM10 24-hour	40	50	55
PM2.5 1-hour	50	60	90
PM2.5 24-hour	24	30	33

Although these triggers have been proposed, Mr Ormerod did not see that these figures are fixed. He stated in his EWS that:

...it is possible to set.....trigger levels that are too stringent, resulting in excessive alerts being issued....' and '.....there is a difference in the level of trigger concentrations that would apply at a residential monitor compared to one that is within the mine site, so these differences need to be accommodated in the trigger levels.

The system relies on the following:

- availability of *response* actions to be taken to reduce emissions
- *defined* roles and responsibilities in response to alerts
- predetermined response actions to *different* alert levels
- an automated system of communicating alerts to action officers.

In addition to the automated alert capability, the system includes a back trajectory model that can be used to back-track the path of a pollutant, leading to the likely source of the reading.

Mr Ormerod was questioned by the Panel and submitters, including EPA, about the system and its detailed application. The focus of the questions was how this system would be applied in the context of the Big Hill project. The PEM requires a mix of monitors to assess compliance with the assessment criteria as well as some that are established for the purpose of informing real-time management options.

A number of questions by EPA and other participants related to the number of monitors that would be required to meet the requirements of the PEM and how they would be located. Mr Ormerod responded that determining the number of monitors required a detailed design. The network could be designed, he said, to pick up key events and determined maxima over time. He envisaged that a limited number of compliance monitors, measuring particles and meteorological parameters, would be required, together with a number of e-samplers³⁸ measuring particles closer to the mine for assessing the likely source of high particle levels.

Dr Grynberg suggested that three locations for assessment of compliance measuring of PM10, PM2.5 and meteorological parameters, together with dust deposit gauges would be required. He said that two of these monitoring locations would need to be located at the most impacted receptors as determined by modelling depending on the assessment year, and the third would be used for ongoing background monitoring at a suitable location.

A number of questions by the Panel and submitters related to the model and monitoring accuracy and resolution. In response, Mr Ormerod stated that monitoring was accurate to a few percentage points. Model accuracy was more problematic to determine, he said, and also depended on the accuracy of the emission estimates. He nevertheless said that conservative outcomes were aimed for and could be validated against the measurements. The resolution of the model could be altered, Mr Ormerod said, and had been used on a 25 metre grid. It could be used to calculate values at discrete receptors and could cater for bushfire days.

³⁸ An e-sampler is a light scattering instrument for measuring particle concentrations.

A number of questions were asked about the use of triggers and their use and effectiveness. This included questions from DSDBI and EPA. With regard to the actual trigger levels, it was stated that these would initially be set to give false positives, that is, at a conservative level, so that criteria are not exceeded, and would be reviewed periodically during use. The early warning triggers were designed to ensure timely action was taken to avoid exceedances. He acknowledged, however, that it was in the hands of the operator as to what response was made.

The issue was raised by EPA as to whether the system allowed pollution up to a level. Mr Ormerod responded that it applied after all available control measures were in place and could be considered as controlling to a level. In terms of operator response to triggers, he said that the response could be monitored for purposes of enforcement.

In answer to questions by the Panel about where EnviroSuite is used, he stated that it is being widely used in Australia and New Zealand in different industries including coal mines and pointed to examples in his presentation. An addendum to his witness statement (document P21) explains how the system is being used at a Hunter Valley coal mine, and its use for averting potential exceedances of 24 hour averages and 12 month averages. In response to a Panel question, he stated that he was not aware of examples of its use in locations within 50m of residents.

There were a number of questions at the hearing relating to the public availability of online monitoring data. The Panel, submitters and presenters, including Ms Hunt, Ms R Byass, and Mrs Melbourne, asked about the data being made available on line. Mr Power for the proponent indicated during the hearing that the proponent was opposed to making the real time data available online and in particular was opposed to its release to the public. Mr Ormerod was questioned about this. He responded that there were problems in ensuring the validity of data. He said that the NSW EPA had been working on issues in relation to reliable online publishing of industry self-monitoring data and had not been able to achieve it to date. During this session of the hearing, EPA Victoria stated that it does provide its own ambient monitoring data on line with disclaimers on its validity. The success of the predictive and reactive monitoring system depends on an effective response being available and implemented. The proponent indicated that all available physical mitigation measures had been exhausted and that any further actions that might be taken to mitigate the effects are operational ones. These were summarised by Dr Grynberg in relation to the proposed three levels of triggers as follows:

- TRL1 Identify sources and address emissions, for example, increase wetting down
- TRL2 Continue mitigating measures
 - Assess work activity rates
 - Reduce or relocate on the site as necessary
- TRL3 Continue mitigating measures
 - Cease work in high dust areas.

The available responses described above indicate an increasing scale of response according to trigger level. The responses would appear to be not always available in all circumstances and would be dependent on the working methods being employed at the relevant time. It may not be possible, for example, to further dampen down or to relocate activities to another part of the site. Ceasing work altogether would then be the only response available

not only in response to TRL3 but also to TRLs 1 and 2. Based on the modelling, suspending operations could be required for more than 30 days.

A number of questions centred around the feasibility of ceasing work as a management option and whether suspension of work would actually happen close to the end of the day. EPA also asked whether watering would actually work on a very windy day, and Ms R Byass asked whether sufficient water for dust suppression was available.

3.3.3 Compliance expectations

(i) Buffer distances

As mentioned above, the EPA Buffer Guidelines recommend a separation distance for mining operations from sensitive receptors of 250m. The current project significantly reduces that buffer to approximately 37m at the closest residence.

At the directions hearing, the Panel requested that the proponent provide examples of where mining operations have been successfully undertaken so close to residential areas. In particular, the measures taken to manage air and noise emissions were to be assessed. In response, the proponent tabled examples of mining operations at the hearing (documents P81 and P83). Some of the examples put forward were for underground operations and not open pit mining such as is being proposed for Big Hill. None of the examples provided were within the same proximity to residences as the proposed Big Hill project. The example provided which is closest to residential areas is the Linwood Quarry in South Australia, which has isolated residences within 70m of the operational stockpiles. This is almost double the 37m distance that the pits at Big Hill will be from some of the residences in Fisher and Main Streets.

Of the management measures put forward, dust suppression by use of water sprays was said to be the key measure, with progressive rehabilitation and revegetation also being applied. No information was provided on how successful these measures were in ensuring compliance with air quality standards/guidelines.

One project put forward as an example of a mining operation close to residential areas was the Montrose Quarry (document P83). The Montrose Quarry was put forward by Mr Fleeer as part of his expert evidence where it was stated that the quarry was within 60m of residences. Document P83, however, indicates that the proposed 2004 quarry expansion would have brought the quarry within 250m from the closest residence not 60m. The Panel notes that approval for the 2004 quarry expansion was not granted based on concerns about the impacts of dust, in particular RCS, on the health of nearby residents and concerns about noise. We note that the local council refused to issue a planning permit for the expansion and Minister for Planning determined that he would not intervene in that decision³⁹.

As discussed earlier in Chapter 2, the Panel noted during the hearing that the plans showing the location of the pits presented in recent documents had apparently changed from those in the EES, with the south pit in particular coming closer to houses on Fisher Street. Mr

³⁹ see <http://rangestrader.starcommunity.com.au/mail/2008-05-05/quarry-expansion-blasted/>;
<http://archive.premier.vic.gov.au/media-releases/69-minister-for-planning/2094-no-planning-intervention-for-yarra-ranges-council.html>.

Power commented that additional modelling of air quality and noise would be done once the design of the operations was complete and as part of the work plan variation approval process handled by DSDBI.

As we have said, we consider that this is an unacceptable approach in the circumstances of the close proximity of the mine workings to sensitive receptors. It is possible that the final design may have a larger impact if the pits continue to extend closer to residences. The Panel is being asked to make recommendations on a project design that, as advised by the proponent, will change.

Both EPA and DoH in their submissions commented that the reduction in the recommended separation distance would require SGM to go beyond best practice to ensure that the impacts on local residents would be minimised. As noted earlier, the practices being put forward by SGM for best practice measures have been benchmarked by URS against a report done for coal mines in NSW. One of the key measures being put forward for the management of emissions is the implementation of the predictive and reactive modelling and monitoring program. SGM and URS claim that this goes beyond best practice for similar operations.

The EPA also noted (document EPA 60) that the location of the proposed Big Hill development should be viewed as siting the north and south pits within the town and not adjacent to it. The EPA's view is that, in this situation, both the PEM and NEPM standards apply due to the location of the pits in relation to the town population. The EPA state that:

Integrating the weight of evidence of impacts, no safe limit, equity and precautionary principles and emissions reduction approach, EPA considers the PEM limit as a minimum tolerable design standard (without reactive measures); and NEPM limit as the acceptable design standard (with reactive measures).

The PEM limits referred to would be the assessment criteria of $60 \mu\text{g}/\text{m}^3$ as a 24-hour average for PM_{10} and $36 \mu\text{g}/\text{m}^3$ as a 24-hour average for $\text{PM}_{2.5}$. The NEPM limits would be the ambient air quality standards of $50 \mu\text{g}/\text{m}^3$ as a 24-hour average for PM_{10} , $25 \mu\text{g}/\text{m}^3$ as a 24-hour average and $8 \mu\text{g}/\text{m}^3$ as an annual average for $\text{PM}_{2.5}$.

The EPA recommends that as part of best practice and going beyond best practice that strict governance for the final design and implementation of an integrated air monitoring program is required. The EPA recommended that an independent third party should be engaged to oversee the management of emissions and operations of the site to ensure compliance with the requirements of the PEM and the site Environmental Management Plan (EMP).

In closing on behalf of the proponent, Mr Power stated that he proponent did not accept the role of a third party reviewer and that SGM would be responsible to ensure that the requirements of any approvals are met. The Panel believe that the EPA suggestion for the use of an independent governance arrangement should be considered.

(ii) EES information on compliance

As noted, the modelling undertaken as part of the EES documentation used Bendigo background data. Modelling was undertaken for Years 1, 2 and 5 of the project as these were the years predicted to have the maximum amount of material movements and therefore the greatest potential for generation of dust. In Year 1, only PM₁₀ and PM_{2.5} were assessed. For Years 2 and 5, all air quality indicators were assessed, including arsenic, RCS and PAH. PM_{2.5}, given the absence of 12 months of Stawell data, was assessed using ratios of PM_{2.5} to PM₁₀ obtained from the Bendigo data.

Dr Grynberg, in his evidence, concluded that, for Year 1, the modelling predicted that there would be no exceedances of the PM₁₀ or PM_{2.5} assessment criteria. For Year 2, exceedances of the PM₁₀ criterion were predicted at eight residences. For Year 5, seven locations were predicted to exceed the assessment criterion. Exceedances were predicted to occur on six days in Year 5 and two days in Year 2. The maximum concentration was predicted to be 89.9µg/m³. No exceedances of the PM_{2.5} criterion were predicted for Years 2 and 5 using the Bendigo background data.

Levels of arsenic were predicted to exceed the PEM criterion in both Year 2 (one location) and Year 5 (two locations). No exceedances of the RCS criterion were predicted for either Year 2 or Year 5.

Dr Grynberg's expert evidence (document P41) stated that the PAH assessment criterion is predicted to be exceeded at two receptors in Year 2 (R24 and R32) and would be at the criterion at R93 and R91. For Year 5, the PAH levels were predicted to exceed the assessment criterion at one location, R6, which is adjacent to the proposed TWRS. No additional measures were proposed to reduce the levels of PAH to bring them into compliance as required by the PEM. No discussion of MEA measures was provided. Dr Grynberg noted that the PAH exceedances had been addressed through the Health Impact Assessment (see Chapter 5).

The EPA in their presentation at the hearing (document EPA60) noted that the key component of the PEM and SEPP (AQM) is emissions reduction with a focus on best practice and MEA emission reductions. They said that the air quality standards /criteria in the NEPM/ PEM are not 'pollute up to' numbers. The approach to air quality management is about minimising emissions not a process of 'pollute up to'.

All the exceedances of the assessment criteria presented in the EES using the Bendigo background data occurred at residences close to the mine operations and in particular residences in Fisher Street and Upper Main Street. In Year 5, as well as receptors to the west and south west of the pits, exceedances at residences close to the TWRS, in Crowlands Road, were also predicted, due to increased material movement at the TWRS during Year 5.

As part of the EES, an assessment of regional air quality within the township of Stawell was undertaken. This assessment showed that there were expected exceedances of the NEPM PM₁₀ standard at a number of residences for up to two days per year. The EES stated that, as the NEPM allows five exceedances per year, then the NEPM is complied with. The locations where the exceedances would occur were not identified in the EES.

The EES nevertheless concluded that additional measures would be required to ensure that exceedances of the PEM and NEPM criteria did not occur.

(iii) Revised air quality impact assessment

The revised AQIA, conducted using the 12 months of Stawell air quality and meteorological data, was presented as document P18. This modelling was conducted using the same assumptions as used in the original AQIA contained in the EES. A comparison of the data from the revised assessment with the original EES assessment was presented by Dr Grynberg in his presentation at the hearing (document P42).

The revised air quality assessment (document P18) showed a greater number of predicted exceedances using the Stawell data. The distribution of impacts also changed with different receptors predicted to have the highest impacts.

During Year 2, exceedances of the PM₁₀, arsenic, RCS and PAH assessment criteria were predicted. For PM₁₀, the exceedances for mine plus background were said to be due to bushfire impacts in the background data. When the bushfire days were removed, no exceedances of the PM₁₀ criterion were predicted for Year 2. The annual average arsenic and PAH concentrations for mine plus background were predicted to exceed the PEM assessment criteria at 23 receptors for both pollutants. For arsenic, the maximum predicted concentration for mine plus background was 0.0047 µg/m³. The incremental increase from the mine alone also exceeded the assessment criterion of 0.003 µg/m³. The maximum PAH concentration was 0.5 ng/m³ of which 0.44 ng/m³ came from the mine alone. The assessment criterion for PAH is 0.3 ng/m³. All 23 impacted receptors were to the west of the south pit.

For Year 5, two receptors are predicted to exceed the assessment criteria for arsenic and PAH. These receptors are located to the north of the TWRS. The maximum arsenic annual average for mine plus background is predicted to be 0.0074 µg/m³ which is more than double the assessment criterion, with 0.0059 µg/m³ from the mine alone also exceeding the PEM assessment criterion. For PAH, the maximum predicted concentration is 0.46 ng/m³, of which 0.4 ng/m³ came from the mine alone, both predictions exceeding the PEM assessment criterion.

In Year 5, five receptors were predicted to exceed the PM₁₀ assessment criterion. Of these the exceedances for two of the receptors were due to bushfire impacts in the background data. For the most affected receptor, R6, which is located to the north of the TWRS, with the exclusion of the bushfire affected days, 32 exceedances of the PEM criterion of 60 µg/m³ were predicted. The maximum predicted concentration was 127.7 µg/m³ of which 113 µg/m³ came from the mine operation alone.

Exceedances of arsenic and PM_{2.5} assessment criteria were also predicted in Year 1.

Although not a compliance standard, the proponent, through the Health Impact Assessment, proposed a project specific annual average PM₁₀ criteria for the increment of the mine alone of 3 µg/m³. In Dr Grynberg's presentation at the hearing (document P42), he provided an assessment for Year 2 against this criterion. Two approaches were undertaken for the modelling of the impacts – the flat top model and the terrain model. The results of the flat top model showed that there were 28 receptors predicted to exceed the proposed annual

average PM₁₀ criterion for mine alone with the highest concentration being 6.6 µg/m³. For the terrain model, 14 receptors were predicted to exceed the proposed annual average criterion, with a maximum of 4.8 µg/m³. No data was provided for Year 1 or Year 5.

Although a number of additional management and mitigation measures were proposed to reduce these impacts no additional modelling was undertaken to demonstrate that the implementation of these measures would result in meeting the relevant air quality criteria. These measures included the cessation of works on the site.

(iv) Information received after the hearing

At the hearing, the Panel requested that the results of the revised air modelling be provided in the form of contour plots for mine plus background predictions to graphically represent the extent of impact across the surrounding urban area. After the hearing, the Panel received contour plots of PM₁₀ and PM_{2.5} showing the maximum increment from the mine alone, and the mine plus the 70th percentile background data.

The PEM requires the maximum incremental concentration from the mine alone to be expressed in contour format. The Panel requested the contour plots with background to better inform their assessment of the impacts across the broader Stawell community. In particular, the Panel was seeking the daily varying background data to be included with the bushfire days excluded. This was not forthcoming.

URS in their response on behalf of the proponent forwarded on 5 August 2014 said that they had instead included the 70th percentile background data in the contour plots as this was allowed for in the SEPP (AQM).

The SEPP (AQM) states that:

Proponents required to include background where no appropriate hourly background data exists must add the 70th percentile of one year's observed hourly concentrations as a constant value to the predicted maximum concentrations from the model simulation. In cases where 24-hour averaging time is used in the model, the background data must be based on 24-hour averages.

From the information that was provided, it is clear that there would be exceedances in the residential area due to the mine emissions alone. This is consistent with the evidence provided at the hearing.

3.4 Discussion

From the evidence presented at the hearing, the information contained in the EES and the revised AQIA (document P18), it is the Panel's assessment that the proposed open cut mining operation would not be able to comply with the assessment criteria in the PEM. In particular, the revised air modelling done using the Stawell background data showed exceedances of the assessment criteria for PM₁₀, PM_{2.5}, arsenic, RCS and PAH at several sensitive locations close to the mine. Even the annual average project-specific PM₁₀ criteria proposed by the proponent to assess the increment from the mine alone were also exceeded at a number of locations.

The PEM PM₁₀ criterion is predicted to be exceeded in Year 5 at a number of locations. The worst affected receptor, R6, which is located close to the TWRS, is predicted to have 35 days during Year 5 with the PEM criterion exceeded. The highest predicted concentration is 128 µg/m³ which is more than double the PEM criterion of 60 µg/m³. From the time series plots presented in the revised AQIA (document 18), a significant proportion of the PM₁₀ predicted at this receptor is due to emissions from the mine. The arsenic criteria are also predicted to exceed the PEM criteria with maximum predicted concentration of 0.0074 µg/m³ which is more than double the PEM criterion of 0.003 µg/m³. The PAH and RCS criteria are also predicted to be exceeded. Exceedances are also predicted in Year 2.

With respect to the derived project specific criteria for Year 2, there were 28 receptors where the derived criteria was exceeded with the maximum concentration predicted to be 6.6 µg/m³, which is more than double the derived criteria of 3 µg/m³. Exceedances were also predicted in Year 5.

Also, although a number of mitigation measures have been proposed, the Panel is of the view that it has not been demonstrated that these measures would lead to compliance with the relevant criteria.

Mr Power, in his closing in behalf of the proponent, said that it would simply have to be accepted that there would be exceedances of the relevant air quality criteria. The Panel acknowledges that the evidence presented at the hearing supports Mr Power's assessment that exceedances would indeed occur, however, the Panel does not accept his further implication that this factor should be 'set aside' or given no weight in considering approval of the project. Such exceedances should, in our view, be read as indicating that this project would have unacceptable outcomes.

Both the PEM and the SEPP (AQM) have provisions for the use of a risk assessment to assess potential health risks if the criteria in these statutory documents cannot be met. This has been done through the HIA (see Chapter 5). However, as discussed, the Panel is of the view that the health risks as presented in the HIA and subsequent documents are unacceptable.

The Panel also notes that the EES predicted that exceedances of the NEPM standards would occur in the town at various locations. The EES (p 101, Technical Appendix 7) claims that five exceedances are allowed under the NEPM and therefore the goal is complied with. The Panel is of the view that this interpretation is incorrect. As stated in the EES and in the PEM, the five allowable exceedances in the NEPM apply to days when there are bushfires, dust storms or when there is smoke from prescribed burning. None of the days that are predicted to exceed the NEPM standards have been identified as being impacted by any of these events. Therefore, the Panel is of the view that the NEPM standards were predicted to be exceeded in the wider Stawell township. This suggests that the impacts of the mine would extend beyond the residences closest to the proposed open cuts. No detail was provided, however, of the precise locations where the exceedances were predicted, and no assessment against the NEPM criteria was conducted in the revised AQIA. In the HIA it is noted that the original AQIA using the Bendigo background data the NEPM standard for PM₁₀ was exceeded at both the aged care facility (assumed to be the Eventide Home) and the school. These locations are considered as sensitive locations as both the elderly and children are identified as groups within the population that particularly vulnerable to the

effects of air pollution. No data was provided for these locations in the revised AQIA. Provision of the contour plots as requested by the Panel would have enabled the impact on the locations to be evaluated. However, these plots were not provided.

As discussed in Section 2.2, the focus of the PEM and SEPP (AQM) is about minimising emissions not just meeting standards. This position was also put forward by the EPA in their submission. However, the approach taken in the EES is about aiming to meet a number not about minimising emissions, which is reinforced by the derivation of project specific criteria, is in conflict with these statutory documents and the position put forward by the EPA.

The proponent has proposed to implement a proactive/reactive dust management system that would assist them in achieving compliance with the assessment criteria. The predictive component of management system relies on correlating high pollutant levels, as predicted by dispersion modelling, with forecast weather conditions. Alerts would then be issued when the 'high pollutant' conditions are forecast. The success of the system is dependent on the skill of the forecast, and the accuracy of the model. Since the outcome of the alert is preparation for additional control measures in the operation of the mine, and since the forecast is for three days ahead, adequate time for modifications would appear to be available. However, if the model's forecasting skill was to be low, and too many false alarms were to occur, there would be a risk that the alerts would eventually be ignored and the system would become ineffective.

The proposed reactive management system relies on data collected by monitors that would have been sited on the basis of the modelling to detect the highest pollution values, and therefore the system would indirectly depend on the accuracy of the model and of the emissions inventory. The use of multiple monitors facilitates the validation of the model and allows for the trigger levels to be appropriately tuned⁴⁰.

The evidence presented at the hearing suggested that the predictive and reactive modelling and monitoring being proposed would enable the operations to proceed and assist in achieving compliance with the relevant criteria. It is of course the case that, although the proactive and reactive measures are useful tools, and would advise the site operators when exceedances of the criteria may be expected to occur, the monitoring system itself does not manage the emissions. The success of the system in mitigating emissions would depend on the ability of the site manager to implement additional equipment and other management measures in response to the forecast information or monitoring. A large number of mitigating measures were assessed in the EES but the evidence provided has indicated that compliance cannot be achieved. The Panel notes that a reactive monitoring program is a requirement of the PEM and is required for all Level 1 mines in Victoria. There is no detailed discussion on MEA requirements for arsenic, PAHs and RCS except for cessation of works. Mr Power (document 87) put forward the view that as there were no other measures that could be implemented then MEA had been demonstrated. The Panel believe that the issue of MEA has not been adequately addressed in the EES and subsequent revised AQIA. This is a concern given the extent of exceedances of arsenic, RCS and PAH criteria that are predicted.

⁴⁰ It should be noted that the PEM states that *'Hourly trigger levels will be provided by EPA that will allow site managers to identify when a problem may be arising on site.'*

During the hearing, the Panel asked both Dr Grynberg and Mr Fler as to their knowledge of any additional measures that could be applied to reduce emissions above what was already proposed. Both replied that they were not aware of any additional measures. The proponent has stated that if exceedances occur that they would cease operations until compliance would be achieved.

In responding to the EPA submission in his witness statement, Dr Grynberg stated that under the worst case scenario, cessation of operations '*...could occur on between 4 and 13 days...*' This contrasts with the revised air quality assessment report dated 3 July 2014 that predicts 35 days (32 excluding bushfire days) where criteria are exceeded at a sensitive receptor R6. Dr Grynberg estimates that cessation of activity would reduce the impact of the mine by 80-90% but this was not modelled.

The Panel does not believe that reliance on stopping work at the frequency that the model predicts would be required is a realistic or practical management measure. At R6, air quality is expected to fail to comply with the PEM criteria on 35 days in Year 5. Without any additional measures being available to reduce emissions, as put forward by Mr Power on behalf of the proponent (document P87), this implies that the mine would have to cease operations on 35 days in that year.

The proponent has indicated that stopping work on up to 40 days per year would be economically feasible. However, there has been no economic assessment justification provided for this. The Panel agrees with the EPA submission that it would not be appropriate to rely on this as the key management measure. A related concern is whether the competing demands to complete the project within the proposed time frame might hold greater sway against stopping work as a management measure.

The Panel considers that the modelling approach taken in the revised impact assessment is in general sound and is consistent with the requirements of the PEM. However, as noted earlier despite our requests for inclusion of contour plots of maximum concentrations showing both mine contributions and the variable background, the proponent has not done so. The Panel acknowledges that this is not a specific requirement of the PEM but is of the view that this information would have been helpful in assessing the extent of non-compliance across the broader community.

The EPA and DoH in their submissions have stated that, given the reduction in the recommended separation distance between the pits and the sensitive receptors from 250m to less than 40m at some locations, emissions must be controlled by measures that go beyond best practice.

As noted, when the Panel, at the directions hearing, asked the proponent to provide examples of where mining has been successfully undertaken at the distances being proposed for the Big Hill development, the examples provided did not have active mining operations less than 40m from residential areas. Some of the examples were for underground operations which have significantly less impact than open cut mining operations. More significantly, no information was provided as to how successful various management measures had been in achieving compliance.

The proponent has assessed best practice as is required for this project against practices used in coal mines in NSW. The coal mines were generally further than 37m from people's homes. While the management measures adopted there (and which subsequently modelled in the EES and revised AQIA), do reflect best practice for those operations, the Panel agrees with the view of the EPA and DoH measures that go beyond best practice must be implemented here given the proximity to dwellings. It is the Panel's view that the application of measures that go beyond best practice has not been demonstrated. Even if it was accepted that the measures being put forward do go beyond best practice, they do not lead to compliance with the relevant legislation.

The Panel considers in particular that the issue of mitigation to the maximum extent achievable (MEA) for control of arsenic and PAH has not been adequately dealt with in the EES or revised AQIA. The extent of predicted exceedances of the arsenic and PAH criteria is considered by the Panel as unacceptable. This view is supported by the position stated by DoH in their letter dated 6 August 2014.

In the HIA, project specific criteria for arsenic and PM₁₀ have been proposed. The derivation of project specific criteria is not supported by any air quality legislation in Victoria or nationally. Neither the PEM nor SEPP (AQM) allows project specific criteria when criteria are specified in statutory documents. This is the case for this project with criteria for relevant pollutants in the PEM. The Panel accepts the DoH view that the criteria in the PEM have been based on the protection of human health and are applicable for this project.

As noted earlier, Mr Power stated in his closing that the proponent is strongly opposed to making real time data available publicly on line and proposes that quarterly summaries be provided to the community instead. This was based on an argument that data which had not been validated may mislead.

The Panel agrees with the proponent that there is little value with providing the real-time data generated for operational management on site available to the community. However, the Panel does believe that the real-time data from the community based monitors could be provided. The provision of the data could occur accompanied by a rider explaining the absence of validation. Openness about the monitoring data would, in our view, assist in overcoming what appears to be a breakdown in trust between the proponent and some members of the community. The Panel recommends that, should the project proceed, consideration be given to providing the community based monitoring in real-time.

3.5 Conclusions

The Panel concludes:

- The model used in the impact assessment is appropriate and has been correctly applied and the emissions inventory has been correctly compiled.
- The modelling indicates that non-compliance with air quality standards will occur at residences close to the site and across the urban area during the life of the project.
- The application of control measures have not been demonstrated to meet the requirements for best practice or control to the maximum extent achievable especially for a development this close to residences.
- Given the predicted number of exceedances of PM₁₀, arsenic and PAH presented in both the original and revised AQIA and the extent of those exceedances above the assessment

criteria, the Panel concludes that the proponent has not demonstrated that the emissions from the proposed operation can be managed such that they would not adversely impact on the surrounding community. The adverse health effects of the emissions are discussed in Chapter 5 of this report. The Panel concludes that the predicted impacts are unacceptable.

- If the project were to be approved, a predictive/reactive management system might be used to assist in reducing the impact of emissions from the mine, though not necessarily to achieve compliance with air quality policy standards. The success of this type of system to work effectively is dependent on operational practices to be put in place to reduce the emissions from the mine site.
- Based on evidence provided at the hearing, the Panel is of the view that the effectiveness of any additional measures, above those assessed in the AQIA and revised AQIA, is not clear and we question the practicality and the economics of the stop work approach to extent that appears required.
- An appropriate system of independent monitoring and reporting on the response to triggers should be included as a component of any predictive/reactive management system implemented as part of this project.

The Panel is of the view that it has not been demonstrated that the project can comply with the relevant statutory requirements and that the resultant predicted emissions from the mine pose an unacceptable health risk to the community as discussed in Chapter 5. The air emissions impacts are a major element recommending against approval of the project.

4. Noise

4.1 The issue

The principal issue is that the noise modelling undertaken for the project showed that noise guideline limits would be exceeded at several dwellings, even with a number of mitigating measures incorporated in the design. This would adversely affect the amenity of a number of residences during various phases of the project and indicates that the close proximity of the pits to residences (less than 50 metres in some cases) would make it very difficult to totally eliminate residential noise impacts without architectural treatments or relocation in some instances.

A number of related issues follow from the lack of a suitable buffer and the predicted modelling impacts. They include:

- The applicability of noise limits and allowances
- Best practice and whether all practicable mitigating measures have been applied including equipment selection, attenuation packages and noise barriers
- Potential impacts on health
- Dealing with complaints
- Monitoring of project noise levels.

Since the original assessment in the EES, further work was undertaken including considering additional noise attenuation packages, which modified the project schedule and layout. This did not, however, affect the overall results in relation to predicted noise impacts, except that more properties then appeared to exceed the noise limits.

4.2 Regulatory framework

EPA Publication 1411: *Noise from Industry in Regional Victoria - guidelines*, 28 October 2011 (NIRV) is the document which sets the guidelines for consideration of the acceptability of noise impacts in country Victoria. It prescribes a method of setting acceptable noise limits.

While the NIRV derived limits are not statutory, they have been widely applied to guide planning decisions and have been accepted by the proponent as applicable to this project.

The application of the NIRV limits for this project would result in day time limits of 50 dBA for residents currently exposed to noise from the mine and 46 dBA for residents assessed as not currently exposed. These noise limits are allowed to be exceeded by up to 10 dBA for some operations and for limited periods.

The *Public Health and Wellbeing Act 2008* is also relevant in relation to potential impacts of noise on physical and mental health as pointed out by the DoH presentation (document DoH62).

4.3 Evidence and submissions

4.3.1 Applicability of noise limits

The Noise Assessment, Section 8.5 and Technical Appendix 5 of the EES presented information on noise impacts and indicated that the proponent had used the ISO 9613-2:1996 wind propagation model in conjunction with SoundPlan software to predict noise levels at nearby receptors.

Receptors were placed in two zones. Zone 1 included receptors exposed to current noise from the mine. They are subject to existing daytime noise limits of 50 dBA as set by the current environmental management plan for the mine. Zone 2 included receptors with lower current exposure to mine noise. The applicable noise limit for Zone 2 receptors was identified as 46 dBA. The boundaries between Zone 1 and Zone 2 are to some extent arbitrary and this questions the practicality and utility of having the two different criteria.

DoH, in their presentation (document DoH62), refer to the two zones and the two noise limits as provided by NIRV. They also note that under the worst case scenarios, and with proposed mitigation in place, the daytime noise limit of 50 dB in the SGM EMP will be met for Zone 1 residences but not the NIRV limits. They note also that Zone 2 residences, which are not currently or less exposed to noise from the mine operations, are predicted to be exposed to much higher levels with all planned mitigation in place. DoH consider that the new noise exposure to be likely to impact on the affected dwellings' acoustic amenity, more so for those that have not been previously exposed.

Both DoH and EPA in their submissions reiterate that the NIRV limits are the applicable limits for the project. In answer to questions during discussion, however, DoH considered that the single lower zone with the more stringent NIRV limits should apply. EPA agreed with this point of view also in response to questions.

Modelling was initially carried out for one month periods in quarters 1, 2, 5 and 8, to reflect activities and locations expected to result in the highest noise impacts. Subsequently, the quarter 8 modelling was replaced by quarter 10 modelling to reflect a changed mining schedule.

Mr Christophe Delaire gave expert acoustic evidence for the proponent (document P4), and presented the modelling results (document P3). These results showed that Zone 1 criteria would be met at all receptors in that zone. In Zone 2, the NIRV criteria would be exceeded at a number of locations and by up to 12 dBA at seven locations. While the Zone 2 criteria are predicted to be met in part, Mr Delaire also advised that the character of the noise would change as ore extraction changed from an underground operation to open cut mining.

In response to questions by the Panel and presenters about the model, Mr Delaire explained that the model is based on fixed meteorological parameters and does not provide an option to vary these. He stated that he considered it suitable for the site conditions and that it produced conservative results since it assumed that the wind direction from all noise sources was in the direction of the receptor. In relation to model accuracy, he advised that it was subject to the normal uncertainties of models and model inputs. Technical Appendix 5 of the EES states:

The ISO 9613-2 propagation model is specified to be validated for a maximum source height of 30 metres, and a maximum source-receiver distance of 1000 metres. Within these bounds, the stated accuracy of the model is +/-3dB. Use beyond these parameters is not precluded, but no statement of error bounds is provided in this case.

Mr Delaire considered that the model used is the most appropriate model and that it gives reliable results as indicated by the close agreement between measured and predicted values in the vicinity of the mine. He acknowledged that further validation would be required. He stated in his EWS (document P4):

Part of the Noise Management Plan will detail a noise monitoring program that will provide information for assessment of performance against objectives and validation of the noise model.

4.3.2 Best practice

In his evidence, Mr Delaire described a range of ‘*standard best practice*’ acoustic measures and ‘*project best practice*’ acoustic measures to be employed at the mine. These included selection of low-noise plant, restriction of operating hours, push-back multiple bench mining, bund walls around the working levels of the TWRS, noise treatments for some heavy equipment, and acoustic screening around the haul roads and the rock breaker. Mr Delaire also provided information about further available noise mitigation packages, including their cost and noise reduction properties, but was not proposing these in the first instance. These could be applied after the project was operational if necessary, he said, and if assessed to be effective in addressing specific noise issues.

In their submission (document EPA60), Mr Robinson and Dr Ferrando-Miguel of the EPA stressed that the NIRV values were ‘*upper limits*’ after all best practices had been applied, not minimum targets. Dr Ferrando-Miguel questioned Mr Delaire as to whether all best practice measures had been used. In particular, Dr Ferrando-Miguel, the Panel and other presenters asked Mr Delaire about the use of temporary barriers and bunds to screen noise generating operations, including during the construction of the final land form and other unshielded work periods such as compaction of back-filled material.

In relation to barriers, Mr Delaire stated that they would need to be close to the source to be effective and this presented practical difficulties with mobile operations. He also said that smaller quieter compactors were available and could be used, but this would prolong operations to achieve the required degree of compaction and extend the period of the noise impacts. The Panel and Dr Ferrando-Miguel asked whether noise barriers could be placed close to residences to achieve effective screening. Mr Delaire’s opinion was that this was possible but they would need to be continuous to be effective, that is, have no gaps, but noted that continuous barriers may not be acceptable to all residents. They would also be less effective for residences located behind the front line of houses. He also said that the erection of the barriers would involve additional construction noise and prolong the project.

Mr Power (document P87) stated that, if it was considered necessary, SGM was prepared to investigate and report to DSDBI and EPA on the effectiveness or otherwise of a noise barrier adjacent to the Fisher St residences. It was also said that if the barrier was seen to deliver a

material benefit (perhaps 5-6dB) to residents, then this could be the subject of further community consultation prior to the Work Plan being finalised and works commencing.

Mr Delaire was further questioned by Dr Ferrando-Miguel as to why additional equipment noise mitigation packages, including those described in Appendix F of his expert witness statement, had not been applied. Mr Delaire responded that, as the noise emitted by different sources cannot simply be added to assess the effect on receptors, these measures might not have any effect on receptor noise levels (noise at a receptor would largely be the noise from the loudest source). It therefore would be necessary, he said, to identify any problem on the ground to determine what treatment would be effective and/or practicable. He said that, in some cases, equipment to achieve total compliance did not exist and other measures to mitigate impacts, such as architectural treatments to the housing, may be required.

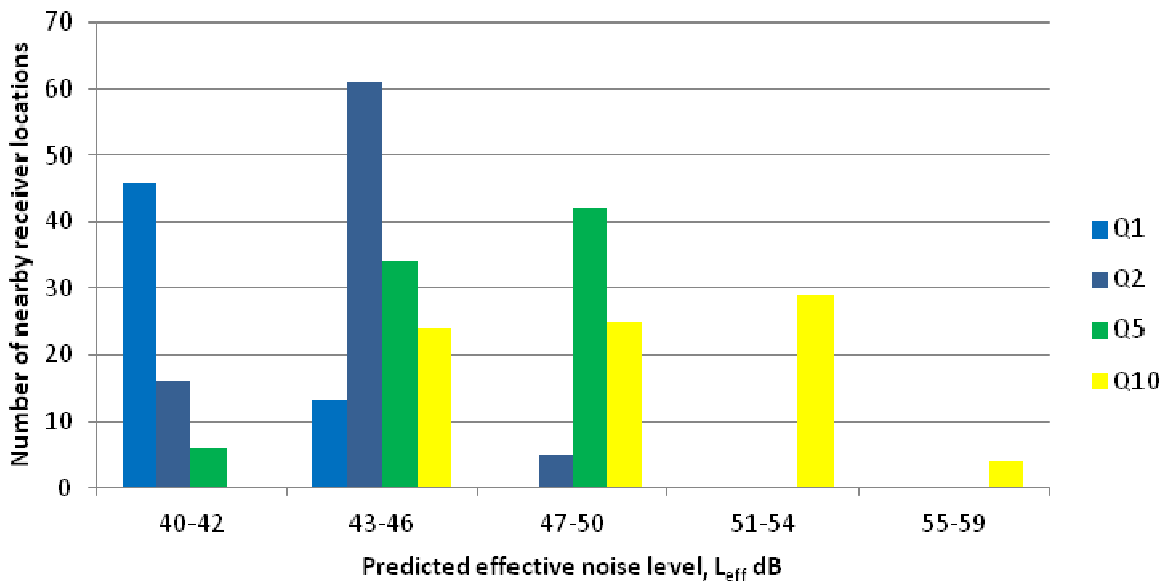
Mr Power (document P87) noted that during the detailed design and equipment selection steps for the project, other opportunities to reduce noise emissions would need to be considered. He also noted that SGM accepted Mr Delaire's advice to the Panel that it would need to select the quietest equipment that is practicable and it also accepts the need for a more refined and granular level of acoustic modelling throughout the project life. He further stated that this would enable SGM, regulators and stakeholders to understand where and when the noise impacts of the project are likely to be greatest. This in turn would enable criteria to be developed and included in the Work Plan, community information provision and liaison to occur, and decisions to be made on application of acoustic treatment for dwellings and resident relocation.

Mr Delaire's field notes from site visits were provided to illustrate the difficulty with noise assessment (documents P88, P89, P90). They included examples of where background noise levels mask noise from the mine. It was also indicated that the character of the noise from particular items of mine equipment makes them easier to be heard.

Mr Delaire was asked about the proportion of unshielded work and he provided an update of the data in the EES assessment. The data indicated totals of around 11, 12, and 25 weeks of unshielded work for the north pit, south pit, and TWRS respectively, in different quarters over the five year project life. The information was not clear whether a variation from NIRV limits would be needed for all this time, nor was it clear why no unshielded work appeared to be listed for the reconstruction of the north pit. The compactor would be operating for part of this time, and Ms Scott Decosta (document S71) pointed out that a large number of residents would be potentially impacted.

Mr Delaire presented information on the exposure of nearby houses to noise as indicated in the following table.

Figure 4: Predicted noise exposure of dwellings during most noisy quarters
 Source: Marshall Day Acoustics, presentation overheads, document number P3



The EES material shows that the number of residences exceeding 46 dBA is 43 in quarter 5 and 33 in quarter 8. The revised modelling results shown above, taken from Mr Delaire's presentation (document P4), show a similar number to that in the EES for quarter 3, but a different outcome for quarter 10⁴¹ with close to a total of 60 receivers exceeding 46 dBA.

4.3.3 Potential impacts on health and amenity

The HIA (Technical Appendix 15) provided a qualitative assessment of the health risks of noise. Ms Lazenby, the expert witness on health for the proponent also gave evidence on this issue and was questioned by the Panel. It was an issue of concern raised by the community and is discussed fully in the HIA discussion in Section 5.3.5 of this report. The issue was raised in questions at the hearing mainly in relation to sleep disturbance. Mr Delaire stated that he did not expect night time noise to exceed current levels, as only the mill would continue to work as at present and some limited maintenance activity would occur at night.

Submitters, including Ms Ware (documents W103 and W104) and Mr McMahon (document M113), raised the question of shift workers who need to sleep during the day, and the wellbeing of house-bound residents who have special needs. Mr Delaire advised that if remedial on-site measures were not possible, architectural treatments and possible relocations could be looked at on a case by case basis. In response to queries by presenters and the Panel as to what criteria would be used in determining eligibility for architectural treatments and relocation, Mr Power provided design advice from Marshall Day (document P130). Possible criteria for acoustic insulation and relocation eligibility are listed below.

⁴¹ Quarter 10 modelling replaces quarter 8 modelling to reflect rescheduling of mining operations.

Table 4: Possible noise criteria for eligibility for dwelling insulation
Source: Marshall Day Design Advice (document P130).

Time	Relevant time period	Averaging time, T	Noise insulation trigger level dB $L_{Aeq,T}$ ^{A)}
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Saturday	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday and Public Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55

^{A)} All noise levels are predicted or measured at a point 1 m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

Figure 1: BS5228-1:2009 Table E.2 - trigger levels for noise insulation eligibility

Table 5: Possible noise criteria for eligibility for resident relocation
Source: Marshall Day Design Advice (document P130).

Time	Relevant time period	Averaging time, T	Rehousing trigger level dB L_{Aeq}
Monday to Friday	0700-0800hrs	1hr	The higher of: <ul style="list-style-type: none"> • 80; or • Existing ambient L_{Aeq} + 10dB
	0800-1800hrs	10hr	The higher of: <ul style="list-style-type: none"> • 85; or • Existing ambient L_{Aeq} + 10dB

The above criteria were the result of a Marshall Day literature review but it remained unclear how a negotiated agreement with the community would be achieved.

Mr Power, in his submission on 14 July 2014 (document P87), referred to the London Health Commission's view that: *'environmental noise levels of 42-55dB(A) Leq is likely to lead to significant annoyance and can disturb sleep.'* These were the guidelines used in the HIA on noise and referred to in the evidence of Ms Lazenby.

He also cited the World Health Organisation (WHO) Guidelines *'...which recommend noise criteria of 45dBLAeq at night to protect against sleep disturbance, and 50dBLAeq during the day to protect against moderate annoyance.'* Mr Power noted that the London Health Commission guidelines used the WHO community noise guidelines.

4.3.4 Complaints

In response to a Panel direction intended to allow some assessment of the best practice performance of SGM to date, the proponent, NGSC, DSDBI and EPA provided data on complaints about the mine operations.

The EPA presented data from their records that listed one complaint in 2010, four in 2013, and two in 2014. Of these, four related to noise and three to blast and vibration. EPA (document EPA60) said that complaints were referred to the then Department of Primary Industry (Department of Primary Industry (DPI))(now DSDBI) and the complainants were advised accordingly. Ms Linley, Chief Executive Officer of NGSC, (document NSGC34) indicated that the Shire had received five complaints relating to noise and vibration. These had been referred to DPI (one complaint) or SGM (four complaints). DSDBI (document DSDBI 57) reported that they had received one complaint in the last 10 years.

Mr Power on behalf of the proponent presented data from the SGM complaints register (document 87). After 2002, 367 complaints for noise, blasting and vibration had been received by SGM, 80% of which related to vibration, and 6% to noise. Only three of the vibration complaints related to incidents which exceeded regulatory limits. For noise, annual compliance survey reports from 2005 to 2012 showed that evening and night limits were exceeded by between 2 and 11 dBA. Survey results were provided to the community via meetings of the mine's Environment Review Committee (ERC).

The Panel was told that SGM has formal internal procedures in place to register all complaints made directly to the company, or referred by government agencies. The procedures include a call back to the complainant to communicate the result of any investigation of the complaint, and reporting to regulatory agencies and the community at quarterly ERC meetings.

DoH in their presentation (document DoH62) observed that there is likely to be an increase in air and noise complaints arising from the project and that there are currently insufficient details on complaints processes and management, and they sought *'clarity on the complaints process and roles and responsibilities of agencies.'*

4.3.5 Noise monitoring

The issue of noise monitoring, including real time monitoring at different locations, for compliance assessment and for providing direct feedback to the community, was the subject of submissions, presentations and questions by various parties including residents, the EPA and the Panel.

At paragraph 195 of his opening submission (document P2), Mr Power stated:

Importantly in relation to dust and noise generated by Project activities, a sophisticated program of predictive management and real-time monitoring is proposed.

The draft Environmental Management Plan dated February 2014 in Section 5.6 of Appendix H to the main EES report expanded on this in relation to noise as follows:

The current monitoring program will be expanded in consideration of the BHEDP and will consist of continuous real-time noise and meteorological monitoring as detailed below. This will also be supplemented by hand held monitoring periodically at key times during operation. All monitoring will be conducted in accordance with the Noise Management Plan EC-MPL-004.

During the hearing, however, Mr Delaire said in reference to his evidence (document P3) that, because of the continuous variations in background noise it would be very difficult to distinguish plant noise from background noise, and hence difficult to implement a real-time reactive noise management system, and difficult to provide meaningful real-time noise level data to the community. In response to a question by the Panel during his evidence on air quality management, Mr Ormerod, who was called by the proponent to explain the real-time monitoring proposed for air emissions and noise, expressed the view that real-time monitoring of noise could be possible but was not in a position to be able to provide details.

Mr Delaire was questioned by the Panel on the use of sound spectra to distinguish particular equipment noise in ambient noise monitoring. Mr Delaire stated that because sound from different sources cannot be added directly, masking would occur and the technology for separating them is not available. The same problem exists in assessing compliance with noise limits. Mr Delaire stated that assessing compliance required a carefully designed measurement program and that this was a complex task for an acoustician. He did not consider that measurement at numerous locations was appropriate for the task. He suggested the use of one or more 'derived measurement points' close to the source and a validated noise model to predict noise levels at specific receptors. The draft noise management plan included a noise monitoring plan to assess performance and validate the model.

4.4 Comparison with the 2000 EES Inquiry Report

While recognising the challenges of the close location and the proposed open cut mining, the 2000 Panel concluded:

... subject to due care and the implementation of a detailed Noise Management Plan as an element of the EMP ... it should be possible to undertake both construction and mining operations such that the Permissible Noise Level limits, as prescribed under EPA guidelines, are met...

The then project included:

- a seven metre high noise attenuation wall around the mining area,
- a set of principles as a basis for compensation for residents within 100 metres.

The current proponent does not consider that a noise wall on the western boundary of the project area is likely to be effective and has not proposed compensation principles in relation to noise disturbance.

4.5 Discussion

In relation to the delineation of two noise zones for the project on the basis of higher or lower exposures to current noise levels, the Panel considers that this classification of receptor zones is arbitrary and impractical in terms of implementation.

If the project proceeds:

- There will be a change in the character of the noise and possibly an increase in the level of annoyance
- All noise sources, including the current mill, need to be considered in terms of compliance
- Noise from the mill will need to be mitigated to meet current standards by the application of best practice measures.

The Panel considers that the artificial delineation of the area around the mine site into two zones on the basis of change in level of exposure to noise (which would in reality be a noise level continuum) would need to be abandoned and a single NIRV 46 dBA limit applied. This position is supported by DoH and EPA. If this approach was taken to acceptable limits, it would seem that exceedances of defined limits would be likely, unless changes are made to existing practices as well further changes to activities associated with the proposed project.

In relation to best practice, it is the view of the Panel that there is scope for additional consideration of what constitutes best practice in relation to noise mitigation. This was acknowledged by Mr Power (document P87). As earlier noted, a number of measures additional to those assessed in the modelling were outlined in Mr Delaire's evidence but have not been applied in the proposal. The Panel understands that these measures would be implemented should action be required after mining operations had commenced. The Panel notes that indicative costs and potential noise reductions were provided for these measures, but no information was presented on the predicted benefits at receptors other than in generic terms, nor was information presented about their relative costs and effectiveness compared to other measures, for example, the use of a smaller compactor on project time lines.

The Panel notes that the use of barriers, other than temporary barriers around limited areas for some operations, has not been accepted by the proponent because the topography and relative elevations would make effective screening difficult. It was clear to the Panel from the evidence, however, that barriers close to the receptor sites may provide effective shielding. Mr Power (document P87) noted that SGM is willing to investigate the effectiveness of a sound barrier near houses and the Panel is of the view that if the project proceeds that this should be done.

Arguments were put forward by the proponent and the expert witness that the barrier would need to be continuous and this may cause division between neighbours with different views about barriers, and possibly be ineffective for residences beyond the first row houses immediately shielded by the noise barrier. The reasons for this were not fully explained.

Rising terrain may have an effect on this, but the immediate terrain in most cases continues to slope downwards away from the mining site.

There was also no information presented that residents had been surveyed about attitudes to barriers for noise screening. A barrier height of 8 metres was mentioned, but it does not appear that the variation in barrier height with distance from the receptor had been investigated in detail. Other barrier options such as combinations of source/receptor barriers had likewise not been considered.

The Panel notes that from the evidence presented, 6% of the 367 complaints recorded since 2002 about the existing mining operations were specifically about noise, and the current noise limit of 50 dBA was exceeded during annual noise surveys by up to 11 dBA at some locations. If the project is approved, 24-hour underground mining will cease and be replaced by daylight hours, week-day only, mining. The current mill will however continue to operate on a 24 hour basis. The project would also lead to a change in the character of the noise. The Panel notes that the expectations of various parties to the hearing including the DoH are therefore that annoyance levels leading to complaints will increase and that this is not disputed by the proponent's evidence.

The Panel notes also that the current system of response to complaints is via investigations and reporting by SGM directly to complainants, regulatory agencies and quarterly ERC meetings. It does not appear that the regulatory agencies play a direct role in the investigations although they may undertake an auditing function.

The referrals by regulatory agencies and the description provided by Mr Sellers (document S122) highlighted the inadequacy of the current response system to noise and vibration. This also illustrated what appears to be a disconnect between what residents believe should occur, what SGM believes is an appropriate response, and what the regulators are empowered to or able to do. Quarterly reporting to a committee with no apparent powers does not inspire confidence about the ability to adequately manage the noise impacts of the mine in such close proximity to residences, or provide any incentive for the mine operator to comply with NIRV requirements.

As observed by the DoH, there is a need for better clarity and understanding in the roles, responsibilities and coordination of regulatory agencies including the NGSC. There is also need for a more visibly independent approach to monitoring and reporting responses to complaints including necessary remedial actions.

Mr Power, in his closing submission, said that the proponent does not propose to undertake reactive real time noise monitoring as was indicated in the draft noise management plan. We assume that this change of intent was in recognition of the stated difficulties in interpreting noise measurements because both source noise and background noise are reflected in measurements as described by Mr Delaire. Derived point measurements were discussed as an alternative during the hearing.

The Panel understands that it is now proposed to develop a detailed noise monitoring program for assessing compliance with noise limits and validating the noise model. This poses a dilemma in that unambiguous noise measurement appears to be difficult on the evidence provided and validation of the noise model would appear to require an

unambiguous receptor noise measurement as well as a range of source noise level measurements. The Panel therefore considers that it would appear to be some considerable difficulty in measuring compliance against the noise limits. The use of derived points likewise relies on validated modelling and therefore poses similar difficulties. The Panel notes that Mr Delaire did suggest that measurements when ambient noise levels are low, such as at night, may be used, but this does not appear to help with operations restricted to daylight hours.

It is therefore not evident to the Panel what the form and detail of any monitoring plan design might feasibly be. What is clear to the Panel is that community expectations of real time measurements and direct feedback on source impacts are not likely to be met. This in our view would be both unpopular and unfortunate. The Panel also considers that it would also make enforcement of limits and non-compliance penalties difficult.

4.6 Conclusions

The Panel concludes that the project as currently proposed contains a number of deficiencies with respect to noise impacts. These relate to:

- the lack of final design detail and whether all best practice measures have been applied
- uncertainties as to the potential noise benefits of particular mitigation measures and their extent of application
- an absence of investigation into the potential use, design, and acceptability of noise barriers, although the Panel notes the proponent's willingness to now undertake this work
- the projected non compliance with NIRV limits potentially for some six months
- a lack of detailed design information concerning the noise monitoring plan
- the absence of negotiated criteria for determining residential eligibility for noise-mitigating architectural treatments or relocation of residents
- the uncertainty as to how compliance with noise limits can be assessed.

The Panel concludes that, in its present form, the project is likely to result in the loss of noise amenity for residents at a number of locations, and for not inconsiderable periods. Further mitigating measures would need to be implemented to reduce impacts to an acceptable level, and the evidence is that it is not certain that available measures would be successful, nor indeed whether any measures exist. The Panel also expects that there would be an increase in public complaints about noise.

The Panel concludes that, having evaluated the evidence, it would be difficult to comply with current standards, and the Panel is not confident that mitigation measures could be designed and implemented.

Accordingly, we consider that unacceptable and unmanageable noise impacts recommend against approval of the project.

5. Health

5.1 The issue

There are a number of factors associated with the project that potentially impact on the health of the Stawell population. They are:

- Air quality impacts, including:
 - Particulate matter – PM₁₀, PM_{2.5}, dust deposition
 - Arsenic and respirable crystalline silica (RCS)
 - Combustion sources – nitrogen dioxide (NO₂), carbon monoxide (CO), sulphur dioxide (SO₂), polycyclic aromatic hydrocarbons (PAH)
- Noise impacts
- Blasting impacts
- Public safety risks
- Socio-economic factors.

The Air Quality Impact Assessment (AQIA) for the project in the EES predicted that the air quality assessment criteria for PM₁₀, PM_{2.5}, arsenic, and PAH will be exceeded. Further exceedances were predicted by the revised assessment presented to the Panel. Noise criteria were also predicted to be exceeded at various stages of the project.

The Health Impact Assessment (HIA) assessed some of these issues. It also assessed the baseline health status of the population and found that compared to other parts of Victoria that the population of Stawell is on average older and has poorer health status. These factors are known to make people more vulnerable to the effects of environmental factors such as air pollution and noise.

5.2 Regulatory framework

The Environmental Health Standing Committee (EnHealth), a standing committee of the Australian Health Protection Principal Committee⁴², has developed a framework to conduct HIAs in Australia - *Health Impact Assessment Guidelines 2001* (HIA Framework). Under this framework a HIA needs to consider the issues that are important to the community in terms of potential impacts on the health of the affected population which go beyond direct impacts on health and include the broader social determinants that can affect people's health and wellbeing. The Centre for Health Equity Training, Research and Evaluation⁴³ (CHETRE) has developed documentation (*Health Impact Assessment – A Practical Guide, 2007*) (CHETRE Guidelines) that provides guidance in how to apply the enHealth HIA framework in practice. These two documents guide the conduct of HIAs in Australia and are adopted by regulatory agencies for this purpose.

As part of a HIA, a health risk assessment (HRA) is usually conducted. The HRA aims to quantify the impacts of hazards, in this case environmental hazards, on human health. The

⁴² The Committee has the responsibility of providing agreed environmental health policy advice and implementing the National Environmental Health Strategy 2012-2015.

⁴³ Part of the University of New South Wales' Centre for Primary Health Care and Equity and also NSW Population Health.

Australian guidance for conducting HRAs is set out in the enHealth *Guidelines for Health Risk Assessment*, 2012 (HRA Guidelines). For the assessment of health risks from air pollution the National Health and Medical Research Council (NHMRC) *Approach to Hazard Assessment for Air Quality*, 2006 and the National Environment Protection Council (NEPC) *Methodology for Setting Air Quality Standards in Australia*, 2011 provide detailed frameworks to assess health risks primarily via the inhalation pathway.

The PEM for mining and extractive industries and SEPP (AQM) both have provisions relating to the use of risk assessment to assess risks to potentially exposed communities from industrial emissions if the assessment or design criteria cannot be met. Neither of these documents allows the use of HRAs to derive particular or project specific air quality standards as alternatives to those contained in statutory instruments. The assessment criteria in the PEM and air quality standards in the SEPP (AAQ) and SEPP (AQM) have been derived for the protection of human health. They include a margin of safety to ensure that the health of sensitive groups in the population, such as children, the elderly and people with existing diseases, are protected. This view is clearly stated in the invited post-hearing correspondence from the DoH dated 6 August 2014 to Chair of the Inquiry Panel.

5.3 Evidence and submissions

Expert evidence was presented for the proponent by Ms Victoria Lazenby of URS.

Submissions were made by the DoH on the potential risks from air emissions, noise and pollution of rain water tanks arising from the project (documents DoH60 and 61). The EPA (documents EPA58 and 59) also raised concerns about the potential health impacts of air pollution from the project and the need for the application of strict management practices to minimise those risks.

Many local submitters raised concerns about the potential health impacts arising from emissions from the project as well as concerns about the baseline health status of the Stawell community and the stress that the proposal has caused and would cause. Ms Ware (documents W103 and W104) provided a review of the potential health impacts that might arise from emissions from the project. Mr Fox (documents F71, 72, 79 and 129) made several submissions on the potential health effects associated with the project. Professor Noller provided evidence on behalf of Mr Fox (documents F69 and 70) on potential health impacts in particular those relating to arsenic exposure.

Several submitters spoke of the impacts that the proposal has had on their personal health and the health of members of their families. Some submitters such as Mr Fox, Ms Melbourne and Ms R Byass also said that the fact that this proposal was the second to be put forward in the last 15 years has taken its toll on the health of some members of the community.

Many submitters raised concerns that the HIA was dismissive of the potential health risks and the concerns of the community.

From the evidence presented and the many submissions, the key issues for assessment in relation to impacts on public health fall into the following areas:

- The approach taken to the HIA and HRA
- What constitutes acceptable risk

- Baseline health status of the community
- Impacts of air quality on health in particular PM₁₀, PM_{2.5}, and arsenic
- Health impacts of noise
- Contamination of rain water tanks
- Mental health and stress
- The combined impact of multiple stressors on health
- Potential management actions to reduce health risks.

The evidence and submissions for each of these issues is further discussed below.

5.3.1 Approach to HIA

As outlined above, the enHealth HIA Framework and CHETRE Guidelines are the accepted approach to conducting HIAs in Australia. The HIA for this project states that the approach adopted is generally consistent with the enHealth Guidelines.

The consultation conducted for the Big Hill HIA was done as part of the broader consultation for the EES process. Ms Lazenby, when asked by the Panel, confirmed that no additional consultation had been undertaken specific to the HIA.

The HIA examined some of the broader determinants of health including mental health and stress. The evaluation of baseline health status conducted as part of the HIA identified a higher level of mental health problems in the Stawell community compared to the rest of Victoria (see Section 9.5.3). This is consistent with the tenor and content of submissions made at the hearing about how the proposed project is causing significant stress in the community and for some people this is having an adverse impact on their health. Ms Lazenby, in response to a question by Ms Saunders at the hearing, stated, however, that no detailed evaluation of the mental health impacts associated with the project had been undertaken.

The interpretation of the risks from the project used the likelihood and consequence approach established in the Australian and New Zealand Standard for Risk Management⁴⁴.

The HIA indicated that the HRA conducted as part of the HIA process had been done using the contaminated land framework as set out in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended 2013) (ASC NEPM). This was confirmed by Ms Lazenby in her evidence at the hearing and in correspondence to the Chair of the Inquiry Panel dated 18 August 2014. The application of the contaminated land framework for the HRA for this project was said to be inappropriate by DoH (in its letter dated 6 August).

5.3.2 Acceptability of risk

In their submission, the DoH expressed concern about the level of risk predicted for mortality associated with exposure to the predicted levels of PM₁₀ associated with the project. For annual mortality (from long term exposure to PM₁₀), it was predicted that there would be 5.6 deaths/100,000 people. DoH noted that this risk was higher than was

⁴⁴ Australian/New Zealand Standard - Risk Management Principles and Guidelines AS/NZS ISO 31000:2009 (replaces AS/NZS 4360:2004).

considered socially acceptable elsewhere. They referred to the UK Health and Safety Executives framework on 'tolerability' and 'acceptability' of risk where it is considered that 1 death/100,000 is considered tolerable and more than 1/10,000 is considered unacceptable. A risk level of 1/1,000,000 is considered acceptable.

For cancer risk, the enHealth HRA Guidelines and NEPC *Methodology for Setting Air Quality Standards 2011* that the cumulative cancer risk from all sources should not exceed a lifetime risk of 1/100,000. The PEM states that the lifetime cancer risk from exposure to arsenic from site emissions alone should not exceed 1/1,000,000.

The Panel asked the EPA to clarify their position on what they consider 'acceptable' risk levels. Mr Robinson representing the EPA stated that they consider that emissions from an individual source (such as an industrial facility) should not exceed a 1/1,000,000 cancer risk and that the risk from all sources (cumulative impact) should not exceed 1/100,000. This position appears to be consistent with the position put forward by DoH, the enHealth documentation and NEPC. The EPA also commented that they felt the project should be designed to acceptable risk levels not 'tolerable' risk.

Although not discussed in the EES, Ms Lazenby, in her expert evidence, stated that she considered that a lifetime risk of death or cancer is tolerable at 1/10,000 level of risk. The project specific standard that she developed to apply to the incremental increase from the mine alone is based on a 1/10,000 risk of death. Her opinion is that this would have a negligible impact on the local community.

5.3.3 Baseline health status

As part of the HIA, an assessment of the baseline health status of the community was undertaken. The HIA refers to the determinants of health as set out in the WHO *Health Impact Assessment: The determinants of health, 2013*.

They include:

- Income and socio-economic status
- Level of education
- Physical environment including air, noise and water pollution
- Employment and working conditions
- Existence of social support networks including family, friends and community
- Personal behaviour and coping skills (including stress)
- Availability of health services.

Baseline health statistics were obtained from a variety of sources but primarily from the DoH Victorian Population Health Survey 2010: Grampians Region; Australian Bureau of Statistics; Stawell Regional Health Reports; and NGSC. Demographic information was obtained from the Social Impact Assessment prepared for the project (SIA).

From the information presented in the EES, it is clear that the population of Stawell has a poor health status when compared to the rest of Victoria. The population of Stawell is also declining and has a high percentage of older residents. In recent years the number of people in the 55-69 and 80+ age groups has increased in Stawell.

The SIA reports on the SEIFA index for the town, which is a measure of the relative disadvantage of the community. From the data presented, it is clear that Stawell residents are relatively disadvantaged with the SEIFA index for the town in the 1st decile of the index. This means that Stawell falls in the lowest 10% for relative social advantage/disadvantage. Figure 3-2 of the HIA shows that the most disadvantaged members of the community are located adjacent to the proposed project area, in particular to the south west of the proposed mine in close proximity to the south pit.

The information presented in the HIA shows that the Northern Grampians Shire (NGS) has higher avoidable mortality rates than the State average. The highest rates are for both ischemic heart disease (IHD) and cancer, with deaths from chronic obstructive pulmonary disease (COPD) and stroke also being higher. People with these conditions are known to be more vulnerable to the impacts of air pollution, in particular PM₁₀ and PM_{2.5}. Arsenic and RCS are also identified by the International Agency for Research into Cancer (IARC) as known human carcinogens⁴⁵ – it has been demonstrated that exposure to these pollutants causes cancer in humans.

The HIA identifies that morbidity rates in Stawell have also been shown to be higher than State averages, especially for cancer, asthma, cardiovascular disease and mental health. Although the asthma rates in the NGS are lower than the State average, the avoidable mortality rates from asthma are higher, more than double the average for rural Victoria and Victoria as a whole.

The EES also reports that the rates of psychological stress and utilisation of mental health services in the Grampians region are significantly higher than the Victorian average.

DoH, in its written submission (submission 352), notes that the higher morbidity and mortality rates due to cancer, asthma and cardiovascular disease (in particular IHD) are important in relation to the effects of air pollution on health. In particular, they identified that children, the elderly, smokers, and people with existing illnesses such as heart or lung conditions (including asthma), are more sensitive to breathing in fine particles – PM₁₀ and PM_{2.5}.

Ms Ware, in her submission to the Panel (documents W103 and W104), commented that the link between poor health and disadvantage is now beyond dispute. Supporting the information in the HIA, she noted that the NGSC is the sixth most disadvantaged LGA in Victoria according to the SEIFA index. She said that the residents living within 250m of the open cut pits, and hence most exposed to the impacts from the proposed project, are therefore extremely vulnerable.

5.3.4 Air quality

The HIA assessed the health risks associated with a range of key pollutants including PM₁₀, PM_{2.5}, arsenic and PAH. As earlier discussed, the information contained in the EES was based on the modelling done using the Bendigo background data which was later shown by the revised modelling based on Stawell background data to underestimate the predicted concentrations of these pollutants. An addendum to the EWS of Ms Lazenby and Ms

⁴⁵ <http://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder.pdf>

Meaklim (document P22) was provided at the hearing which provided the results of the HIA based on the revised air impact assessment done with the Stawell background data.

The HIA in Technical Appendix 15 of the EES stated that the assessment of health impacts from the mine emissions had been confined to the immediate area adjacent to the mine site – within 200m of the project site. The population considered in the HIA was 536 people. It was said that this was considered to be the most exposed population.

(i) PM₁₀ and PM_{2.5}

The DoH (document DoH61) identified the health effects of PM₁₀ and PM_{2.5} as falling into short-term and long-term effects. The short-term effects identified included the aggravation of pre-existing respiratory and cardiovascular disease, while the long-term effects were said to include contributing to the development of these diseases. DoH noted that the exposure to PM₁₀ and PM_{2.5} would be increased over the duration of the project and that this exposure is assessed as a long-term exposure.

The HIA focussed on assessing the health risks associated with exposure to PM₁₀ and PM_{2.5} arising from the incremental increase in predicted concentrations from the proposed mine operations. The assessment was done for the most impacted receptors located adjacent to the proposed mine site.

A range of health effects were assessed including:

- Annual all-cause mortality
- Daily all-cause mortality
- Daily respiratory mortality
- Daily asthma hospital admissions
- Annual asthma hospital admissions.

These outcomes were done for all age groups combined and did not individually assess the more sensitive groups which have been identified as having greater sensitivity to adverse health effects associated with exposure to PM₁₀ and PM_{2.5}.

The calculated risk outcomes based on the original AQIA for Year 5 were an increase in annual all-cause mortality of 5.6 deaths/100,000 people, associated with exposure from PM₁₀ from the mine operations alone: and 2.4 deaths/100,000 associated with exposure to PM_{2.5}. These predicted risks are higher than those recommended acceptable by DoH, EPA and enHealth. Ms Ware (documents W103 and W104) stated that as a resident that she believed it was intolerable to be exposed to this increased risk and that it was extremely unfair.

Although it was acknowledged that the revised AQIA predicted higher levels of PM₁₀ than those predicted in the original EES, no additional risk calculations were undertaken using this data (document P22). Instead, the range of 'project specific' criteria derived and proposed for use in this project was applied. The adopted project standard for PM₁₀ was an annual average of 3 µg/m³ which was based on an increase of 1/10,000 additional deaths due to the project emissions alone per year.

As discussed in Chapter 3 on air quality, the modelling shows that the derived project-specific annual average standard for PM₁₀ would be exceeded at several locations.

(ii) Arsenic

It was not in contention that arsenic levels are naturally elevated in the soils in the project area and any disturbance of the soil may generate dust that contains arsenic.

Arsenic was raised by several submitters as being a significant issue for this project. The approach taken to assess the health risk from arsenic and the potential risk posed by emissions from the project were issues debated during the hearing.

As identified in SEPP (AQM) Schedule A, arsenic has been classified by the International Agency for Research into Cancer (IARC), which is part of WHO, as a known human carcinogen. As identified in the HIA, arsenic is of concern for the project due to inhalation of PM₁₀ containing arsenic and through deposition of dust that can enter rainwater tanks.

The PEM establishes two approaches to the assessment of arsenic:

- Assessment of the cumulative impacts, background plus emissions from the project, against the assessment criterion of 0.003 µg/m³
- Where background concentrations of arsenic are unknown, emissions from the mine alone must not exceed a lifetime risk of cancer of 1 in a million.

Mr Power, on behalf of the proponent, argued on a number of occasions that the use of 1 in 1 million risk was not appropriate as an assessment criterion as background concentrations of arsenic are known in the area. The Panel acknowledges that the PEM provision to assess the risk is specific to areas where background is unknown, but the use of the 1 in 1,000,000 for mine emissions alone is still appropriate to the assessment of risk for the emissions of arsenic from the mine without background.

Nevertheless, accepting Mr Power's position, the alternative assessment approach in the PEM is that the cumulative impacts, background plus contribution from the mine, must meet the assessment criteria of 0.003 µg/m³.

The AQIA done for the EES predicted that the annual average arsenic levels would marginally exceed the assessment criterion in the PEM of 0.003 µg/m³. These results were used in the HIA. The revised AQIA, using the Stawell background data, predicted considerably higher levels of arsenic with the highest annual average concentration predicted to be 0.0074 µg/m³ – well above the PEM criterion.

The addendum to the HIA (document P22), however, did not assess the cancer risk associated with this data, but instead derived a project specific criterion to be applied to the project. The project specific criterion was 0.27 µg/m³ (approximately 100 times higher than the assessment criterion adopted for protection of public health in the PEM). No justification of this criterion was provided. They stated that:

To ensure that the potential health impacts associated with emissions predicted by the revised air quality modelling are assessed, we have derived project specific air quality criteria that are protective of health. The outputs from the revised air quality modelling have been compared against these criteria.

In correspondence from the DoH post hearing (letter to Panel Chair dated 6 August 2014), the DoH indicated that it did not support the use of the project specific criteria and questioned the basis of the derived criterion. DoH expressed the view that the assessment

criteria in the PEM were derived for the protection of human health, including sensitive groups within the community, and should be applied for the assessment of health risks from the project.

At the hearing, the Panel asked Ms Lazenby if she had undertaken an assessment of the inhalation risk of cancer to assess the risk posed by the project emissions alone. Ms Lazenby said that she had not done that and believed that it was more appropriate to derive project specific criteria. The Panel requested that Ms Lazenby undertake an inhalation cancer risk assessment using the inhalation unit risk factor from the Californian EPA Office of Environmental Health Hazard Assessment which had been used in the development of the PEM (document P37, p8). In response, Ms Lazenby provided an assessment of the cancer risk from the project emissions (document P91). In this assessment, instead of using the inhalation unit risk factor, the oral cancer slope factor was used. The oral slope factor used was $12 \text{ (mg/kg/day)}^{-1}$. The oral slope factor was adjusted rather than using the published inhalation unit risk factor that is derived to assess inhalation risks. The results of the assessment showed that the resultant cancer risk from the mine emissions alone was calculated to be 0.7/1,000,000. Although this risk is within the limit set in the PEM for inhalation risk from the mine emissions alone, the approach taken to assess the risk is not consistent with that used in assessing inhalation risks. This was raised by the DoH in correspondence of 6 August 2014.

Ms Lazenby and Ms Meaklim (in document P91) provided a detailed discussion on the use of the ASC NEPM to assess the risk from arsenic. The ASC NEPM applies to the assessment of contaminated land and contains health investigation levels (HILs) which are screening criteria which if exceeded lead to a site-specific risk assessment being undertaken. The ASC NEPM also establishes a risk assessment process to conduct this site-specific assessment. The main exposure pathway for contaminated sites is ingestion not inhalation. The Panel questioned Ms Lazenby during the hearing on the reasons for application of the ASC NEPM to the assessment of air quality risks where inhalation rather than ingestion is the main exposure pathway. Ms Lazenby acknowledged that she had applied the ASC NEPM framework in the HIA but gave no justification at that time. In a letter from URS dated 12 August 2014, Ms Lazenby and Ms Meaklim again confirmed that the ASC NEPM approach had been used as they believed that this had superseded the requirements of the PEM.

In response to the assessment of carcinogenic risk posed by exposure to arsenic, the DoH (letter dated 6 August) raised concerns about the methodology used in the HIA and in particular the use of the ASC NEPM framework. DoH commented that the focus of the ASC NEPM is on oral exposure of young at-risk children through exposure to contaminated soil, while the primary issue in relation to the proposed Big Hill mine was inhalation risk. DoH expressed the view that a non-threshold approach was appropriate to assess the inhalation risk from arsenic for this project (letter dated 18 July to Panel Chair).

Several submitters raised concerns about the potential health risks from arsenic. Mr Fox in his submission (document F72) identified a number of health effects associated with exposure to arsenic. He raised the question as to whether the documented poorer health status identified in the Stawell community may be attributable to historical exposure to arsenic from emissions from previous mining in the area. He submitted that, given the

existing health status of the community, further emissions from the project should not be allowed.

Professor Noller, who presented as an expert witness called by Mr Fox, also commented on the potential health risks associated with arsenic (document F70). Professor Noller noted that the predicted arsenic levels exceeded the assessment criteria in the PEM and therefore may pose a health risk to the local community. He also recommended that there needed to be a study on cancer incidence in Stawell and exploration of any linkages with arsenic exposures.

5.3.5 Noise

The HIA provided a qualitative assessment of the health risks of noise. This was an issue of concern raised by the community. Noise levels were predicted for sensitive receptors surrounding the project site in the Acoustic Assessment (EES Technical Report 5). These levels were compared to the NIRV target of 46 dB and also the existing Environmental Management Plan (EMP) noise limit of 50 dB for areas that are currently exposed to noise from SGM activities.

The assessment predicted that areas that are currently exposed to noise from SGM activities will continue to comply with the existing daytime EMP limit of 50 dB at all times. With the exception of site rehabilitation, the modelling indicated minor exceedances of the NIRV limit of 46 dBA of between 1 and 4 dB at some locations during day time hours, and at various stages of the project. The HIA noted that a 2 to 3 dB change in noise is at the limits of what is perceptible by the human ear and represents only a small increase in the context of current ambient daytime noise levels.

The HIA (page 50 Technical Appendix 15) noted that during quarter 8 of the project, site rehabilitation of the north pit would involve use of a compactor for a period of approximately four weeks. Noise levels during those works were predicted at times to exceed 60⁴⁶ dB L_{eff} at up to four residential properties. The HIA noted that if environmental noise impacts were experienced when people were asleep, this could affect health due to sleep disturbance and cardiovascular disease. It was also said that a decrease in an individual's quality of life due to an increased level of annoyance could also have a negative effect on health. However, the HIA concluded that, as operations will occur during day time hours only, impacts on sleep are expected to be negligible.

The HIA also noted that exposure to ongoing environmental noise above 40 to 55 dB is likely to lead to significant annoyance; higher noise levels in the range of 65 to 70 dB may be risk factors for school performance and ischemic heart disease; and outdoor noise levels in the range of 40 to 60 dB could disturb sleep (citing London Health Commission findings in 2003). The HIA further stated that any sound above 85 dB can cause hearing loss, with eight hours of 90 dB sound potentially causing damage to human ears, while any exposure to 140 dB sound causes immediate damage and actual pain (citing enHealth: *The Health Effects of Environmental Noise – other than hearing Loss*, 2004).

⁴⁶ The revised noise modelling predicts that noise levels during this period will reach 59 dB at 5 receptors.

The HIA acknowledged that young children may be more sensitive to noise induced hearing impairment than adults, as the effect of noise exposure decreases with age (citing National Institute of Public Health, Denmark: *Health Effects of Noise on Children and Perception of the Risk of Noise* 2001). The identified noise-related effects on children included tasks related to cognition (thinking) and learning, such as reading, attention, problem solving and memory, which are adversely affected when children are exposed to increased noise levels for a prolonged time.

The HIA concluded that while the predicted noise levels associated with the proposed project are expected to exceed the NIRV guidelines during certain stages of the project, the noise levels are unlikely to be associated with adverse health effects, other than annoyance and amenity issues. It went on to say that residents in the vicinity of Big Hill are highly unlikely to be exposed to an intensity of noise that could cause significant health effects (sounds above 85 dB) and therefore the consequences of such exposures were considered minor.

Ms Lazenby, in her evidence, expressed the view that, as the predicted exceedances of the NIRV criteria would occur during the day, there would be no impact on the health of the local community through sleep disturbance or stress. Ms Hunt pointed out that some residents of the area are shift workers and sleep during the day.

The HIA did note that some noise mitigation measures would need to be implemented. SGM were asked by the Panel what options were available to mitigate the noise impacts and associated health impacts. This is discussed further in Section 5.3.9.

DoH, in its submission to the Panel, advised that human health can be affected by the level, tone, frequency, duration, impulsiveness and intermittency of noise. It noted that the project had the potential to increase noise levels for some residents for selected periods over the five year duration of the project. DoH also said that residents who have not previously experienced noise from the existing mine operations will be exposed to new sources of noise. DoH considered this new source of exposure to be likely to impact on people's amenity. DoH also noted that the poorer health status and low SEIFA of the most exposed residents may make them more vulnerable to the effects of noise, and this means that mitigation measures must be put in place to reduce exposure.

Many submitters raised noise as a significant issue of concern. Ms Ware, in her submission (document W104), raised concerns that both the noise impact assessment and the HIA assume that residents would need to keep doors and windows closed to reduce noise levels.

Some submitters who live in Fisher St spoke about underlying health issues that made them or their family members very vulnerable to noise. One submitter commented that a family member had an underlying health condition that made her extremely sensitive to noise and that she could not tolerate high levels of noise. The submitter was concerned that the noise from the project may worsen the family member's condition. Her medical condition makes it difficult for her to be moved from her home so temporary relocation was not a viable option for them. Another submitter who suffers from bipolar disorder commented that he is already being impacted at night by noise and that this has triggered an episode of his condition. He is concerned that the increase in noise levels will worsen his condition. He

stated that he is depressed at the thought of living adjacent to an open cut mine and wants the same quality of life as everyone else in Stawell.

5.3.6 Rain water tanks

The issue of dust deposition, in particular arsenic laden dust, and potential contamination of rainwater tanks was raised by DoH and several submitters. The issue is mentioned in the HIA but no detailed assessment had been undertaken. As noted in the section on potable water in this report, no modelling of dust deposition into rain water tanks was undertaken as part of the EES. No surveys were conducted to determine which, if any, households use tank water as a potable water supply. We were advised by the proponent that it is proposed to conduct these surveys prior to commencement of the project. The HIA indicated that consultation with surrounding properties would be conducted to identify which, if any, properties utilise tank water for drinking water supply. If any such properties were identified, the HIA stated, a tank water monitoring program would be implemented.

The HIA noted that the Victorian *Guidance on Use of Rainwater Tanks, 2006*⁴⁷, recommends the installation of a 'first flush' diverter to all domestic rainwater tanks to protect water quality, particularly for those tanks used for drinking water supplies. This system diverts the first rainfall following a dry period, with the intention of collecting and washing away the majority of contaminants deposited on the roof, such as dust, bird and animal droppings, leaves and other debris. The HIA concluded that if rainwater tanks in the area were used in accordance with this guidance, potential impacts on drinking water supplies would be significantly mitigated. The HIA also concluded that, as it is proposed that rainwater tanks will be directly monitored and managed (if required), the potential impacts on health are minimal.

DoH, in its submission to the hearing (document DoH62), stated that sampling and analysis of tank water intended for domestic uses should occur prior to, during and after the proposed project had commenced. They also proposed that an action plan be developed if contaminated water was identified. DoH recommended that this plan needed to include a protocol for the notification of residents and the provision of advice regarding the need for an alternative drinking water supply and/or replacement of the contaminated water with potable water.

Some submitters referred to the contamination of the tank water with antimony near the mine at Costerfield and were concerned that similar contamination of tank water in Stawell could occur.

5.3.7 Mental health and stress

The HIA identified that the project may result in anxiety and stress for members of the Stawell population, including some persons living near the mine and within the broader community. The HIA stated that there is reasonable evidence that exposure to noise can result in psychological symptoms. However, it concluded that, there is limited evidence that noise at the levels predicted to be generated by the project is responsible for serious

⁴⁷ The Panel was unable to identify this document to review post hearing. There is an enHealth document of the same name but with a different date.

adverse mental health impacts. The HIA identified that individuals suffering from depression are likely to be more sensitive to noise and annoyance from noise, and that it is known that noise sensitive people pay more attention to noise, find noise more threatening, and react and adapt to noise more slowly than less noise sensitive people (citing enHealth *The Health Effects of Environmental Noise – other than hearing Loss* 2004).

The HIA also noted that air blast and vibration can cause a higher than normal level of anxiety, as well as potential sleeping difficulties, albeit operations are scheduled for day time hours only. The HIA also noted that other factors may impact on mental health due to general anxiety in the wider population about the impact of the project on the community.

Although these issues were identified and no detailed assessment was conducted, the HIA concluded that there is some likelihood for anxiety and stress associated with the mine, but that these impacts were considered to be temporary and the consequences classified as minor.

Numerous submitters raised the issue of the stress caused by the proposed project and the removal of Big Hill for five years. It was clear to the Panel that many of the submitters who presented to the hearing were stressed by the prospect of the project proceeding.

The underground blasting currently occurring also causes some concerns within the community and many people have concerns about the new blasting which would take place in the open cuts, and the potential impacts of it.

The lack of clarity about the rehabilitation of Big Hill is of significant concern to some residents and is a further cause of stress and anxiety.

Some submissions, both written and at the hearing, said that for many people Big Hill is not just a 'hill' but is a place that they go when they need solace or are distressed. It was said that spending time on Big Hill has helped people through difficult periods in their lives including severe depression. The thought of Big Hill being removed is a cause of anxiety for these people.

Ms Ware, in her submission (document W104), stated that it is well documented that access to green space improves human health, both physical and emotional. She further said that green spaces contribute to enhanced mental health and wellbeing. This was not addressed in the HIA. Ms Ware also noted that the proposed project will remove community access from Big Hill for at least a decade even though the mining operations are proposed only for five years. She raised concern that there are no alternative green spaces in Stawell that can substitute for Big Hill during that time.

Mr Fox (document F72) commented that the proposal to remove, mine and rebuild Big Hill has created much mental stress in the community. He stated that there have been fears in the community about the potential health effects especially for people living close to the proposed mine. There have also been fears that, if the mine goes ahead, SGM might not be able to complete their commitments and '*leave Stawell with a mess*'. He also noted that there had been grieving in the community about the risk of losing Big Hill as well as anger among the people most affected that they had not been involved in decisions about the project.

Mr Fox also said that the impact of having two proposals for the removal of Big Hill occurring so close together had taken its toll on the health of the community. He commented that some people left Stawell after the 1999 EES due to the stress that it caused and that there have been cases of depression associated with each proposal. He stated that one of the consequences of stress is a weakening of the immune system causing greater susceptibility to disease.

Ms Raeburn (document R119) submitted that the proposed project had left her tired, stressed and depressed. She commented that the town was divided during the last EES and has just healed. It is being divided again. She said that the lack of certainty around the project and the fact that reassessment is still being done is not giving the community any confidence that there will no risk to their health. She further commented that the impact that this project has caused in regard to stress and anxiety in the community is not fair, and that people will continue to be impacted for another five years if the project proceeds.

Ms R Byass (documents B110 and B111) quoted the CEO of Lifeline in saying that every community should ask if there is a location where people go if they are at risk and when they are in a vulnerable state. She stated that she has suffered depression and that Big Hill saved her life – it was her place to go. She was concerned that if Big Hill is not available that there will be no place available to her or others if they find themselves in need of a place to go when they are vulnerable.

5.3.8 Multiple stressors

The issue of the cumulative effects of multiple stressors was raised by Mr Fox (document F72). He identified that there are a number of effects of the mine that can impact on the health of the community. These include exposure to arsenic and RCS in air, water and soil; blasting with vibration and potential fly rock; and noise. He also noted that emotional stress, financial stress due to possible house devaluation, and even social stress from taking a stand against the project, can all have an effect on people's health.

He pointed out that there are environmental standards derived for the protection of health for arsenic, RCS and noise. He noted, however, that these standards were derived for exposure to just one of these pollutants at a time. He said, however, that the community closest to the mine would be exposed to all pollutants at the same time and this would lead to greater impact than exposure to individual pollutants. The effects would be exacerbated by the existing poor health of the affected community.

5.3.9 Management actions

During the hearing, there was significant discussion about what measures could be put in place to reduce the potential stress and health impacts arising from the operation of the mine, especially as might be linked to noise and dust emissions. SGM raised concerns about the ability to determine whether or not the mine is the cause of the problems.

With respect to noise, there were discussions about using architectural solutions to reduce the noise impacts on residential properties such as dwelling or window insulation or noise barriers. The possibility of relocation of residents, either for the full period of the mine operation, or for shorter periods, to provide respite from the impacts, was also raised. However, at the time of the hearing there was no methodology developed for determining if

such a relocation of households was necessary or appropriate and who would make the decision in relation to each household.

Mr Power commented that the decision as to the severity of any impact arising from the mine operations, and any necessary mitigating responses off site, should be determined by SGM. Some local submitters were of the view that an independent body should be established to make those decisions and determine what off site actions should be taken. SGM confirmed that it did not support this.

With respect to health, Mr Power commented that it would be difficult to establish whether any health effects were linked to emissions from the mine and that, before any actions were taken by SGM, this link would have to be made. The Panel asked Mr Power if a signed letter from a medical practitioner would suffice. Mr Power said it would not. He said that the alleged health impact would have to be independently verified by SGM.

Some submitters commented that due to medical conditions or their advanced age that relocation for them would be difficult. One submitter noted that his sister, due to her existing health difficulties, could not be removed from her home. He also advised that her condition is exacerbated by noise. He felt that he had no options for relief if the project were to proceed.

Mr Fox (document F72) and Professor Noller (document F71) both recommended that an empirical health study needs to be undertaken to assess any impacts that the mine might have on the health of the surrounding community. They suggested that this should include a baseline health study to assess the underlying health issues in the community. There was discussion during the hearing as to whether such a study would be useful and how it might be conducted.

5.4 Discussion

The Panel accepts that the broad approach taken in the HIA is consistent with the enHealth HIA Framework. However there are a few areas that were not addressed or were only given brief consideration that we consider should have been included. Also the CHETRE Guidelines have not been referenced nor used in the HIA undertaken for this project.

5.4.1 Limited public consultation

One of the key requirements of the enHealth HIA Framework is the need for community engagement specific to the HIA process. The enHealth Framework states that:

*Community consultation is a critical and integral part of the HIA process. People and communities are part of the 'environment' and rely on the quality of their environment for their survival and maintenance of good health and wellbeing. The public has a right to know the actual or potential effects of a proposed activity on their health and their environment and should be consulted on the management of the risks. The community is also a rich source of local information that can only be tapped through their involvement.*⁴⁸

⁴⁸ Page 10, enHealth Health Impact Assessment Guidelines 2001

One of the key components of a HIA as set out by CHETRE is the establishment of a steering group that includes representatives of the community, to guide the conduct of the HIA.

As noted, the consultation conducted for the Big Hill HIA was done as part of the broader consultation for the EES process and was not focussed on the HIA as such. Neither was any steering group established to guide the HIA and assist in the interpretation of the findings. We consider that not only would the convening of such a steering group have met the guidelines, but it may also have helped gain public acceptance of the findings of the HIA in circumstances where members of the community expressed concerns that the HIA was dismissive of the potential community health risks.

5.4.2 Assessment of health risks

The interpretation of the risks from the project has used the likelihood and consequence approach established in the Australian and New Zealand Standard for Risk Management⁴⁹. This is discussed in Chapter 7. While the likelihood and consequence approach is an accepted approach to assessing overall project risks and hazards, it is not usually applied within a HIA. The enHealth and CHETRE guidelines on HRA do not use this framework for the assessment of risks to human health.

The application of the likelihood and consequence approach is very subjective and relies strongly on the interpretation of risks by the assessor(s) rather than an objective or scientific process. As a consequence, whether a risk is considered major or minor is heavily influenced by the approach taken to assess the acceptability of the risk posed. In this case, this has led to all of the risks to health being ranked as very low or negligible. This contrasts with the outcome of an assessment in accordance with international approaches which would identify some of the risks as unacceptable and others ranked as high or very high. This is discussed further below. In the Panel's view, some of the conclusions reached about health effects are not justified and, when considered overall, that the assessment is very dismissive of the potential health risks posed by the project.

The Panel also notes that the adopted risk matrix approach leads to identification of the mitigation measures required where hazards are significant. In the present case, as the risks are generally assessed as low, a number of management measures that would otherwise reduce the potential risk to the community have not been proposed. Indeed in most cases it has been concluded that no mitigation or management measures are required. The Panel does not accept that this is the case given the unacceptability of the assessment of health risks.

The HIA in Technical Appendix 15 of the EES stated that the assessment of health impacts from the mine emissions had been confined to the immediate area adjacent to the mine site – within 200m of the project site. It was said that this was considered to be the most exposed population. This does not, however, take into account the impacts of some pollutants which extend beyond this area as shown by predicted exceedances of the NEPM standards in the Stawell township. Given that there is no identified threshold for the health effects of these pollutants of concern for the project, any increase in the concentrations of

⁴⁹ Australian/New Zealand Standard - Risk Management Principles and Guidelines AS/NZS ISO 31000:2009 (replaces AS/NZS 4360:2004).

these pollutants can simply be assumed to result in an increase in risk to the health of the population. Therefore limiting the assessment of health risks to the immediate area adjacent to the mine would have underestimated the total risk to the health of the Stawell community.

5.4.3 Assessment criteria

The Panel is concerned that the HRA has been done using the contaminated land framework as set out the ASC NEPM. The application of the contaminated land framework in the HRA for this project was questioned by DoH (letter dated 6 August) who said that it was inappropriate. In correspondence from URS dated 12 August 2014 in response to the DoH letter of 6 August, Ms Lazenby stated that the ASC NEPM framework is the applicable framework and has superseded the SEPP (AQM) and PEM requirements.

We understand that this is not the case. The ASC NEPM has resulted in changes to the legislative framework in Victoria for the assessment of contaminated land, as reflected by the amendments to the *State Environment Protection Policy (Prevention and Management of Contaminated Land) 2002* (SEPP (Prevention and Management of Contaminated land)), which were made in 2013. No changes were made, however, to the SEPP (AQM) or PEM in response to the changes to the NEPM, nor would it have been appropriate to do so. The ASC NEPM is the applicable framework for the assessment of contaminated sites but not for air quality. Although there is guidance in the ASC NEPM on how to conduct an inhalation risk assessment, this is within the context of risk from a contaminated site and it does not relate to broad population health risks arising from emissions from industrial premises, which in this case is the proposed mine workings.

The Panel is of the view that the applicable framework for assessment of risk from the project is established through the PEM, the SEPP (AQM) and the enHealth HIA and risk assessment guidelines. The Panel agrees with DoH that the approach taken in this HIA of applying the framework for the assessment of contaminated land is inappropriate for a risk assessment for air quality and where inhalation is the key exposure pathway.

The application of the framework for the assessment of contaminated land results in a weakening of the required level of health protection to be afforded by the project. The ASC NEPM approach focuses on ingestion as the main exposure pathway which is appropriate for assessment of a contaminated site where the impacts are due to exposure on the site. However, in this case this is an industrial development adjacent to residential areas. The emissions from this industrial facility are being released across that community and therefore should be assessed within the regulatory framework for industrial air emissions in Victoria.

As set out in the HIA and the evidence of Ms Lazenby, the HRA has assumed that the air quality standards are 'screening' criteria consistent with the health investigation levels (HILs) contained in the ASC NEPM. This is not correct and does not properly reflect the air quality legislation and regulations not only in Victoria but also nationally and internationally. The HILs are not protective health standards – they are screening criteria that if exceeded require further detailed assessment of the risks posed by a contaminated site. By contrast air quality standards are usually compliance standards and have been derived to protect the

most sensitive groups and achieve appropriate health outcomes within a community. They contain an adequate margin of safety to ensure protection of these groups.

The Panel has concerns that the amended HIA derives 'project specific' standards to be applied to assess the risks from PM₁₀ and arsenic. The air quality regulations do not allow 'project specific standards' to be developed. They are allowed for contaminated sites as the HILs are not derived to be protective of health and a site specific assessment can be conducted identifying the key exposure pathways and potentially exposed individual at that site. In the case of air quality, it is a whole community that is exposed and health protective standards have already been adopted by national and State Governments.

It is also important to note that some of the 'project specific standards' proposed for use in this project are 100 times less protective than those adopted by Governments for protection of human health. The proposed standards, for example for arsenic, are 100 times less stringent than the criteria in the PEM. It is not acceptable that the community of Stawell be exposed to this level of risk when all other developments in Victoria would have a higher level of health protection. The Panel does not accept the use of project specific standards for the assessment of the health risks arising from this project and we believe that the assessment criteria established in the PEM are the applicable standards to assess the impacts from the project. This position is supported by DoH as stated in its letters dated 18 July 2014 and 6 August 2014.

As raised by DoH, the risks posed by air emissions from this project are greater than those generally accepted by national and international bodies. Ms Lazenby has recommended that a 1 in 10,000 risk of death or cancer should be adopted as a tolerable level of risk for this project. This has been challenged by both DoH and EPA. The Panel does not accept the position of Ms Lazenby in relation to 'acceptability' and 'tolerability' of risk. In her EWS (document P35), she refers to a range of international targets for risk. The Panel notes that, where a 1/10,000 risk level is adopted, it is used as a 'maximum permissible' or 'maximum tolerable' risk where continuous measures must be implemented to reduce the risk to as low as reasonably practicable. The Panel also notes that there is no reference to air quality risk assessment guidance in Australia or internationally. Both the Australian and US references she refers to are drawn from risk assessment guidance for contaminated sites where inhalation risk is not the primary issue.

As discussed in Section 5.3.3, the Stawell community has been identified as being particularly vulnerable to the effects of air pollution due to a range of factors including existing poor health status, low socio-economic indices and being an older population. Given these high risk factors that make the community more vulnerable to the health impacts arising from emissions from the mining operations, the Panel does not believe that it is appropriate for an identified vulnerable community to be exposed to 'maximum tolerable' risk levels that have been established for the 'general' population.

The EPA questioned why the project should be designed to meet a 'tolerable' risk rather than an acceptable level of risk in any case. The Panel agrees with the EPA and DoH that the project should be designed to meet acceptable risks levels, not 'tolerable' levels as defined in the HIA. Based on evidence presented in submissions and at the hearing, the Panel is of the view that the risks from the project alone should not exceed a 1 in a million risk of death

or cancer, and that the cumulative impacts should not exceed 1 in 100,000. This is consistent with the approach currently being used by the EPA and with national guidance from enHealth and NEPC in relation to air quality, as well as the approach taken in the PEM.

Although it is acknowledged that the revised AQIA predicted higher levels of PM₁₀ than those predicted in the original EES, no additional risk calculations were undertaken using this data (document P22). Instead, the 'project specific' criteria proposed for use in this project were applied. The adopted project standard for PM₁₀ is an annual average of 3 µg/m³ which is based on an increase of 1/10,000 additional deaths due to the project emissions alone per year.

As discussed above, this level of risk is much higher than is considered acceptable by DoH and other regulatory agencies in Victoria and Australia, and the Panel does not consider it to be an acceptable risk level to adopt for this project. It is also based on deaths from all-cause mortality across all age groups which is the least sensitive outcome that could be used. Using this as the basis for a project specific criterion does not take into account the vulnerability of the Stawell population and is inconsistent with the NEPC guidance (2011)⁵⁰ that says any air quality standard must be developed to protect the most sensitive health outcomes and groups within a population. This has not been done in this case.

The Panel particularly notes the lack of assessment of effects on the elderly and children, who have been identified as groups especially vulnerable to the effects of air pollution. There was also no assessment for the more sensitive health outcomes, notably cardiovascular outcomes. As stated in the HIA, recent research as summarised by WHO⁵¹ show that there are strong links between exposure to PM₁₀ and PM_{2.5} and increases in mortality and morbidity in people with existing cardiovascular disease, including IHD and stroke. Given the high rates of these diseases in the Stawell community, as identified in the HIA, the Panel believes that that this is a clear omission. When questioned on this issue by the Panel, Ms Lazenby acknowledged that the focus of the HRA was on less sensitive outcomes. She was of the view that the concentration-response functions for these outcomes were difficult to obtain but did acknowledge that they were available from WHO documentation⁹. No other explanation was given as to why these relevant health outcomes were not assessed.

The annual health risks were calculated using the predicted annual average concentrations of PM₁₀ and PM_{2.5} which is considered appropriate. The daily health risks were only calculated for one day of the year, however, which significantly underestimates the potential acute risks arising from the project. Calculations should have been undertaken using data from each day of the year and then summed across the year to give an annual estimate of the acute health risk from the project. When questioned, Ms Lazenby acknowledged that the daily health risk just represents the risk for one day of the year and that it should have been done for every day of the year. The Panel considers that, given the vulnerability of the affected population, the acute health risks were not and should have been properly assessed. We consider that the estimates in the HIA significantly underestimate the acute

⁵⁰ NEPC: Standard Setting Methodology, 2011.

⁵¹ WHO: Review of the evidence of the health effects of air pollution, 2013.

risks posed by the project especially given the number of exceedances and the maximum concentrations predicted in the revised AQIA.

The health risks were only quantified for Year 5 as this was predicted to have the maximum impact on the local community. Based on the revised AQIA, Year 2 of operations is also predicted to have a significant impact on the surrounding community. The Panel is of the view that the health risks should also have been quantified for Year 2.

The Panel is also concerned that the lack of further effective mitigation measures, beyond those already identified and assessed, would mean that the emissions from the project could not be reduced without reasonably frequent cessation of work. While such an arrangement may be acceptable where health risks are low and any failure to stop work might have only limited effect, this situation is not acceptable as the health risks posed by the project, in particular the air emissions, exceed acceptable levels of risk.

The DoH, in its submission to the Panel (document DoH61), raised concern that the buffer distance between this project and sensitive receptors has been significantly reduced from the 250m included in the EPA Buffer Guidelines to less than 50m. DoH submitted that this should only be allowed if it can be demonstrated that the health of the local community will be protected.

The Panel agrees with the DoH approach. We consider, however, that community health protection has not been demonstrated.

5.4.4 Arsenic risks

The PEM establishes two approaches to the assessment of arsenic:

- Assessment of the cumulative impacts, background plus emissions from the project, against the assessment criterion of $0.003 \mu\text{g}/\text{m}^3$
- Where background concentrations of arsenic are unknown, emissions from the mine alone must not exceed a lifetime risk of cancer of 1 in a million.

The modelling done as part of the revised AQIA showed that the assessment criteria applied in the circumstances of known background levels would be exceeded by more than a factor of 2. As discussed above, the Panel asked Ms Lazenby at the hearing if she had undertaken an assessment of the inhalation risk of cancer to assess the risk posed by the project emissions alone. Ms Lazenby said that she had not done that and believed that it was more appropriate to derive project specific criteria. In correspondence from the DoH post hearing (letter to Panel Chair dated 6 August 2014), the DoH indicated that it did not support the use of the project specific criterion and questioned the basis of the derived criterion. DoH expressed the view that the assessment criteria in the PEM were derived for the protection of human health, including sensitive groups within the community, and should be applied for the assessment of health risks from the project. As discussed for PM_{10} , the Panel does not accept that the development of project specific criteria for air quality is appropriate and is not consistent with the regulatory framework for air quality in Victoria. The Panel accepts the view of DoH on this issue.

In response to the assessment of carcinogenic risk posed by exposure to arsenic, the DoH (letter dated 6 August) raised concerns about the methodology used in the HIA and in particular the use of the ASC NEPM framework. DoH commented that the focus of the ASC

NEPM is on oral exposure of young at-risk children through exposure to contaminated soil while the primary issue in relation to the proposed Big Hill mine was inhalation risk. DoH expressed the view that a non-threshold approach was appropriate to assess the inhalation risk from arsenic for this project (letter dated 18 July to Panel Chair). The approach taken to assess the arsenic cancer risk is a non-threshold approach (document P91). This is not consistent with the approach recommended by DoH and is likely to underestimate the potential health risk from inhalation as it assumes that there is a safe level. The Panel is of the view that the approach recommended by DoH and set out in the PEM should have been applied.

The arsenic risk assessment (presented in document P91) states that the HIL is a health protective value. The ASC NEPM identifies a HIL as a screening level which may not be protective of the health of people exposed to soil at a contaminated site. It also states that the HIL is not a number that should be used as a clean-up level nor as an acceptable target level for pollution as was Ms Lazenby's approach.

Ms Lazenby also quoted a HIL for inhalation from soil at a contaminated site. The ASC NEPM (Volume 10, HIL derivation for metals) does not have a HIL for inhalation but uses a toxicity reference value for inhalation to derive the HIL for soil. This calculation assumes that ingestion is the major exposure pathway and that the inhalation pathway at a contaminated site is less than 1% of the total exposure. As we have said, the proposed project is not a contaminated site. The emissions arising from the project, which are the focus of the EES assessment, pose a risk to the health of the surrounding community almost entirely via inhalation. The ASC NEPM (Schedule B4) refers the risk assessor to air quality regulations and guidelines to assess the risk where inhalation is the primary exposure route.

The AQIA proposed trigger levels to be used as part of the reactive monitoring and management program. If this approach were adopted it would be critical that the triggers be derived so that they protect the health based standards contained in the PEM. The Panel considers that any trigger levels used in a reactive monitoring system would need to be to the satisfaction of both EPA and DoH before they would be adopted into any site EMP or before any variation to the Work Plan was approved.

5.4.5 Contamination of rainwater tanks

With respect to the issues around contamination of rainwater tanks, DoH in its submission to the hearing (document DoH62) stated that sampling and analysis of tank water intended for domestic uses should occur prior to, during and after the proposed project has commenced. They also proposed that an action plan be developed if contaminated water is identified. DoH recommended that this plan would need to include a protocol for the notification of nearby residents and advice to them regarding the need for an alternative drinking water supply and/or replacement of the contaminated water with potable water.

The Panel supports the view of the DoH, but we consider that, as part of the action plan, the responsibilities for provision of an alternative water supply where reticulated water is not available, and the replacement of contaminated water, need to be clearly identified. The Panel considers that where the contamination of the tank water can be shown to be due to emissions from the mine, SGM should be responsible for both replacement of any contaminated water and provision of an alternative water supply. The determination as to

whether the mine emissions caused the contamination needs to be assigned to an independent third party.

In relation to submitter concerns about the contamination of the tank water with antimony as occurred near the mine at Costerfield, the Panel is of the view that if a sampling and analysis program, together with an action plan as proposed by DoH, were to be implemented, the risk of such contamination would be low. If contamination was found, it would be found early and mitigation measures could be implemented to ensure that there would be no risk to the health of the affected residents.

5.4.6 Noise and health

The Noise Impact Assessment predicted that the NIRV limits for noise would be exceeded but that these exceedances would be limited to daytime hours. Ms Lazenby in her evidence was of the view that, as the predicted exceedances of the NIRV criteria would only occur during the day, there would be no impact on the health of the local community through sleep disturbance or stress.

This view does not take into account that there are people in the local community that work shift work and do sleep during the day as was pointed out by Ms Hunt. Both the SIA and project risk analysis identify the fact that the sleep of shift workers may be disturbed by noise from the mine operation.

We also consider that the effects of noise should have taken into account the fact that the population of Stawell has a large percentage of people aged 55+ years, many of whom would be home during the day. Concerns about the constant noise from the proposed operation were raised by a number of submitters who saw it as a potential cause of stress.

The HIA also fails to acknowledge the potential impacts of noise on the health of the community due to their greater vulnerability due to higher levels of cardiovascular mortality and morbidity. The HIA and evidence given by Ms Lazenby cites studies that show that noise has been shown to increase mortality and morbidity from cardiovascular causes.

The Panel acknowledges that by limiting the operating hours of the mine to daytime hours means that more stringent night time noise standards are not exceeded. However, the Panel is concerned that the predicted increase in daytime noise, in some cases achieving levels of up to 59 dB at 5 residences, would increase stress for some and may impact on existing medical conditions. The existing vulnerability of the community contributes to this concern.

We also acknowledge that the noise assessment has been done using the NIRV standards which are based on protecting amenity. However, the reduction of amenity can cause stress for some and this in turn may lead to other adverse health effects. In the circumstances of the particular health vulnerability of the population, it is important that exceedances of the NIRV standards be avoided and additional mitigation measures are explored. This is discussed further in Section 5.3.9.

5.4.7 Stress

The HIA recognised that the proposed development on Big Hill; concerns about blasting; community dysfunction; and other factors would have some impact on the mental health of persons living near the mine site. These impacts, which were not considered in detail, were considered to be temporary, however, and the consequences classified as minor. The HIA concluded that the overall impact of the project on mental health for the affected population was negligible.

The Panel is of the view that a more detailed assessment, including greater engagement with the broader community, may have resulted in a different conclusion.

The Panel considers that the assessment of the effects of stress on health in the HIA was not adequately assessed and the HIA failed to recognise the importance of this issue in relation to the health of the whole community of Stawell, not just for people directly impacted by emissions from the mine.

In general, there was no evaluation of the baseline health of the community and its relationship to potential health impacts, even though the evaluation of baseline health status had identified a higher level of mental health issues in the Stawell community compared to the rest of Victoria.

As we have said, the submissions made at the hearing indicated that the project is causing considerable stress within the community and in some cases this is impacting on the health of individuals.

A considerable number of written submissions raised the issue of the stress caused by the possibility of the project proceeding and the removal of Big Hill for five years. It was clear to the Panel that many of the submitters who presented to the hearing were stressed about the future in this way. Many directly addressed the issue of stress or multiple stresses. The underground blasting currently occurring also causes some concerns within the community and some people were anxious about the new blasting which would take place in the open cuts, and the potential impacts of this. The lack of clarity about the rehabilitation of Big Hill is also a significant concern for some residents as is its unavailability to the public for more than five years.

As discussed in Section 5.3.8, the issue of the cumulative effects of multiple stressors was raised by Mr Fox (document F72).

The Panel considers that the position put forward by Mr Fox needs consideration when assessing the impacts of the project.

By way of illustration of the effect of multiple stressors, the Panel notes that PM_{10} , $PM_{2.5}$ and noise all impact on people with cardiovascular disease. Given the HIA identified that the Stawell community already has a high rate of cardiovascular mortality and morbidity, the impact of these pollutants may be heightened. Stress and anxiety too can worsen the symptoms of cardiovascular disease. The combined impacts of all these stressors could have a greater impact on the health of this community than if only one of these situations existed.

The Panel believes that potential cumulative impacts of this kind should be a driver to ensure that emissions from the project are minimised and that all possible actions are taken

to ensure compliance with the relevant environmental standards. It is concerning that the EES assessments have indicated that, for air quality and noise, the relevant standards will not be met and the proponent's position, as put by Mr Power, is that exceedances are inevitable.

5.4.8 Monitoring health effects

Mr Fox and Professor Noller both recommended a baseline health study be undertaken to assess the underlying health issues in the community.

The Panel considers that if the project proceeds, some form of health surveillance need to be undertaken for the life of the project.

The Panel does not believe that a full epidemiological study is necessary or that it would provide useful or timely information to guide management actions for the site. However, there is merit in the utilisation of existing health information and the tracking of increases in illnesses or any exacerbation of disease once the mine would start operation. This might include the use of GP attendance data for specific health outcomes, or hospital attendance and emergency department data. This information might be tracked at regular intervals and any increase in any of the indicators investigated.

The Panel considers that DoH should be consulted in the design of such a study and a steering group established. The steering group should contain representatives of DoH, SGM and the community. It should be chaired by a representative of DoH or the local health region.

The results of such a study would allow early detection of any issues arising and allow management actions to be implemented to reduce the impacts.

5.4.9 Respite relocation and other off site measures

As discussed in Section 5.3.9, there is a need for a contingency plan to be developed that contains a mechanism whereby the community can be provided with some respite from the potential impacts of the project including dust and noise. Given the relatively poor existing health status of the Stawell community, we consider that this is justified. Such a contingency plan would enable the most affected community members to be given some respite from the impacts. This could involve relocation for a period of time or, as a response to noise, the inclusion of architectural solutions.

The Panel is concerned that, despite some references to the possibility of such a plan, it has not been developed and there does not appear to be a firm commitment to it.

5.5 Conclusions

The Panel is of the view that there is a significant health risk posed by this project. The risk posed by emissions of PM₁₀ and arsenic to air in particular is not acceptable and there are limited management actions, short of ceasing work, that can be implemented to reduce that risk. In this respect, DoH noted that the community will be exposed to an 11% increase in PM₁₀ and PM_{2.5} during the life of the project despite 'best practice' measures being implemented. The relatively poor health status of the Stawell community, which makes the

community more vulnerable to health impacts, and which was given little recognition in the EES, is a contributing factor to our assessment of the seriousness of the risks.

This is not a case where the noise and air emissions comfortably meet the criteria designed to protect health, or one where the emissions are to occur in a location remote from sensitive receptors. It is instead a project where exceedances of the noise and air quality standards are predicted to occur and where there are large numbers of dwellings nearby: there would be some 35 dwellings within 100 metres of the pit boundaries and 160 dwellings within 250 metres. It is the Panel's view that it is simply not acceptable that emissions from the site would not be managed to meet the criteria set in the PEM and NIRV. Nor is it acceptable to devise project specific standards in an endeavour to create a semblance of compliance or 'risk assess' the problem away. The goal posts to protect health have been set in legislation and should not be changed.

The Panel believes that the project as proposed cannot operate without impacting adversely on the health of the local community.

Also the Panel considers that the assessment in the HIA of the impacts on mental health and stress is not adequate. It is clear that the project is having a significant impact on the mental health of people within the community and that the levels of stress being experienced by some community members are not acceptable. The Panel believe that this is a significant issue that has been underestimated in the HIA.

The Panel believes that the significant health risks and the particular vulnerability of this population to impacts on health strongly recommend against approval of the project.

6. Social

6.1 The issue

The Social Impact Assessment (SIA) was undertaken to assess the potential impact of the project on the social fabric of the community. The SIA used a variety of sources of information including the results of other technical reports conducted as part of the EES and a community survey. An assessment of the existing population demographics, community resources and the value of Big Hill to the community was undertaken. The SIA concluded that even though there are positives from the project being approved, including employment opportunities and some economic benefits for the town, several social negatives would occur. The SIA recommended a range of mitigation measures to address the negative issues.

Many individual submitters indicated that they believed that the SIA did not accurately represent the views of the Stawell community and were highly critical of the community survey that was undertaken and the way in which participation of community members had been sought. A separate survey was conducted by Ms Marion Byass which she believed came to a different conclusion on social impacts.

6.2 Evidence and submissions

The judgement on the severity of potential impacts on the community in the SIA was based in part on the information provided in the Technical Appendices in the EES. The SIA identified concern about air pollution, and in particular the resultant potential health risks, as an issue that members of the community identify as significant.

The SIA noted that the 1999 EES process caused significant division within the community. It identified that this could happen again but concluded that the impact would be a minor negative and that the positives from the project would help the healing.

Expert evidence on social impacts was given by Mr Glenn Weston on behalf of the proponent (documents P32, P33, P39 and P82).

A number of submitters made presentations and written submissions about potential social impacts associated with the project. In particular, Ms Marion Byass (document B84) presented the methodology and results of the survey conducted on behalf of a community group on community attitudes to the project.

The key issues arising from the SIA and submissions received through EES process are:

- The previous EES process and its effects
- The validity of the community survey undertaken as part of the EES
- Social division
- Health and amenity
- Community linkage with Big Hill
- Rehabilitation of Big Hill.

(iii) Previous EES

As part of the 1999 EES a SIA was developed. The current SIA notes that the key concerns raised by the community at that time were, in order of priority:

- Effect on property values/financial compensation and a sharp decline in prospective buyers for houses.
- The physical impacts of the project which focussed on noise, air quality, vibration, traffic, fly rock, blasting chemicals, gases, light spill and water pollution.
- The physical/visual loss of Big Hill as a town feature/icon, and its loss as a cultural, recreational and flora and fauna area.
- The uncertainty surrounding the impacts posing unanswered questions such as *'Will the open cut proceed?'* and *'What will be the impact of the mine if does proceed?'*
- The lack of trust and loss of credibility for SGM that was engendered; and the perceived misinformation/lack of information provided by the company and by the 'bureaucracy' concerning the whole EES process.
- The issue had divided the town in a manner that was in distinct contrast to the way the town had traditionally functioned.
- The change in the image of the town. An open cut mine in the town was seen as creating an unwanted image which would stigmatise Stawell and actively work against the town's future.
- The detrimental impact on people's lives and the stress it was causing families, particularly those contemplating relocation.
- The impact on people's health, which included their physical, emotional and mental wellbeing.
- The hill acts as a physical barrier to the operation of the mine, and with its removal the impact of the existing mine would be substantially increased.

Mr Weston, in his evidence, noted that the nature of concerns expressed previously mirror those raised by sections of the community in relation to the current proposal, in particular the concerns about lowered amenity, risks to health and reduced property values, which would be felt unevenly throughout the community. The current SIA stated that some of the uncertainty and concerns expressed previously (for example, change in the image of the town and possibly stigmatisation of the town) reflect those typically expressed in relation to what are termed 'Locally Unwanted Land Uses' (LULUs), for example, power plants, waste dumps/storage facilities, prisons, etc. It identified that LULUs are land uses that are useful to society, but objectionable to neighbours due their perceived effects on area reputation, health and amenity in their immediate surrounds.

(iv) Community survey

The SIA noted that the information that formed the basis of the SIA was collected by a variety of means including a community survey which was conducted to allow Stawell residents to express their views regarding the project. Mr Weston in his evidence (document P32) outlined the process for conducting the community survey. The survey was distributed to residents of the Stawell township and the area within 5km of the project site. The distribution of the survey was via the internet and access to the survey was secured via

use of an access code. Mr Weston stated that the survey was completed by 246 households which made up approximately 10% of those in the town.

Mr Weston (document P32) said that the strength of the survey method allowed households to participate anonymously at a time of their choosing. He commented that the demographic composition of respondents was quite representative of the town population.

Mr Weston acknowledged that the main weakness of the survey was that respondents self-selected to participate. He said that therefore there was a potential attitudinal bias among the respondents, with those with stronger views, positive or negative, being over-represented.

Mr Weston was of the view that the data provided useful insights into the reasons why people in the community supported or opposed the project and that the data provided an indication of the balance of opinion at the time. However he noted that the results did not allow precise quantification of the views of the community as a whole.

The results of the survey showed that opinion in the town on the project was divided with 49% expressing support and 44% expressing opposition. Large proportions of respondents reported both strong support (31%) and strong opposition (32%) to the proposal. A relatively small proportion of respondents who completed the survey were neutral (7%).

The survey methodology allowed for the views of sub-sections of the community to be explored. The data was analysed by separating the population of the town into different regions to explore the views of respondents living at varying distance from the project. Respondents were asked to indicate the geographic part of the township (or surrounding area) they lived in. Area 1 was the area closest to the mine, followed by Area 2, Area 3 and then Area 4. The SIA concluded that although it might be expected that community members living closer to the proposed project would be more concerned about potential amenity impacts and consequently more negative about the project, the differences in responses by area were not significant. Mr Weston in his evidence at the hearing, however, advised that there was a higher participation in the survey by people living in Area 1.

One issue that was raised by submitters was that the questions that were asked did not explore the reasons for opposing the project, and therefore did not accurately present the views of the community on the project.

When questioned by the Panel, Mr Weston stated that the community survey was just a snapshot of the views of the community and should not be construed as statistically representing the views of the community as a whole. In particular, he did not disagree with the suggestion by the Panel that, if there was a bias in the spectrum of positive and negative attitudes to the project, it would be in favour of the project, given that the survey was identified as for the SGM EES (leading to some disinclination for opponents to participate). He commented that the survey was really only trying to obtain a qualitative understanding of the range of views of the community and not to select a representative sample of the community and thus give quantifiable results. The SIA therefore did not try to extrapolate the views expressed by the respondents to the survey to those of the whole community. In other words, he said, the survey was not intended to be a poll. Its purpose was to provide

an opportunity to people within the community who did not want to attend public meetings to express their views on the project.

Ms Marion Byass (documents B84 and B85), in her submission, commented that she believed that the survey should have been conducted by an independent person not by a consultant on behalf of SGM. Her view, which was supported by a number of other submitters, was that the methodology used in the community survey conducted as part of the SIA had led to the exclusion of a large proportion of the community. The reliance on a web-based survey made it very difficult for older people to access, she said, and many people in Stawell did not have access to the internet.

As part of her submission to the hearing, Ms Byass (document B84) presented the results of the community attitudes survey conducted on her behalf. This community survey was open to all residents of Stawell and surrounding areas and was made available online. The availability of the survey was advertised three times in the *Stawell Times*. In addition, flyers were placed in shops and on noticeboards around the town and promoted via a mothers' group. Individuals were also encouraged to pass on information about the survey via social media. The survey was not locked against multiple responses from the one respondent. The results of the survey were analysed by a Dr Perkins.

There were 98 responses to that survey with respondents aged from 17 to 76 years. Of the respondents, some 69% were opposed to the project.

The issues of concern identified through this survey were similar to those identified through the SIA survey. There was, however, a greater proportion of respondents who opposed the project and who had concerns about the impact of air pollution on their health. There was also a higher proportion of respondents who highly valued Big Hill for its visual significance as well as its recreational and cultural value. People who felt that Big Hill provided benefits to them personally were more likely to be opposed to the project. About 65% of respondents were concerned that the plans for rehabilitation were not acceptable and a similar percentage were not confident that the rehabilitation would be implemented should the project proceed.

Although the exact breakdown of responses, as well as the proportions supporting and opposing the project overall, varied, the findings of both surveys were generally consistent in the issues and concerns identified.

(v) Social division

The SIA stated that development proposals which change the built or natural environment may result in actual and/or perceived changes to the physical environment. It also said that the various individuals and groups within the community will experience different impacts as a result of these changes. If it is perceived that a proposal would change the physical environment, for example, reduce air quality, this may cause some individuals to feel stressed or anxious (a social change). This could lead to a reduction in their health and well-being (a personal impact) and even possibly affect their ability to continue in community roles, such as a volunteer for a community organisation (a broader social impact). It was further said that it is possible that a proposal to develop a LULU may galvanise people,

leading to the creation of social networks and bonds in a community that previously did not exist (a potentially positive social impact).

The SIA noted that there are clearly divergent views among members of the Stawell community about the project. In his expert evidence, Mr Weston (document P33) noted that there can be no doubt that a range of views exists in the community and, that in many cases, these views are passionately held. He further noted that some submissions had drawn comparisons between the current social tensions and those which arose during the 1999 EES process. Mr Weston went on to say that, notwithstanding these tensions and the difficulties that they are likely to create for local residents, Stawell is still characterised as a friendly and tight knit community. This view is in contrast to submissions made to the Panel by some members of the community during the hearing and in written submissions.

A number of submitters spoke at the hearing of the significant impact this proposal has had on them personally and some were visibly upset during their presentations. One submitter commented that she no longer had contact with her daughter as her daughter did not agree with her opposition to the project. Another submitter commented that she was considered as a trouble maker because she has taken a stand against the project. She related that one Stawell resident told her that he should have run her over because of her position on Big Hill. Another submitter commented that he could no longer have open discussions with one of his closest friends because of their differing views on the project. He said that this is putting strain on their friendship and that they have started avoiding each other. Ms Hunt (document H106) said that she had been heavily criticised on social media because of her opposition to the project. Mr Fox in his submission (document F72) commented that the community has just recovered from the social division caused by the previous EES and are being torn apart again by the current proposal. He said that he did not know if the community could recover from this second EES in a relatively short period of time. His views were supported by submissions made by others.

The SIA concluded that there was some existing minor conflict among residents with divergent views, and that a similar conflict may be associated with a refusal to allow the project. The SIA defined the health and social impacts associated with the project as a minor negative. However, when all other aspects of the project were considered the SIA further concluded that overall the project is likely to have a net benefit on the health and social condition of the community, as the community benefits of the rehabilitation of Big Hill would more than offset the concerns about issues such as air pollution and noise.

Another issue that the SIA community survey identified as creating a division in the community was the perception that jobs for some people would be traded off against impacts on others. The EES stated that the project would provide employment for up to 80 people⁵². Some respondents were of the view that the potential jobs created did not justify the impact on people's health, especially the effect on the health of those living closest to the mine. It was suggested that, instead, new industries should be encouraged to develop in Stawell and those industries could provide alternative employment for current mine workers. The SIA noted that the community survey had indicated that a number of the

⁵² Although there was an inconsistency or at least no assurance that all those jobs would be filled by Stawell residents.

residents who opposed the project expressed frustration that Stawell is still dependent on the mine for its economic wellbeing, despite there being an expectation of the mine's impending closure for many years. Also, while some respondents suggested that more effort needed to be put into finding alternative sources of employment and economic prosperity for the town, others were frustrated that people in the town could not see the benefits of the project for Stawell.

The presentations to the Inquiry by individual submitters similarly raised these issues. The short-term employment benefits, over 4-5 years, were not seen by some submitters as being worth the potential long-term impacts on people's health. Many submitters supported the continuation of mining so long as it remained underground. Ms Hunt (document H106) expressed the view that no one wins with the current proposal. She said that her utopia would be that the mining stayed underground, that people kept their jobs, Big Hill remained intact and that people's health was not impacted. She said, however, that this was not the reality of the situation being faced.

A number of submitters at the hearing commented that, if the project proceeds, they would leave Stawell. The reasons for this were varied but included potential impacts on health, change to the amenity and character of Stawell, and because they could not watch what they described as '*the destruction of Big Hill*' – a feature or place which is important to them for a variety of reasons. Some people believed that the division being created in the community on this second occasion would not be able to be repaired.

(vi) Concerns regarding potential impacts on the health of the community

The SIA noted that there are many people in the Stawell community who were concerned that the new mine project would adversely impact their health. It reported that approximately 40% of the community survey respondents believed that dust from the open cut mine would negatively affect their health and a relatively high proportion were undecided on this issue (23.6%). When asked about health issues in terms of their confidence that the mine would not negatively affect their health, fewer respondents were undecided. The SIA concluded that this indicated that, in addition to those who believed their health would be compromised, some respondents were unsure about the nature of likely impacts for them. It further concluded that given the link between mining activities, air quality and health is complex, it was understandable that people living in Stawell would hold concerns, and be looking for reassurance that their health would not be compromised.

The analysis of the population demographics done as part of the SIA showed that Stawell has one of the lowest socio-economic (SEIFA) indices in Victoria which shows that the town community experiences a relatively high level of social disadvantage. The assessment of baseline health status conducted as part of the HIA found that the residents of Stawell also have a poorer health status when compared to the rest of the State.

The SIA also noted that principals of local schools consulted as part of the EES indicated a degree of concern about potential reductions in air quality and the implications for the health of their students. They reported that parents had raised with them concerns about air pollution and health.

The SIA further noted that community consultation undertaken as part of the HIA indicated that some residents were sceptical regarding the ability of SGM to effectively mitigate dust emissions. Those consulted acknowledged that the mining company had committed to minimising dust impacts as far as possible, including wetting exposed surfaces for dust suppression and stopping work, when adverse weather conditions, which would give rise to unacceptable air quality, were predicted. However, some queried whether stopping work would be a measure sufficient to suppress dust on windy days given the extent of exposed surfaces including haul roads and stockpiles. Several participants queried the reliability of wetting as a dust suppression measure. They relayed previous experiences of dust suppression activities in the area during summer under drought conditions, when insufficient water was available and when heat and wind contributed to fast evaporation of the amounts of water applied.

Although a number of community consultation sessions were held as part of the overall EES process there was only one meeting focussed on collecting information to inform the SIA. The SIA noted that comments made by attendees of the community meeting had indicated that, for some Stawell residents, the planning process and the prospect that the project may be approved was causing them a great deal of anxiety. Community survey respondents were directly asked whether the proposal had made them feel stressed and also whether the proposal had made them feel more optimistic about the future. The data confirmed comments made by community meeting attendees that the planning process was causing stress for people in the town. Specifically, 33.3% of community survey respondents reported feeling stressed. Mr Weston stated that his personal interactions with some residents confirmed that this was the case.

There was concern raised by some submitters in regard to the consultation conducted as part of the project including for the SIA. Mrs Melbourne (document M76) commented that the community meetings were held at night in the middle of winter which made it difficult for some community members to attend. She also stated that one of the meetings was held in Donald which was an hour's drive from Stawell making it impossible for some people to attend. She commented that the fact that meeting was held in Donald had created questions within the community as to whether SGM were serious about the community engagement process.

The SIA also concluded that the prospect that the project may be approved was also having a positive impact on the sense of optimism enjoyed by others in Stawell. The SIA concluded that whether the project has caused a respondent to feel stressed or more optimistic correlated with the respondent's level of support for the project. However, there was no difference in the experience of stress or increased optimism among respondents living in different parts of the town.

(vii) Community linkage with Big Hill

The SIA noted that a number of concerns regarding loss of access to Big Hill and the implications of the project for flora and fauna and historical monuments had been raised by members of the community. It identified that some comments received from residents had indicated strong opposition to the project because of Big Hill's symbolic importance to Stawell and its contribution to the residents' sense of place. Discussion on the impacts of

the project on flora and fauna, visual impacts and cultural heritage are presented in Chapters 15, 14 and 13 respectively of this Inquiry report.

As part of the community survey, respondents were asked to indicate their level of concern regarding a number of potential issues relating to the effect of the project on Big Hill. The SIA stated that concerns relating to the visual impact of the proposal were common among the survey respondents and held strongly by many. It stated that 48% of respondents reported being extremely or very concerned about the visual impact of the project. However, the SIA also stated that the survey data also indicated that there were notable numbers of people in the community for whom visual impacts were of no concern. The SIA also stated that approximately 40% of survey respondents reported being extremely or very concerned about loss of access to Big Hill during the operation of the mine, loss of habitat for flora and fauna and the need to relocate historical monuments.

The SIA also noted that a small proportion of survey respondents held concerns relating to the loss of historical mine shafts within Big Hill, with 23% reporting that they were extremely or very concerned about this. The SIA concluded that the social value of the shafts, which cannot be accessed, is an 'existence value' and somewhat esoteric. It did acknowledge, however, that, for those who do value the shafts, a strong sense of loss would be experienced if they were destroyed. The SIA noted that members of Stawell Historical Society interviewed as part of SIA process indicated that the internal composition of Big Hill, including the shafts, was important to them as it reflected historic interactions between the local environment and geology and the miners who founded the town. The society members appreciated Big Hill in its current form in a holistic manner and did not welcome any major disturbances. The historical society's views were reflected by the submissions by Mr Cameron, a mine employee who is a member of the historical society (documents C114 and C115).

The SIA commented that more commonly community members were concerned about how the proposal would affect the social and recreational functions which Big Hill supports. The SIA referred to a number of comments made by residents at the community meeting that indicated a desire to ensure that the particular attributes of Big Hill were retained and improved if the Project went ahead and even if it did not.

The SIA addressed the loss of Big Hill primarily in terms of changes to visual amenity, the loss of flora and fauna and effects on its recreational values (see also Chapters 14 and 15).

Many submitters, at the Inquiry hearing, however, indicated that, to them Big Hill is as lot more than a piece of land. Many described how Big Hill holds special significance and is their special place. Mr Kimber in his submission (document K102) commented that, although Big Hill is not considered a beautiful place, it is a place of peace and quiet for residents. Ms Marion Byass (document B85) suggested that Big Hill can be viewed as a sacred site. She commented that people have a spiritual connection to land and that this is the case for many residents and their relationship with Big Hill. Mrs Melbourne commented that the loss of Big Hill would be devastating for her and that if the project proceeds she will have to leave Stawell. Mrs Saunders commented that she could not watch the destruction of Big Hill and would have to leave Stawell. Mrs Rosalind Byass commented that Big Hill was a special

place for her and had been her place to go when she was suffering from severe depression. She stated that Big Hill had saved her life and that she is struggling with the potential loss.

Figure 5: Big Hill Road
Source: Ms Byass



(viii) Concerns regarding rehabilitation of Big Hill

Many submitters raised concerns about the ability of the proponent to reinstate Big Hill and questioned what rehabilitation would be undertaken. The SIA noted that what SGM has proposed in terms of enhancing the amenity and open space of Stawell was considered by some members of the community as being a fundamental consideration in terms of their support the project. Some respondents suggested that a lasting legacy should be left for the community. The SIA also stated, however, that concerns about the ability of SGM to restore Big Hill were voiced at the community meeting. It reported that questions were raised about what guarantee there was that the mine company would follow through with its restoration promises. There were also questions about how the Council could guarantee the rehabilitation and conditions on the project.

The SIA reported that a large proportion (52%) of survey respondents said that they were extremely or very concerned about the ability of SGM to successfully reinstate Big Hill. Only 24% of respondents held no concerns in relation to this issue. The SIA noted that respondents who considered the project to be risky expressed a much higher level of concern regarding the ability of SGM to successfully reinstate the hill. The SIA further noted that concerns of this nature were widely held, even among respondents who supported the project (31.4% of whom were at least moderately concerned about the issue).

More particularly, the SIA reported that 56% of community survey respondents were extremely or very concerned that SGM would be unable to finish the restoration of Big Hill if the price of gold falls. Further 36% of respondents were not convinced that the bond which SGM would have to pay to the State Government prior to commencing the project would guarantee that Big Hill would be reinstated. The SIA concluded that SGM had not convinced all community members that the project could be undertaken without causing lasting damage to Big Hill. It went on to suggest that this may in part have reflected the fact that advocacy groups such as 'Friends of the Earth' had published information on their website that indicated that the successful rehabilitation of Big Hill was contingent on the continued strong price of gold. The SIA identified that two potential risks to successful rehabilitation had been raised by Stawell residents in various forums. These related to SGM not having the financial resources required to complete the restoration or the technical capability. The same views were expressed by several submitters during the hearing.

One of the key issues raised by the submitters at the hearing was the lack of a rehabilitation plan and confusion about what such a plan might include (see also Chapter 11). The uncertainty about what the final form of Big Hill would be and who would be responsible for the ongoing maintenance of the Hill was a frequently expressed concern. Mrs Ware, for example, in her submission (documents W 103 and W104), said that it was unacceptable that there was no agreed master plan for the rehabilitation of Big Hill. She commented that she was concerned that the ongoing management of Big Hill is unknown and was of the view that the long-term rehabilitation and management needs to be resourced. These views were also expressed by a number of other submitters.

There was also confusion about what the project would do for Big Hill in the longer term. The SIA and many submissions clearly indicate that the name of the project - '*Big Hill Enhanced Development Project*' - apparently led many people in the local community, and more broadly, to believe that the outcome of the project would be an enhancement of the Big Hill public space⁵³. In the SIA some of the assessment of the impacts was based on this assumption that Big Hill would be restored and enhanced when compared to its current state. It was seen as an opportunity for the community to have an improved community asset.

During the hearing, however, SGM commented that the name of the project should not be interpreted this way. It was said that the term '*enhanced*' was intended to apply to the project itself when compared with the 1999 project (filling the voids previously to be left open, a shorter period of operation, relocation of the TSF to a cleared area etc) and not the post operations outcome for Big Hill. In relation to the outcome, SGM commented that their commitment was to reinstate the landform of Big Hill, Big Hill Road and some of the monuments. They said that beyond that contribution, rehabilitation would be the responsibility of others.

On this issue, some submitters commented that the community should have input into the development of any plan for the rehabilitation of Big Hill. Mr Power, in his closing, suggested that a steering group would be established for the development of the

⁵³ See for example the NGSC submission (288) which refers under 'Implications of the Project' to gaining a resource at the end of the project '*that can be as, or more, valuable than the current hill*'.

rehabilitation plan but he commented that the community would not be part of this group. He said that the community would be provided with information on what the plan would contain, but members of the public would not directly be part of the decision making process.

(ix) Other social effects

Mr Ben Martin (submission 300) made a presentation at the hearing supporting the project. He said that members of his family had worked at the mine for some years or decades, including his father, brother and brother in law. He said that if the mine were to close, his brother at least would likely stay in the mining industry and adopt a 'fly in fly out' work arrangement. This he said would result in disruption to his family life and result in less contact with his three young children. He said that a benefit of the project would be another 5-6 years of mine work in Stawell and less disruption to family life. He said that there would be a short sacrifice required by some, such as putting up with noise, for considerable gain for others.

6.3 Discussion

It is clear from the evidence and submissions that there is a divergence of views within the community on the benefits and disbenefits of this project. The issue of retaining jobs for some versus potential impacts on the health and amenity of others (in certain respects, all residents of the township) is one which is creating significant social division and stress within Stawell.

The Panel is of the view that the social division within the community is creating significant stress within the community. The Panel considers that the breakdown of families and friendships, as well as threats of physical violence against community members who oppose the project, are creating worry and uncertainty within the community. Some people report that it is resulting in impacts on their health.

These adverse social impacts are difficult to redress. Whatever the outcome of this proposal, the damage has already been done to community cohesion and social wellbeing. Also, no matter what decision is made on the project, there will be some members of the community who will be unhappy with that decision, adding to their continued disaffection.

The Panel considers that, because this division has now occurred twice within a relatively short period of time, it has probably exacerbated people's responses to the current project. The consequent intensified emotional investment in the debate about the project, in the Panel's view, will make it even more difficult to regain community cohesion and re-establish trust between its members.

In relation to the concerns expressed about the results of the SIA community survey and that they may not have accurately reflected community views, the Panel agrees that the survey methodology may have prevented some people from participating in the survey. Although in the SIA it was put forward as representing the views of the community as a whole, Mr Weston in his evidence at the hearing resiled from this, making it clear that it could not be interpreted that way. We accept that the purpose of the survey was to provide a qualitative rather than quantitative record of community views. We consider that the survey in this way did provide some useful qualitative material informing the social impact analysis of the

project. In a similar way, the information provided by the survey conducted by Dr Perkins and Ms M Byass provided information that has assisted in assessing the social impacts of the project.

It is clear to the Panel that a major concern by members of the community is the potential impacts of air pollution and noise on their health and amenity and the ability of SGM to manage these impacts. The Panel, in Chapters 3 and 5, finds that air pollution and its health effects would be unacceptable in real terms. We also find that the impact of noise on people's amenity would, in real terms, also be unacceptable and potentially have health effects (see Chapters 4 and 5). These health and amenity effects are elements of the social impacts of this project. As discussed in Chapter 5 on the HIA, its poorer health status and relatively low socio-economic status makes this population more susceptible to some of the environmental impacts of this project such as air emissions and noise.

In terms of the less tangible social impact of the concerns about these matters, the Panel therefore does not agree with the findings of the SIA that the effect of the concerns about pollution and health impacts on the community should be viewed as a minor negative social impact of the project and therefore only to be given little weight. The concerns, in our view, are not unfounded, especially in the context of the health vulnerability of this community. We consider that the concerns expressed represent reasonable apprehensions on the part of members of the community which, if the project were to proceed, on the evidence presented, would be realised.

This project and its effects are clearly a significant issue for the community and causing stress among many residents. For people with some existing diseases the possibility of the project proceeding is a major issue as, due to their medical conditions, relocation and respite from potential noise and dust impacts will be difficult.

With regard to the concerns expressed in submissions about the loss of Big Hill, the Panel accepts that for some members of the community Big Hill does have a special social significance. It is clear from the submissions made at the hearing that the value that the community places on Big Hill goes well beyond just its visual role. For those with that particular social bond with the hill, its potential loss is creating significant stress and anxiety, which has not been captured in the SIA. The lack of a clear rehabilitation plan, and the confusion over what state the Hill will be left in, is only exacerbating this situation.

If the project proceeds, the Panel believes that the uncertainties around the rehabilitation outcomes need to be resolved as a matter of urgency, as discussed in Chapter 11. A detailed master plan for the rehabilitation of Big Hill needs to be developed before any approvals are given as it must inform matters such as reconstruction, bonds and the like.

The Panel is also of the view that the process of designing the rehabilitation plan offers an opportunity to alleviate, if not overcome, community disaffection. That process, to be successful in achieving that social outcome would, however, need to actively engage the community, through representatives on a working party or similar and by other means in the development of the plan. It would be inadequate simply for the broader community to just be informed of the decisions made by others. This would help to build ownership of the outcome within the community and would help to give community members a sense that they have some meaningful input into decisions that ultimately impact on their quality of

life. It would also help to rebuild the trust between the community and SGM which has clearly been lost.

In this respect the Panel acknowledges the concerns raised by the community about the potential loss of flora and fauna and the diminution of the natural values of the hill. As discussed in Chapter 15, however, an objective assessment of the impacts of the project on biodiversity values indicates that these effects are not of major significance. Nevertheless, if the members of the community concerned about these issues were given meaningful input into the reinstatement and revegetation of Big Hill, the outcome may not only be a more beneficial one in terms of natural values but their engagement in the process would again help give them ownership of the outcome.

We acknowledge the issues raised by Mr Martin - that there would be positive effects for family life for some workers kept on at the mine and possible negative effects on their domestic situation if they were to lose their job. We have, however, no information about the household circumstances of the persons who work at the mine at present and do not know what employment outcomes either local or elsewhere would be available. Mr Martin also in raising this issue did so in the context that he believed that there would be only a short sacrifice required of persons living near the mine in terms of impacts on their amenity. As we have indicated in Chapters 3, 4 and 5 we do not regard the impacts on the community as slight, and as indicated in Chapter 2 and elsewhere, we have concerns that the timelines for the project may prove to be optimistic.

6.4 Conclusions

The Panel concludes that the project has resulted in a significant division of the community that will be extremely difficult, if not impossible, to repair. The social impacts include the breakdown of families and friendships, as well as threats of physical violence against members of the community who oppose the project.

The Panel is of the view that the social impacts of this proposal have been amplified by there being only a relatively short period of time since the previous EES and the revisiting of issues and entrenchment of views that has resulted. If it is decided that this project should not now proceed, the Panel would urge that, in the interests of the social health of this community, and howsoever it is effected, this should be the last time that such a proposal is put forward.

The Panel also concludes that the SIA has underestimated some of the impacts of the project which has led to a low ranking of some of the negative impacts. This is particularly the situation with the concerns around health and amenity impacts from air pollution and noise which the Panel believe are legitimate concerns and are creating significant stress and anxiety in the community, and if the project proceeds would be realised.

7. Potable water

7.1 The issue

Much of the Stawell water supply system infrastructure is located on the northern slopes of Big Hill adjacent to the proposed open cut mine proposal. The main source of raw water for Stawell water supply is from a weir on the Fyans Creek upstream of Lake Bellfield. Water is piped from this weir to the Stawell open storage reservoirs. The supply from the Grampians is supplemented from Lake Fyans at times of low flow in the Fyans Creek. The Lake Fyans supply requires pumping to the Stawell water storage reservoirs.

The Stawell water supply assets include:

- Three raw water supply open storage reservoirs (reservoirs 4, 6 and 7)
- Three treated water supply tanks (tanks 1, 2 and 3)
- Treated and raw water supply pipework and associated infrastructure
- The Stawell Water Treatment Plant (WTP) which was commissioned in 2000 and operated by Trility.

In the development of the Big Hill open cut it is proposed that two of the reservoirs that provide drinking water supplies for the Stawell township be drained and taken out of service for the life of the project. In addition, two of the potable water supply tanks for the town will be decommissioned. The remaining water storage reservoir, reservoir 7, will be adjacent (within 50m) to the temporary waste rock stockpile (TWRS).

Figure 6: Main water supply reservoir and adjacent site for temporary waste rock storage
Source: Ms Byass



7.2 Legislation and policy context

The National Health and Medical Research Council (NHMRC) has developed the *Australian Drinking Water Guidelines, 2011 (ADWG)*, which provide a framework for the management of drinking water supplies in Australia. They are designed to provide an authoritative reference on what defines safe, good quality water, how it can be achieved and how it can be assured. They address both health issues and aesthetics.

The ADWG are not mandatory standards but provide a basis for determining the quality of water to be supplied to consumers across Australia.

7.3 Evidence and submissions

No evidence was given on the issue of water supply. Expert evidence was given by Dr Grynberg for the proponent (documents P41 and 42) on the potential for dust deposition to contaminate water supply. Submissions were received from a number of submitters and from Grampians Wimmera Mallee Water (GMMWater). The concerns raised by submitters included:

- The drainage of the two reservoirs (reservoirs 4 and 6) could impact on the security and quality of Stawell's water supply
- Dust generated from the mine operations, including the TWRS, may contaminate the water supply in reservoir 7
- The closure of the two reservoirs, which will result in the need to pump water from Lake Fyans and Lake Bellfield, will cause water prices to increase for Stawell residents
- There may not be sufficient water available for dust suppression at the mine.

7.4 Water Discussion

7.4.1 Water supply issues

There was no discussion in the EES on the impact of the project on water supply. The GMMWater submission (no 342) identified the key water supply assets that may be affected by the project. These were:

- Potable water balancing storage tanks 1, 2 and 3
- Potable water supply pipework and associated infrastructure (including the Byrne Street pump which supplies potable water to tanks 2 and 3)
- Raw water reservoirs 2, 6 and 7
- The sewer connection to properties on Main Street, Stawell

GMMWater stated in their submission that they believed that the potential impacts had been adequately addressed in the EES documentation. GMMWater was of the view that the potential impacts on potable water supply had been examined, the risks assessed and strategies developed, to ensure continuity of water supply and water quality for the Stawell Township. The mitigation strategies included additional operating and maintenance requirements upon GMMWater as a result of the mining, the costs of which would be met by SGM. GMMWater advised that they are of the understanding that any costs associated with design and construction works associated with any assets that will be decommissioned and constructed will be met by SGM. This agreement will be formalised in a commercial agreement that is to be developed between GMMWater and SGM.

At the hearing, GWMWater commented (GWM63) that during the period when both reservoirs 4 and 6 were drained there would be a greater reliance on Lake Fyans as a source of water for Stawell. They acknowledged that there will be an increase in water supply costs with additional pumping costs and monitoring expenses. This increase in pumping costs is due to the:

- Temporary water supply infrastructure which will have a greater reliance on pumps
- Reduced volume of raw water storage at Stawell during the life of the mine due to reservoirs 4 and 6 being off-line and therefore resulting in a greater reliance on pumping from Lake Fyans.

In addition, the current water quality monitoring program will be expanded to include testing of a broader range of parameters in both the raw and treated water supply. GWMWater stated that it was their understanding that the increase in water supply costs for pumping and monitoring would also be covered by SGM. This was confirmed by Mr Power on behalf of SGM at the hearing. GWMWater also commented that if the range of raw water quality parameters cannot be met, and monitoring indicates that this is the result of mining activities, it was expected that SGM would meet the additional treatment costs. GWMWater expects that this would be formalised as part of the commercial agreement with SGM.

The commercial agreement being entered into by GWMWater and SGM is to ensure that the project will result in:

- No short or long term impacts to water quality, water security or water supply infrastructure
- No additional cost to GWMWater or its ratepayers
- All temporary or new permanent water supply assets will be constructed to GWMWater standards and become GWMWater assets
- A gravity water supply system will be recommissioned at Stawell with at least the same volume of raw water reservoir storage.

At the time of the hearing, the agreement between GWMWater and SGM had not been entered into. GWMWater in their submission stated that:

Should the EES be approved, GWMWater requires that a further level of detail is provided in the Work Plan and supporting management plans. This detail should clearly articulate the methodology for undertaking the actions, including responsible parties and who will meet the associated costs of implementation. This will also be enshrined in a commercial agreement between GWMWater and SGM, which is yet to be developed. GWMWater will not support the project as a referral authority on the Work Plan until this commercial agreement has been finalised to our satisfaction.

At the hearing, GWMWater commented that their assessment of the implications of the removal of the two reservoirs and water storage tanks on the water supply for Stawell was based on the assumption that the project, including full remediation of the site and restoration of the GWMWater supply assets, will occur within five years. The impact of any drought over that five year period had been considered but not beyond that. GWMWater commented that, if the project extended beyond the five years, further assessment would

be required to assess the impact on water supply and water quality. However, GWMWater considered that any impact on water supply could be managed with greater reliance on Lake Fyans as a water source.

The Panel notes the concerns raised by various submitters in regard to the security of water supply. GWMWater has assessed the potential impact of the project on water supply and is confident that for the proposed timeframe of the project of five years that water supply can be managed albeit with a greater reliance on water being pumped from Lake Fyans. The Panel accepts GWMWater's assessment that the water supply could be managed during the proposed five years of the project.

The Panel supports the formalisation of an agreement between GWMWater and SGM in regard to water supply, but is concerned that this agreement has not yet been finalised. GWMWater commented at the hearing that they required further details of the arrangement before they would sign off on any approvals. The Panel is of the view that this agreement would need to be finalised before any approvals were given for the project if it was to proceed.

The Panel further recommends that further analysis of the impact on water supply, if the project was to extend beyond the proposed five year timeframe, would need to be undertaken before the details of the agreement were finalised. This is necessary to ensure that if there were any delays in the rehabilitation of the site, in particular restoring the water supply infrastructure, that the impacts would be understood in advance and that the security of Stawell's water supply would be guaranteed. This information should be used to inform a contingency in the agreement between GWMWater and the proponent related to the project extending beyond the five years. The agreement would also need to clearly identify the ongoing responsibility of SGM to cover any increased costs in supplying water to the town beyond the five years of the project if there was to be any delay in reinstating the water supply infrastructure as a result of the project. The Panel is of the view that this would be required to ensure that any increased costs of water supply as a result of the project within the proposed five year timeframe and beyond would not be passed on to the community.

7.4.2 Water quality issues

As part of the air quality assessment, the impact of dust deposition from the mining operations was modelled. There was concern not only about the dust emissions from the north and south pits, but also dust and run-off from the TWRS which is only 50 metres from reservoir 7. The modelling that was done was conducted using the Bendigo background and meteorological data. It was redone with the Stawell data for sensitive human receptor locations, but does not appear to have been redone for reservoir receptors. Run-off was assumed to be managed through the drainage channels which lead to the sediment dams located near the TWRS. This is described in the Surface Water section of the EES. Clean water from these dams is intended to be used for dust suppression. The EES concluded that there will be no run-off into the reservoir.

The EES assessed the dust impacts from year 2 and year 5 of the project operation on water quality in reservoir 7. The air quality modelling showed that the dust deposition into the reservoir had a very low impact and that all parameters, except aluminium and iron, were

well within the ADWG. The ADWG for aluminium and iron are based on aesthetics not health. The EES concluded that the exceedances predicted were not due to emissions from the mine but from the water obtained from Lake Fyans. Only a qualitative sensitivity analysis was undertaken to test the assumptions in the modelling.

The EES further concluded that any impact arising from the mine operations would be removed through the water treatment process that would be undertaken prior to potable water being provided to the town.

The Panel is concerned that the impact of dust deposition on the water quality in reservoir 7 has not been reassessed using the Stawell background air quality and meteorological data. As discussed in the revised Air Quality Impact Assessment section of this report, the use of the Stawell data has a greater impact in the area of reservoir 7 as indicated by the predicted impact on sensitive receptor R6 which is adjacent to reservoir 7. Using the Bendigo background data, no exceedances of the PEM criteria for PM₁₀ were predicted for R6. Using the Stawell data, the PM₁₀ assessment criteria was predicted to be exceeded on 37 days of the year, on some days to nearly double the criterion. Arsenic levels at R6 also exceeded the assessment criteria in the PEM using Stawell data. No exceedances at R6 were predicted using the Bendigo data.

The revised modelling deposition rates for R6 are 0.2 g/m²/month higher than the original modelling. No equivalent data has been provided for the receptors sited to assess deposition on storage reservoirs; hence an equivalent comparison for assessing water quality impacts is not available.

What this indicates is that the assessment that has been done on the dust deposition on potable water supply using the Bendigo background data may have underestimated the impact on the potable water supply in reservoir.

The Panel recommends that, although it is unlikely that exceedances of the ADWG will occur, the assessment of the impacts of dust deposition, in particular arsenic deposition, should be redone prior to any agreement between GWMWater and SGM being finalised. This is appropriate to ensure that any additional costs of treatment of water supply, if required, would be addressed within that agreement.

SGM has proposed a water quality monitoring program to continually assess the quality of the water supply. It is proposed that monitoring be conducted prior to commencement of works on the site and then quarterly throughout the life of the project. The Panel supports the implementation of a water quality monitoring program should the project proceed but are of the view that quarterly monitoring would not be sufficient. The Panel recommends that monitoring of water quality would need to be undertaken monthly and that it is appropriate that the results of that monitoring be made available to the community. The provision of this data to the community would give them confidence that the quality of their water supply was not being adversely impacted, and if it was impacted, that appropriate management actions were being taken to ensure provision of a safe water supply. The details of any monitoring program would need to be agreed with GWMWater and formalised in the agreement between SGM and GWMWater.

At the hearing, GWMWater were asked by the Panel about the potential for arsenic contamination of the water supply and what actions could be taken to restore water quality if such contamination was identified. They were of the view that, if arsenic contamination was found, the water supply could be chlorinated to convert arsenic (III) to arsenic (V) which could then be removed through the current water treatment processes. GWMWater were confident that any arsenic contamination could be managed in this way. They said that they currently successfully treat the groundwater supply in Edenhope in this way.

The impact of dust deposition on the quality of water in rain water tanks was raised by the Department of Health (DoH) (documents DoH 60 and 61) as well as a number of submitters. There was no evidence provided on this issue and no assessment was undertaken as part of the EES. At the hearing, Mr Power, on behalf of the proponent, stated that there would be a monitoring plan implemented for the testing of the quality of water in the rain water tanks in residential areas surrounding the proposed mine operations. The details of the plan are still to be worked out and would be incorporated into the air quality management plan for the site. The Health Impact Assessment done as part of the EES acknowledged that there was a potential health risk from arsenic, although ranked low, where tank water was used for drinking, though no testing or assessment had been undertaken. The HIA recommended that the community be consulted to identify where tank water is used for drinking and that a monitoring program should be implemented at those properties through the air quality management plan.

The DoH in its submission and at the hearing was strongly of the view that monitoring of water quality in rain water tanks must be undertaken prior to the commencement of the project and at regular intervals throughout the life of the project. The main concern was with respect to arsenic levels. DoH was also of the view that the community would need to be advised of the results of any monitoring and, if any exceedances of the ADWG were found, the measures that would be put in place to manage the issue and restore the water quality to safe levels.

The Panel supports the position of DoH. The Panel further recommends that any monitoring would need to commence prior to any works commencing on the site and be repeated on a monthly basis. The monitoring program would need to be developed in consultation with DoH and the results of the monitoring provided to DoH for review. Any management measures proposed to be implemented in response to exceedances of the ADWG would need to be discussed and agreed with DoH prior to implementation.

7.5 Conclusions

The Panel accepts that the water supply issues for Stawell could be managed for the proposed five year period of the project, however further analysis would need to be undertaken to assess any impacts if the project was to extend beyond the five years leading to delays in reinstating water infrastructure. The Panel considers that agreement between SGM and GWMWater for the management of increased costs of water supply and water quality must be formalised before any approvals would be given for the project. This agreement would need to contain provisions for any ongoing impacts and costs should there be delays in the completion of the project including rehabilitation of the site.

The Panel is concerned that the use of the background Bendigo data has significantly underestimated the potential impacts of dust deposition, in particular arsenic, on reservoir 7. Although it is unlikely that the ADWG will be exceeded, the Panel recommends that it would be necessary that prior to any approval being given for the project, that the assessment of impacts on potable water supply be redone with the Stawell background data.

The Panel supports the development and implementation of a water quality monitoring plan, but is of the view that such monitoring would need to be undertaken monthly not quarterly as proposed in the EES. The details of any monitoring plan should be included as part of the agreement entered into by SGM and GMMWater. Any monitoring results should be made publicly available.

A similar monitoring plan would need to be implemented to assess the impact of dust deposition on rain water tanks where the water is used for drinking water. If the project is to proceed, the rain water monitoring plan should be developed in consultation with DoH and all results made available to them for review. The Panel is of the view that any management measures that might be implemented if any exceedances of the ADWG were found, need to be discussed and agreed with DoH prior to implementation.

8. Surface water

8.1 The issue

The key issues relating to surface water management during operation of the mine are the need to ensure that no contaminated water enters the surrounding NGSC drains, waterways or GWMWater storages and that the residences downslope in Fisher Street are not affected by any overflow from the proposed sedimentation basins (SDBs) that would be located nearby. Other issues of concern relate to possible unplanned runoff from the reconstructed Big Hill landform as a result of the hill settling more than expected or differentially and causing disruption to the planned drainage network. Concerns also relate to ensuring revegetation occurs speedily on the reinstated Big Hill so as to avoid erosion of bare soil areas causing sedimentation of drainage channels and sediment basins, and detrimentally affecting surrounding properties, drains or watercourses.

A key surface water management issue relates to the proximity of the TWRS to the GWMWater storage number 7, but the issues of possible contamination of water in the storage is covered in Chapter 7 of this report.

8.2 Legislation and guidelines

The DSDBI (formerly Department of Primary Industry) publication *Environment Guidelines: Management of Water in Mines and Quarries (February 2014)* provides the framework for managing water on the project site.

Any discharge of water from the site to watercourses or natural wetlands needs approval under the Mineral Resources Act and EP Act. Any connection to provide for discharge to NGSC drains needs NGSC approval.

8.3 Evidence and submission

8.3.1 EES information

The Surface Water Assessment in Chapter 8.11 and Technical Appendix 11 of the EES presented information in relation to existing surface water flows, and the management of surface water during mining and after the completion of mining and rehabilitation of the project area. The assessment indicated that there would be no adverse impacts caused by surface water runoff on the surrounding area during mining or after the project area had been rehabilitated. This would be achieved by:

- Containing all surface water runoff from disturbed areas (such as pits, haul roads and TWRS) within the project area and storing and reusing this water for dust suppression and ore processing.
- Ensuring that, during mining operations, erosion was controlled and any sediment was captured from surface water runoff.
- Ensuring that, after completion of mining, runoff from the rehabilitated site would be treated to a suitable quality by using vegetated channels and sediment basins prior to discharge into the existing drainage system.
- Designing all channels for a 100 year peak flow and designing flood storage basins to capture maximum flood volumes based on the past 112 years of local rainfall data, that is

ensuring that all flood storage basins and storage dams had the capacity to manage all predicted levels of surface water run-off.

The EES indicated that management of surface water would require the construction of a network of drainage channels, sediment basins (SDBs) and flood storage basins, and installation of pumps as follows:

- A channel would be constructed along the haul road upstream from SGM dam 1 designed to divert water flows to SGM dam 1 near the processing plant.
- A channel would be constructed along the haul road downstream (to the south) of SGM dam 1 designed to divert water to small SDBs adjacent to the haul road then to SGM dam 5. Water from SGM dam 5 would be pumped to SGM dam 1.
- A channel would be constructed on the 15-20 metre wide space between the TWRS and the GWMWater storage number 7 designed to divert water flows to SDB 2 near the northern end of the TWRS.
- A channel would be constructed along the southern side of the TWRS also designed to divert water flows to SDB 2 near the northern end of the TWRS.
- A flood storage basin would be constructed near Crowlands Road which would be designed to capture the flows from SDB 2 near the northern end of the TWRS. The water from the flood storage basin would then be pumped to SGM dam 1.
- A channel would be constructed on the eastern side of the north pit designed to divert water to SDB 1 constructed near Main Street. Water from this SDB would channelled around northern end of the north pit to SDB 3 constructed behind the houses in Fisher Street near Sloan Street.
- A channel would be constructed on the western side of the north pit designed to divert water to SDB 3. Water from SDB 3 would then be pumped to SGM dam 1.
- A channel would be constructed on the western side of the south pit designed to divert water to SDB 4 constructed behind the houses in Fisher Street near Duke Street. Water from this SDB would also be pumped to SGM dam 1.

The EES stated that a bund would be constructed around the south western perimeter of the north and south pits during the initial construction phase (year 1) to prevent overflow from the pit into the adjacent undisturbed areas and/or offsite. The EES also indicated that a silt fence would be erected downstream beyond the extent of excavation to ensure that sediment laden surface water does not leave the site.

The EES indicated that during rehabilitation, the stormwater run-off from the western side of the reinstated land form of both the north and south pits would be captured and level containment benches would be constructed on the rehabilitated slope at a spacing of 40-50 metre to enhance infiltration (see also Chapter 11). Any flow from these benches would be collected by channels and drained to the two SDBs behind the houses in Fisher Street. Excess water would then be pumped from these SDBs to SGM dam 1 to ensure that there was no discharge to the surrounding area.

After completion of the rehabilitation, water would be discharged offsite with the quality being similar to or better than the quality of the run-off water from the surrounding areas. This would be achieved by:

- Collecting and treating any contaminated water prior to discharge offsite.

- Maintaining erosion control through ongoing rehabilitation and revegetation of any bare areas.
- Ensuring that the temporary erosion and sediment controls remained in place until the vegetation is established (estimated to be two years).

The effective performance of the erosion and sediment stormwater controls would depend on ongoing active maintenance including the checking of all components at regular intervals, as well as immediately after significant rainfall events; removing litter, debris and sediment from channels and SDBs; checking flow paths for erosion and scour; and checking the condition of vegetation and replacing it if necessary.

Change to surface water flow from catchment reduction is listed as a risk in the risk register for the project.

8.3.2 Comparison with the 2000 EES Inquiry Report

The key recommendations of the Panel in 2000 in relation to surface water management and the proponent's response in relation to the current project are as follows:

- The Panel in 2000 recommended that detailed water balance modelling should be undertaken prior to a final system design. *Response* – A water balance has been developed and has been included in the proposed work plan.
- The Panel in 2000 recommended that surface water should be monitored as part of the EMP and used to validate water management strategies as well as being reported to the ERC. *Response* – Monitoring of surface water will be undertaken as part of the EMP and will be reported to the ERC.
- The Panel in 2000 recommended that all surface runoff from mining areas, including the TWRS, will be contained and reused in the project area. *Response* – This has been incorporated into the project design.

8.3.3 Other submissions and presentations

Professor Noller in his EWS (document F69) stated that erosion of sediment by storm events could disperse contaminated material into the drainage system and therefore adequate bunds would be required to deal with irregular flood events.

Mr Magee in his EWS (document S74) stated that the project did not appear to propose a bund wall that would be adequate to contain stormwater and sediment discharge from entering the main drain of Stawell during the reconstruction of Big Hill. He stated that a 1 in 1000 year rainfall event could discharge more than 10 megalitres of water and sediment from Big Hill, and if a landslip was to disrupt the bund, then residences near the main drain might need to be evacuated.

Ms Bennett in her presentation (document B78) raised concerns about the possibility of landslips of the reinstated Big Hill caused by rainfall events. Ms Kossowski, as a resident of 12 Fisher Street, in her presentation (document K80) raised concerns in relation to the SDBs proposed to be constructed behind the houses in Fisher Street and in particular with SDB 3 which would appear to be proposed to be less than 30 metres from her property. Ms Ware in her presentation (document W104) raised concern about the effect of the leaching of acid forming rocks on runoff water quality and about possible gully and tunnel erosion on Big Hill caused by rainfall events. Mr McMahon in his presentation (document M113) expressed

concern about run-off arising from the changed topography of Big Hill affecting houses in Fisher Street. Dr Letts in his presentation (L117) was concerned that the Wimmera Catchment Management Authority (Wimmera CMA) had not provided input into the EES. In response to this concern, the proponent indicated that he had invited input from the Wimmera CMA but no response had been received.

The Panel inspected the project area several times, including during the accompanied site inspection on 17 July 2014 when we inspected the sites of the proposed SDB 3 and SDB 4 on the south western side of the north and south pits.

8.4 Discussion

The Panel considers that the EES outlines a comprehensive approach to surface water management during the life of the project and in general the Panel considers that the proposed actions would appear to avoid any adverse impacts from predicted rainfall events or normal operations of the mine on the surrounding NGSC drains, GWMWater storages, watercourses or private properties.

The Panel is concerned, however, that there is little or no safety margin built into some aspects of the design of the surface water management system. An adequate margin is required to allow for any severe unforeseen natural events or human caused adverse events. We believe that two design elements of the surface water management system are particularly problematic:

- The close proximity of the proposed SDBs to neighbouring properties in Main Street and especially those downslope in Fisher Street. The concerns of the residents of Fisher Street such as were expressed by Ms Kossowski are not without foundation. The Panel considers that high water flows, especially in the rehabilitation stage of the project from the newly re-created Big Hill, could potentially lead to overflowing of these SDBs which could be subject to some siltation. The Panel considers that this could potentially lead to flooding of properties in Fisher Street especially as the management of the water levels in these SDBs depends on pumping which could be overloaded or fail during high rainfall events.

Although dealing with overflow was not addressed in the EES, the Panel was reassured to some extent about this matter by the proponent in response to our questions at the hearing when it was explained that any overflow from these SDBs would be channelled to the nearest NGSC drains. The Panel considers that this should alleviate any possibility of the flooding of residences in Fisher Street. Such an arrangement could, however, lead to the possibility of contaminated water entering the NGSC drainage system.

- The proposed location of TWRS, which will be up to 50 metres in height, in close proximity (15-20 metres) to the GWMWater storage number 7 gives us some concern should slippage of rock or another event cause overflow or blockage of the drain in this area, potentially contaminated or silt laden run-off from the TWRS could possibly enter the GWMWater storage (see also Chapter 7 Potable water). The Panel is also concerned that the flood storage basin located near Crowlands Road, which is designed to store surface water runoff from the TWRS, is to depend on pumping to maintain the water levels. This pumping system could become overloaded or fail during high rainfall events. The Panel considers that if this occurs then Crowlands Road and/or the properties to the

north might be flooded with contaminated water. The Panel considers that the distance between the TWRS and GWMWater storage should be greater to increase the safety margin in the event of an unforeseen catastrophic event.

The Panel also considers that a high standard of maintenance is essential for the effective operation of the surface water management system. This is required not only during the operation of the project, but in the long term after completion of mining operations and until the re-created Big Hill has been successfully stabilised and revegetated. The Panel consider that effective maintenance should include including checking all components at regular intervals as well as immediately after significant rainfall events; removing litter, debris and sediment from channels and SDBs; checking for erosion and scour; and checking the condition of vegetation and replacing it if necessary.

The Panel agrees also with the concerns of some of the presenters that surface water management could be an issue with the reinstated Big Hill after mining has been completed. The Panel does not accept that two years (as stated as a estimate in the EES) would be sufficient time to ensure that the reinstated Big Hill would be stable enough to provide consistent water flow patterns and that the vegetation would necessarily be successfully established in this timeframe. The Panel considers that it could take five years or longer (see also Section 11 Rehabilitation and post mine management).

8.5 Conclusions

The Panel concludes that the surface water management proposal is comprehensive in terms of dealing with predicted rainfall events and should generally avoid any adverse impacts on the surrounding GWMWater storages, NGSC drains, watercourses or private properties. However the Panel concludes that some aspects of the surface water management are of concern in relation to unforeseen catastrophic events and exceptionally high flows. In particular the Panel concludes that:

- The close proximity of the SDBs to the private properties in Fisher Street is problematic in terms of potential flooding. Although not proposed in the EES, but presented by the proponent at the hearing, these SDB's would need to be designed with an overflow connected to the NGSC drainage system.
- The distance between the TWRS and GWMWater storage provides an inadequate safety margin in the event of an unforeseen catastrophic event. If the project proceeds the distance should be increased if possible to more than 15 metres.

The Panel also concludes that more certainty is required in relation to the post mining ongoing surface water management responsibilities of the proponent, especially in relation to the reinstated Big Hill (see also Chapter 11).

9. Groundwater

9.1 The issue

The key groundwater issues relate to the potential of the north and/or south pit to impact on groundwater during mining or after back filling, and the effect of any seepage from the tailings dam on groundwater and any users of groundwater. A small number of submitters were concerned with the management of the tailing dam and its impact on the surrounding environment.

9.2 Legislation and policy context

The EP Act regulates any discharge to groundwater by licences and work approvals. The *SEPP (Groundwaters of Victoria) 1997* (SEPP GoV) developed under the EP Act sets out the segments of the groundwater environment which are based on the level of total dissolved solids (TDS) in the groundwater. Each segment has beneficial uses that must be protected.

9.3 Evidence and submissions

9.3.1 EES Information

The Groundwater Assessment, in Chapter 8.12 and Technical Appendix 12 of the EES, presented information on both groundwater in the region and in the vicinity of the current operating mine. It indicated that the regional groundwater flow was to the northwest and that there might also be some shallow perched groundwater aquifers in the basement rocks as a result of rainfall infiltration. The assessment indicated that groundwater quality was likely to lie within Segment C of the SEPP (GoV), that is TDS ranging from 3,501 to 13,000 milligrams per litre (mg/l) with protected beneficial uses including maintenance of ecosystems, stock watering, industrial water use, primary contact recreation and buildings and structures.

The assessment stated that there was only one registered groundwater bore within two kilometres of the site - a domestic use bore approximately 1.1 kilometres north of Big Hill (although its current operating status was unknown). The closest mapped groundwater dependent ecosystem was Jerrywell Creek which lies 0.8 kilometres to the east of the project area.

The EES stated that due to historic and current dewatering activities relating to underground mining, the local groundwater table has been depressed by over 1000 metres and is unlikely to be intercepted at the base of either of the proposed pits. Recovery of groundwater levels is expected to occur slowly and not expected to stabilise in less than 20 years. The EES said that it was unlikely that fully recovered groundwater levels would intersect with waste rock back filled in the north pit, but might intersect with the back filled waste rock in the south pit. However the majority of the waste rock to be used for backfilling will not be leachable for metals and would be unlikely to materially affect groundwater quality.

The EES indicated that potentially acid forming materials were unlikely to be encountered during mining and in the event that they were, they would be identified, isolated and back filled into the base of the pits and sealed with a compacted layer of non-acid forming mine waste rock. The EES indicated that mitigation measures would be implemented to minimise

any adverse impact on groundwater. These would include restricting deep infiltration of rainfall inflow by adequate compaction of back filled waste rock and revegetating the rehabilitated pit surfaces to increase local transpiration.

The EES indicated that the tailings storage facility number 2 (TSF2) in use for the current mining operation would handle all the tailings waste produced by processing ore from the project. The original embankment of the TSF2 had been raised several times to its current height of 250 metres AHD ie up to 28 metres above surface level. TSF2 had an approved works plan including an approval to raise the embankment up to 253 metres to provide sufficient storage for this project. On the basis that the TSF2 was already approved, constructed and operating as part of the existing operations, no further environmental assessment of TSF2 was included in the EES.

The EES stated that as a result of impact on the groundwater quality arising from seepage from the TSF2, SGM had been issued with a pollution abatement notice (PAN) under the EP Act by the EPA as well as a notice requiring action issued by DSDBI. The EES stated that SGM was in compliance with these notices and environmental auditing of the facility was ongoing. The TSF2 had a Groundwater Management Plan which aimed to manage the known impacts of the surrounding environment.

Figure 7: Tailings Dam (TSF2)
Source: Panel



9.3.2 Comparison with the 2000 EES Inquiry Report

The key recommendations in relation to groundwater the EES report in 2000 and the response of the proponent in relation to the current project are as follows:

- The Inquiry Panel in 2000 recommended that a detailed assessment be undertaken of the groundwater levels and hydrogeology near the south pit. *Response* – The current project will monitor groundwater levels in the underground workings for as long as possible, so this assessment was not required.
- The Inquiry Panel in 2000 recommended modelling to determine the level to which the water table would recover after underground mining ceased. *Response* – This modelling is not required because unlike the previous proposal, the current project does not propose to leave an unfilled south pit and therefore there is no issue of groundwater eventually entering an open pit as the water table rises.

9.3.3 Other submissions and presentations

In response to a request from the Panel at the directions hearing for further information on the TSF2, Mr Mitas tabled a letter dated 9 July 2014 from Ms White, Executive Director Earth Resource Regulation, DSDBI (document 59). This letter indicated that the approved Work Plan for the current mining operation required SGM to monitor groundwater on site and off site to ensure compliance with the SEPP (GoV) and in particular to ensure that no off site groundwater discharge occurred. The letter stated that groundwater monitoring post 2008 indicated the presence of thiocyanate resulting from seepage from the TSF2. It stated that despite undertaking remedial works recent information indicated that the extent of seepage is increasing.

The letter stated that the EPA and DSDBI have both issued notices to SGM in 2013 directing the licensee to undertake further remedial works. It indicated that a recently completed environment audit by Cardno Lane Piper had concluded that migration of groundwater from the TSF2 was slow and localised, but further work was required to delineate the groundwater impacts both laterally and at depth. This audit considered that the risk to beneficial use of stock water was 'moderate' and the risk to primary contact recreation and buildings and structures was 'low'. The letter stated that both EPA and DSDBI were currently working with SGM on this issue.

The EPA in its written submission (number 319) stated that although the EES contained limited background water quality data due to past extraction as part of the underground mining operations, this was not an impediment to form conclusions on the potential impacts of the project on the groundwater in the Big Hill area. The submission also stated that the EPA had issued a PAN in September 2013 to clarify the risk associated with the placement of more material in TSF2 and to determine remedial options for the off-site contamination of the groundwater plume caused by leakage from TSF2.

Dr Ferrando-Miguel of the EPA in his presentation at the hearing (document 60) stated that groundwater quality needed to be maintained as close as practicable to the background quality and that the seepage detected in 2010 appeared to be a breach of the EP Act and the SEPP (GoV). He stated that the recent statutory audit came made similar recommendations to the audit in 2008, that is, the GWMP was ineffective in preventing the spread of

contamination. Dr Ferrando-Miguel stated that the seepage from the TSF2 needed a remediation strategy before the work plan was finalised.

Ms Saunders in her presentation (document S73) expressed concern with possible leaching of heavy metals into the environment from the TSF2. Mr Magee in his EWS (document 74) stated that in his opinion, the existing tailings management process appeared to be of third world standard and SGM had not released any relevant work plans for community information. He also raised concerns with the long term management of the TSF2. Mr Magee tabled a media article (included in document 119) relating to a spill from the then tailing storage facility in 1984. Ms Bennett in her presentation (document B78) stated that in the past the tailings dam had overflowed as a result of heavy rains, and tailings had flooded into Congongella Creek and the Wimmera River. Dr Saunders in his presentation (document 125) was concerned that the TSF2 might not be large enough to handle the quantity of waste that would be produced by the project and that the cost of the long term monitoring and maintenance of the TSF2 would be excessive.

The Panel inspected the TSF2 as well as the former tailings waste storage facility (number 1) which is currently being rehabilitated, during the accompanied site inspection on 17 July 2014.

9.4 Discussion

The Panel accepts the evidence in the EES, supported by the EPA, that the mining and back filling of the north and south pits is unlikely to significantly affect the regional groundwater resource in the short term or long term after the groundwater levels have returned to pre-underground mining levels.

Although the Panel acknowledges that the three metre increase in the dam wall height required to enable the TWF2 to handle the wastes generated by the project has already been approved, the Panel is concerned that the project may increase the difficulty of resolving the current seepage issue. As the project will apparently result in an increase in water levels, the Panel considers that the additional water head could lead to increased leakage from the TWF2. The Panel considers that even if the risk from this seepage to beneficial use of the surrounding groundwater as stock water is 'moderate' and to primary contact recreation and buildings and structures is 'low', as indicated by the recent audit, the contamination caused by the seepage is inconsistent with the SEPP GoV and is unacceptable.

The Panel is concerned that the EPA evidence indicated that the recent statutory audit had come up with the same recommendations as the audit in 2008, that is the GWMP was ineffective at preventing the spread of contamination of groundwater. The Panel noted the position of the EPA that the seepage from the TSF2 needed a remediation strategy before the work plan is finalised.

The Panel considers that the leakage from the TSF2 is a serious issue in need of resolution and from the evidence presented to the Panel little progress has been made to date in this regard. If the project is to proceed, the Panel considers that successful remediation strategy for TSF2 must be developed and put in place before the project is approved.

The Panel also notes that, although at some time in the past, the then tailings dam overflowed as a result of heavy rains and that this is an example of a catastrophic event that caused unforeseen problems.

9.5 Conclusions

Subject to the comments regarding TSF2, the Panel concludes that the project is unlikely to significantly affect the regional groundwater resource, even in the long term after the groundwater levels have returned to pre-underground mining levels.

The Panel concludes that even though the changes required to enable the TWF2 to handle the wastes generated by the project have already been approved, the contamination of groundwater caused by seepage from the TWF2 may well be increased by the project. At the least, the Panel concludes that it is inappropriate to rely on a dam which has unresolved seepage problems for the disposal of tailings from the project. The Panel therefore concludes that if the project is to proceed, a remediation strategy must be developed and put in place before the project is approved.

10. Geotechnical issues

10.1 The issue

The key geotechnical issues relate to the stability of the north and south pits during mining and backfilling. This is a particular concern given their close proximity to residents. The stability of the TWRS given its close proximity to the GWMWater reservoir is also an issue. Other issues relate to the stability of the reinstated Big Hill as construction extends above the lip of the north pit and the ongoing settlement of the reinstated hill. The impact of possible collapses of old underground workings during mining and the impact of any collapse on the stability of the pits is also an issue.

10.2 Legislation and policy context

The MRSD (Mineral Industries) Regulations 2013, Part 2 – Declared mine stability requirements and processes outline requirements with regard to mine stability matters. The DSDBI guidelines *Earth Resources Guide for the Assessment of Geotechnical Risks in Open Mines and Quarries, 2014* (Geotechnical Risks Guidelines) provide a basis for assessing open cut mine stability.

10.3 Evidence and submissions

10.3.1 EES information

Geotechnical information on the project was presented in Chapter 8.9 and technical Appendix 9 of the EES. The EES indicated that the project was assessed in line with the DSDBI Geotechnical Risks Guidelines. The assessment indicated that the walls of the north and south pits will remain stable during mining and that no buildings or critical infrastructure are likely to be affected. The EES stated that there is no risk of long term mine instability as the pits will be filled, and that the reinstated Big Hill landscape will remain stable.

The EES indicated that many residences, some roads and other infrastructure including three of the GWMWater storages, water mains, power poles and gas pipelines lie within the geotechnical risk zone (GRZ) around the north and south pits. The EES indicated that the potential for surface failure within the GRZ is expressed in terms of a factor of safety (FOS) and a FOS greater than 1.5 demonstrated that the relevant slope is 50% stronger than is required to prevent failure. The EES indicated that for all the residences (other than the two properties being purchased by SGM) and all infrastructure (other than that removed by SGM prior to mining), the FOS would be 2.0 or greater. Figure 8-66 in the EES indicated that the contour around the north pit where the FOS would be 2.0 extends almost to Upper Main Street⁵⁴.

The EES stated that in a worst case scenario there could be some pit face instability within the north pit, but if this occurred no property outside the project area would be impacted. The EES indicated that as the GWMWater storage number 1 lies almost on the 2.0 FOS

⁵⁴ The Panel has earlier noted that the location of the pits has been moved further northward in revised plans prepared since the EES was exhibited.

contour, for safety reasons this storage would be drained for the duration of the mining of the north pit.

The EES stated in the technical appendix 9:

- *'For the likely worst case fault strength conditions, 3D modelling predicts minor batter-scale instability extending to any nearby properties or infrastructure. Impacts will be assessed and managed during mining, and monitoring will be established to confirm that this wall performs as predicted by the 3D modelling'* (p112 referring to the western wall of the north pit).
- *'Back-analysis of monitoring data and model calibration is an essential process in gaining confidence in predictive model results. Due to a lack of monitoring data and detail of previous pit slope failures, a thorough back-analysis of pit slope performance in the vicinity of Big Hill has not been possible'*(p106).

The EES stated that the edge of the TWRS which would be located approximately 15 metres from the GWMWater storage number 7, will be up to 50 metres high and be constructed with two 20 metre lifts and one 10 metre lift. The EES indicated that the TWRS outer surface would have a FOS exceeding 1.5 and therefore would meet general mine stability requirements. Also a bund would be constructed around the toe of the TWRS to provide a barrier for any material that might escape during dumping operations or heavy rainfall. The EES indicated that the TWRS was therefore unlikely to impact on the GWMWater storage number 7.

The EES stated that the north pit would be back filled to form a landform similar to the existing hill using a number of filling zones based on type of material and the method of its placement. The EES indicated that material that might disperse would not be used at the base of the pit (where there could be groundwater) or near the surface where erosion could occur. The EES indicated that three different filling methods are proposed to back fill the north pit as follows:

- Tip head dumping where mine trucks tip material over the edge of the filled area.
- Paddock dumping where the trucks dump their loads side by side and a bulldozer flattens the surface to a depth of not more than two metres at one time to achieve high levels of compaction from the rolling weight of loaded trucks.
- Surface contouring where the material is placed in layers of not more than 600mm in depth, which are then rolled using a vibrating or sheep foot roller to compact each layer. The EES indicated that this method provides the most effective compaction and stability.

The EES stated that the north pit would be filled using a combination of fill material in each of a number of zones as follows:

- Zone A: Located at the bottom of the pit. Oxide material (mainly gravelly silt) from the south pit and waste rock from underground mining would be placed together using tip head dumping.
- Zone B: Located in the next level of the pit (above RL265 metres). Waste rock from underground mining (crushed basalt) would be placed using paddock dumping. Each layer is proposed to be rolled with trucks and additionally compacted if necessary.
- Zone C: Located under the area of the summit of Big Hill from bedrock to near the surface. Oxide material from the south pit mixed with waste rock from underground

mining would be placed using paddock dumping. The material will be additionally rolled if necessary.

- Zone D: Located over the whole reinstated landform surface to a depth of three metres. Material with a higher gravel content sourced from the surface of Big Hill before mining would be placed using surface contouring. This material is more resistant to erosion than the other types of waste material.

The EES indicated that the final Big Hill landform outer surface would be constructed with 20 metre high benches interspersed with 10 metre wide berms, and the steepest slope would be not more than one metre vertical to three metres horizontal and have a FOS value equal to or greater than 2.0 which would be very stable. The EES indicated that enhanced compaction would be carried out at key areas prior to constructing the infrastructure on Big Hill and that the Pioneer Memorial would be rebuilt on a rigid slab with adjustable footings. The EES also indicated that if monitoring showed that the settlement rate was unacceptable, then the Pioneer Memorial structure could be built on stronger piled foundations.

The EES stated that the settlement of the reinstated Big Hill would be monitored using multipoint borehole extensometers at bedrock and surface settlement points. The EES indicated that the reinstated Big Hill on which infrastructure such as the road, the monuments, and memorials will be rebuilt, could settle by up to 2.6 metres. 90% of settlement would occur within 18 months of the completion of backfilling and the remaining 10% would occur over approximately 10 years.

10.3.2 Comparison with the 2000 EES Inquiry Report

The 2000 Panel report recommended that regular monitoring of the northern wall of the north pit be undertaken, and that there should be an emergency response plan including temporary relocation of residents, temporary closure of the gas main and Upper Main Street. The actions proposed in the present project in response to these issues involves extensive monitoring of the pit faces, comprising prism monitoring of all pit walls, radar monitoring if critical movements are detected, deformation monitoring of critical infrastructure in Upper Main Street and daily visual inspections by qualified personnel. Emergency response such as evacuation of residents is not proposed, as the modelling has indicated that it is unlikely there will be any impact from the project on the nearby residences or the infrastructure in Upper Main Street. In relation to the safety issue and the time to respond to an emergency, Mr Lucas indicated during his presentation, that earth movements potentially affecting residents would be slow and not sudden, thereby allowing adequate time for appropriate safety measures to be taken.

10.3.3 Other submissions and presentations

At the request of the Panel, the proponent pegged out the boundaries of the north and south pits on the ground.

Mr Lucas, in his EWS (document P15), reiterated the information in the EES in regard to the stability of the pits and the reinstated landform. He also indicated that it would be very unlikely that blasting would collapse any underground voids which might lead to instability such as slumping of the pit walls.

Mr Darmawan, in his EWS (document P11), indicated that the materials to be used for back filling had been tested for their compaction properties and that these values had been used to estimate the rate and extent of the settlement of the reinstated Big Hill landform. He stated that the south pit would be filled mainly with gravelly silt excavated from both the north and south pits. He indicated that tip head dumping would be used to place the material in the lower level of the south pit while paddock dumping would be used to place the material in the upper levels. Total settlement of the south pit is predicted to be up to 2.1 metres.

The proponent provided further information on the back filling of the north pit designed to reinstate Big Hill (document P54). This information included details of the methods that would be used at different levels in the pit, such as the noisier bulk dumping methods (for example tip head dumping) would be used when the back filling level was below and shielded by the western pit edge (RL265 metres) and that quieter paddock dumping would be used when the back filling level rose above the western pit edge level. The information indicated that paddock dumping would be undertaken in two metre lifts and extra compaction applied if necessary. It also indicated that the ramp into the north pit would be located in the area of the pit above which the Pioneer Memorial would be reconstructed and as this area would have a large number of truck movements, it would achieve a high level compaction.

The proponent provided further information on the management of the TWRS (document P55) which indicated that the different types of materials to be used in the back filling operations were intended to be stored separately. The information indicated that the material with the greatest erosion resistance will be placed around the outer surface of the TWRS, will be the last material to be removed and be used to provide the final contouring of sub soil zone in the back filled south pit.

A number of written submissions and presentations at the hearing raised concerns about the stability of the pits during mining and/or of the stability of the reinstated Big Hill landform post mining.

Ms Scott Decosta, in her presentation (document S17), expressed concerns about mine stability due to the presence of old workings and with lack of segregation of rock in the TWRS. Mr Magee, in his EWS (document S74), considered that there was insufficient waste rock to reconstruct Big Hill and it would be cost prohibitive to mix fine materials with the waste rock. Ms Bennett, in her presentation (document B78), raised concerns about the stability of the TWRS; and Ms Ware, in her presentation (document W104), raised the matter of the proposed compaction, possible settlement of the reformed landscape and that the use of acid forming rocks for back filling may result in erosion. Mr B Hunt, in his presentation (document H109), was concerned that Mr Lucas, in his EWS, had indicated that a stability incident would trigger a response. He said that this would be too late as it would be after the event had occurred. Ms Raeburn, in her presentation (document R120), expressed concerns about the stability of the north pit and the possible impact of any incident on nearby houses, and about the settlement evidence given by Mr Darmawan in his EWS. She was also concerned about the stability of the TWRS. Dr Saunders, in his presentation (S125), argued that the proposed back filling methods were suboptimal and

that it would be too expensive to do it properly. He also queried the stability of the TWRS and said that the project area will require on going monitoring.

The Panel inspected the site of the north and south pits, and the site of the TWRS on several occasions, including during the accompanied site inspection on 17 July 2014.

10.4 Discussion

10.4.1 Stability of pits and TWRS during mining operations

After reviewing all the information presented, the Panel has concerns about some of the geotechnical aspects of the project during mining operations, especially given that the north and south pits would be so close to Upper Main Street and residences in Fisher Street. This proximity provides minimal safety space should an issue arise with the stability of either pit.

The Panel notes from the plans and its inspection on the ground that the north pit would extend to less than 20 metres from Upper Main Street and the south pit would extend to less than 50 metres from the properties in Fisher Street. The concerns of the residents living in Fisher Street about the close proximity of the proposed pits to their properties are understandable. The analysis in the EES, however, indicates that no significant infrastructure or residences (other than those being purchased by SGM) lie within the FOS 2 contour (in relation to pit face stability). The Panel understands that this normally indicates an acceptable safety margin.

The Panel also noted that the EES stated that:

For the likely worst case fault strength conditions, 3D modelling predicts minor batter-scale instability extending to any nearby properties or infrastructure. Impacts will be assessed and managed during mining, and monitoring will be established to confirm that this wall performs as predicted by the 3D modelling (referring to the western wall of the north pit)

and

Back-analysis of monitoring data and model calibration is an essential process in gaining confidence in predictive model results. Due to a lack of monitoring data and detail of previous pit slope failures, a thorough back-analysis of pit slope performance in the vicinity of Big Hill has not been possible.

Given these statements, the Panel considers that because the deep pits would be so close to residences and public infrastructure the safety margin may not be adequate to cater for possible inaccuracies in the model used for assessing pit safety should an unexpected human error or a natural catastrophic event occurred during the mining of either of the pits.

The Panel also notes that the TWRS will be will about 50 metres high and located very close to GMMWater storage number 7, at 15 metres. The Panel notes that the TWRS outer slope would have a FOS exceeding 1.5 and therefore would meet the stability requirements generally accepted for mining operations. The Panel also notes that a bund will be constructed around the toe of the TWRS to prevent any material escaping during dumping operations or heavy rainfall. However the Panel is concerned that little margin for error has been incorporated into the design of the TWRS to protect the GMMWater storage number 7

in the event of a catastrophic event impacting on the TWRS, as this storage will continue to be used during the operation of the TWRS.

The Panel accepts Mr Lucas evidence that it would be very unlikely that blasting would collapse any underground voids which could lead to instability such as slumping of the pit walls.

10.4.2 Stability of the reinstated Big Hill

The Panel's principal concerns in relation to stability are about the compaction proposed and settlement of the reinstated Big Hill. It is clear that a high level compaction methodology must be applied to the backfilling of the north pit in order that Big Hill is reinstated as a stable and usable landform. The Panel has not been persuaded by the information provided, however, that what is proposed is a suitable methodology. Much reliance is placed on the paddock dumping method which involves loaded truck movements providing the compaction. We are concerned that this may not be sufficient to provide adequate and uniform compaction across the whole back filled area (below the three metre surface contouring of the reinstated landform - zone D). In particular, we were unable to establish whether the truck movements would or could be systematically directed. The Panel considers that in particular as there would be fewer truck movements near the edge of the filled material than at the centre, this could result in uneven levels of compaction and consequent differential levels of settlement, if not stability. While we are satisfied by the evidence that compaction close against the pit walls might be undertaken with other equipment (such as a sheep foot roller), the compaction of the outer edges of the fill above the lower lip of the pit needs further consideration. Despite requesting a further written response from Mr Darmawan about the compaction of these outside edges, the only reply we received was that this would have to be engineered. We agree that additional compaction techniques would indeed need to be developed and applied near the edges of the back filled material, but it is disturbing that no answers were to hand at the time of our enquiry.

The Panel also considers that enhanced compaction will likely be needed at key locations of the reconstructed hill to enable the satisfactory replacement of the infrastructure. We were advised that the Pioneer Memorial needed to be rebuilt on a rigid slab with adjustable footings. This may also be required for other infrastructure if areas for enhanced compaction are not identified in advance of reinstatement of the hill. In order that backfilling proceeds in an orderly fashion it is important that the rehabilitation plan is developed well in advance of commencement of backfilling (see also Chapter 11). The Panel nevertheless also considers that if monitoring showed that the settlement rate was unacceptably high or differential, then the Pioneer Memorial structure and any other buildings might be built on stronger piled foundations.

The Panel considers that if issues relating to the compaction of the reinstated Big Hill are satisfactorily resolved then the actions proposed to stabilise the hill's surface would be appropriate. The Panel notes that the steepest slope of outer surface of the final Big Hill landform would be constructed with 20 metre high benches interspersed with 10 metre wide berms, have a gradient no steeper than 1 metre vertical to 3 metres horizontal and would have a FOS value equal to or greater than 2.0. The Panel appreciates that although

this reinstated landform structure would have different topography to the current Big Hill, the Panel is satisfied that the slope of the landform would be stable providing that the revegetation and erosion control measures were effective.

A major concern is that the reinstated Big Hill is predicted to settle up to 2.6 metres and that only 90% of this settlement is predicted to occur within 18 months of the completion of backfilling and the remaining 10% of settlement could take up to 10 years to occur. The Panel considers that given the magnitude of the predicted settlement, no structure should be built on the reinstated Big Hill within 18 months of completion of back filling. The Panel also considers that the ongoing settlement could cause future difficulties with the reconstructed Big Hill Road and car park. The Panel considers that it is important that arrangements are put into place to ensure that any impacts arising from settlement over the 10 year period are rectified by the proponent or that the costs involved in rectification works are reimbursed by the proponent. The Panel also considers that ongoing monitoring of the settlement of the reinstated Big Hill for at least 10 years after completion of the project is essential and should be funded by the proponent.

10.5 Conclusions

The Panel concludes that, based on the analysis in the EES, it is most unlikely that any significant infrastructure or residences (other than those being purchased by SGM) will be affected by instability that occurs during the mining of the north or south pits. However, the Panel concludes that the close proximity of the north and south pits to Upper Main Street and the residences in Fisher Street, and the close proximity of the TWRS to the GWMWater storage number 7, provides little margin for error should an unpredicted catastrophic event occur. The Panel considers that this is a major negative aspect of the project.

The Panel concludes that a high standard and level of compaction of the material back filled into the north pit material is required to reinstated Big Hill as a stable and usable landform, and further details of the proposed compaction methodology is required to give confidence that this outcome will be achieved.

The Panel concludes that, due to the predicted rate and extent of settlement of the reinstated Big Hill, no infrastructure should be constructed on the hill for at least 18 months of the completion of back filling. The Panel also concludes that the ongoing settlement over the following nine years could cause ongoing difficulties with the reconstructed Big Hill Road and car park. The Panel concludes that the proponent should be responsible for all costs associated with ongoing monitoring and rectification of all impacts arising from settlement for 10 years after completion of the project. The Panel concludes that the ongoing settlement of the reinstated Big Hill is a negative aspect of the project and will considerably delay reinstatement of public access to the hill.

11. Rehabilitation, post mining management and bonds

11.1 The issue

The key rehabilitation issues relate to the nature of the reinstatement being proposed for the overall project area and in particular, the reinstatement of the Big Hill and the monuments and memorials currently located on the hill. Other issues relate to the process being proposed to finalise the concept master plan, including the timelines involved and community involvement in the process.

The key post mining management issues relate to the proponent's post mining responsibilities and DEPI's and/or NGSC's roles as potential managers for part or all of the Crown land.

The issue relating to bonds is whether the rehabilitation bond for the project would be effective in achieving rehabilitation. This relates to whether the bond would be large enough to meet rehabilitation costs as well as whether it could be managed to ensure that delays do not occur in the restoration.

Key issues raised by members of the community during the preparation of the EES and at the hearing included concern about the ability of the proponent to satisfactorily restore Big Hill and the ability of the authorities to ensure that the rehabilitation conditions would be met. Other issues raised related to inadequate long term planning and that the planting regime for Big Hill was not yet clear. The community also raised concerns relating to bonds.

The issue relating to the impact of settlement on the re-instated Big Hill, the roadway and other rebuilt structures is covered in Chapter 10.

11.2 Legislation and policy context

The Mineral Resources Act requires a mining licence holder to develop a rehabilitation plan as part of the work plan variation. The Mineral Resources Regulations outline the information required in a rehabilitation plan as part of a work plan. Part 7 of Mineral Resources Act is the main legislative provision relating to bonds.

The Environment Conservation Council, *Box-Iron Forests & Woodlands Investigation- Final Report (June 2001)* provides recommendations (which were accepted by the Government in 2002) for the future management of all the public land in the investigation area including the Stawell area. The recommendations relevant to the project area are that the Big Hill summit area be managed as a community use area (recommendation J undefined) and the Crown land in the south of the project area be managed for earth resources (recommendation L1 – mining).

11.3 Evidence and submissions

11.3.1 EES information

The Rehabilitation Plan for the project area is outlined in Chapter 10 and Technical Appendix 19 of the EES. Information on the backfilling of the pits, compaction of material, stability of the created landforms and the work needed to be satisfactorily completed before rehabilitation of the surface can be undertaken is provided in the geotechnical sections of the EES ie Chapter 8.9 and Technical Appendix 9 and is covered in Chapter 10 of this report.

The EES indicated that the rehabilitation of the north pit and south pit would aim to leave a final landform that was visually compatible with the overall Big Hill landscape; was safe with no historic mine shafts or voids; was stable and not prone to erosion; slipping or excessive slumping; was suitable for vegetation establishment; had a low fire risk; had minimal maintenance requirements; and did not constrain future land uses. The rehabilitated Big Hill would be built to a similar height to the existing summit to blend into the unmined eastern ridgeline.

The EES stated that the backfilled slopes on the surface of both the north and south pit would include level containment benches spaced between 40 and 50 metres and the inter bench slopes would be no steeper than 3 metres horizontal to 1 metre vertical. The EES indicated that satisfactory compaction of the back filled material would be essential as uneven compaction might compromise surface water drainage and lead to erosion (see Chapter 10 for information on compaction). The EES stated that during mining operations, waste materials would be sampled and evaluated for physical and chemical characteristics, such as total sulphur and metal concentrations, erosion resistance, ability to retain soil water and capacity to support vegetation, and if suitable would be placed on the outer surface of the back filled landforms prior to placement of topsoil.

The EES indicated that topsoil would be salvaged from disturbed areas throughout the project area, stockpiled separately within the TWRS and respread to a depth of 100mm on rehabilitated areas. The rehabilitated surface would include the construction of grass swales to drain surface water and provide treatment before the water was directed to sediment basins where sediment would be captured. The EES indicated that the surface of the reinstated Big Hill would be stabilised with vegetation and irrigation would be provided if necessary to maintain some of the more difficult areas.

The EES stated that there would be ongoing settlement of the backfilled material in the north and south pits which could impact on the rebuilt Big Hill Road and other structures on Big Hill. The EES indicated that ongoing monitoring would continue beyond the life of the operation of the project, especially of the stability of the landform and functioning of the ecosystems.

The EES stated that many stakeholders were consulted in order to understand the character of the reinstated Big Hill that the Stawell community wanted after completion of mining. The EES also stated that a master plan would be prepared to guide the post mining development of the Big Hill area which would include reinstatement of Big Hill Road and associated parking area near the summit of the reinstated hill, and reinstatement of the

Pioneer Memorial Rotunda, Dane Memorial Seat, Water Supply Memorial, Apex Memorial Gate, and Quartz Reef Discovery Monument.

11.3.2 Comparison with the 2000 EES Inquiry Report

As noted earlier the creation of a permanent safely hazard as a result of not infilling and rehabilitating the south pit was a key factor contributing to the Minister for Planning recommending against the Big Hill open cut mining project in 2000. As back filling and rehabilitating the south pit is proposed as part of the current proposal this issue has been resolved. The Panel in 2000 recommended that indigenous plant species should be used for site revegetation and buffer planting associated with the mine area and haul roads. It also recommended that planting should use plants propagated from seeds collected on site and species from the appropriate ecological classes. The planting of indigenous species is not proposed as part of the current project.

In relation to bonds, the 2000 Inquiry Report (Appendix 7) had the preliminary estimate of \$10.3 million for the maximum bond liability.

11.3.3 Other submissions and presentations

(i) Rehabilitation and post mining management

Many written submissions received prior to the hearing raised concerns in relation to the proposed rehabilitation of the overall project area and of Big Hill in particular. Submissions also raised concerns with the post mining management of the area.

The proponent stated at the hearing that the rehabilitation plan would form part of the work plan variation for the project. The draft work plan variation was tabled (document P24) and this plan included a draft concept plan for the Big Hill area prepared by David Turley Landscape Architects. The draft work plan variation indicated that the project area would not be returned to native vegetation such as Box Ironbark Forest, because such vegetation would be an unacceptable fire risk to adjacent residential properties. The proponent also indicated at the hearing (document P87) that the draft concept plan for the Big Hill area had been prepared following consultation with key community and stakeholder organisations, and presented at community information sessions. The EES indicated that the final concept plan design would be negotiated with stakeholders during the first two years of the project and wider community consultation would be undertaken prior to finalisation of the rehabilitation plan for the north pit.

The proponent tabled at the hearing tabled a draft strategy for the finalisation of the master plan for the rehabilitation of the project area (document P131). This draft strategy outlined two steps as follows:

- Pre-work plan stage initiated by SGM. This stage would establish an agreement between SGM, NGSC and DEPI on the principles for the end land use of the project area, the post mining land manager, responsibility for leadership and costs associated with the process and identification of key stakeholders to be involved in development of the final concept master plan. This stage would also finalise the concept plan involving consultation with key stakeholders, and estimate the costs involved with implementing the master plan.

- Post work plan stage initiated by NGSC. This stage would finalise the master plan and confirm the post mining land manager in line with the above agreement. This stage would involve community consultation and endorsement of the master plan by DEPI and NGSC.

DEPI, as the current land manager of most of the Crown land in the Big Hill area, presented a written reply dated 17 July 2014 in response to questions asked by the Panel. DEPI stated that when mining operations were completed, the environmental and public land values of the Crown land would have been eliminated and DEPI would consider the land as surplus to its public land portfolio. Post mining, DEPI's position on rehabilitation would be limited to safety, stability and contamination or other gross impediments to sale. DEPI was neutral regarding the value of the need for restoration, revegetation and provision of infrastructure and regarded that the post mining land use and management should be driven by NGSC and the community. However, before DEPI could agree to a community driven rehabilitation proposal it would need to be confident that future management arrangements would support such a proposal. DEPI was not supportive of large portions of the land being rehabilitated to native vegetation, that is Box Ironbark forest. With respect to future site ownership and management of Crown land outside the project area on cessation of mining, DEPI's position was the same as for land within the project area.

Ms Linley, Chief Executive Officer of NGSC, in her submission (number 288) and presentation at the hearing (document NGSC34), stated that it was important that the reinstated Big Hill provided a legacy for residents and visitors by recognising the contribution of miners and early settlers while providing a community meeting and elevated viewing place. Ms Linley said that NGSC would prefer the site to be rehabilitated to parkland/garden rather than native bush as its proximity to residential areas presented challenges for fire management which would be greater for native bush vegetation. Ms Linley said that, in response to a direction from the Panel at the directions hearing, the Council had met with DEPI to discuss future management of the Big Hill area. She indicated that it was unlikely NGSC would manage the area if it were rehabilitated to Box Ironbark forest and the Council had no intention of becoming the manager of this site should the project not proceed.

Ms Linley said that the rehabilitation plan should include the installation of drinking fountains, irrigation systems for grassed areas, waste receptacles, toilets, parking areas, service utilities and seating and tables, tracks and paths, signage and bike racks. She said management should include removal of weeds, erosion control, pest animal control and the planting of non-invasive species to landscape the area. Ms Linley, in response to questions from the Panel, indicated that NGSC was not opposed to the replanting of Box Ironbark forest in the south of the project area, but would not be interested in managing such vegetation.

In relation to the rehabilitation of Big Hill, Dr Jasper in his EWS (document P12), stated that the vegetation would be established by directly broadcasting seeds, applying seeds with mulches and planting some species as tube stock. He said grasses would provide ground cover within the first year while larger trees would take longer. Dr Jasper indicated that the key rehabilitation objective was to achieve a stable landform with a grass cover which would not constrain future development of the site. Dr Jasper's EWS indicated that the draft concept plan prepared by David Turley Landscape Architects provided for:

- Reinstating Big Hill which would facilitate the viewing of the surrounding region.
- Reinstating the Big Hill Road as well as the pre-existing monuments and memorials.
- Planting designed to create a park environment that could be maintained by using current NGSC practices.
- Installing recreational facilities including picnic table and walking tracks.

Dr Jasper stated that, in his opinion, the draft concept plan was consistent with the anticipated land capability of the rehabilitated backfilled north pit.

Ms Scott Decosta, in her presentation (document S17), raised concerns in relation to backfilling the north pit and reconstructing the Big Hill land form, including what would happen if the mine became uneconomic and ceased to operate. She also expressed concern with the difficulty of establishing trees on the compacted material. Ms Saunders, in her presentation (document S73), stated that the concept revegetation plan had not been subject to full community consultation which should have occurred before it was included in the EES. She was also concerned that the responsibility for the long term management of the site after rehabilitation was uncertain and that neither DEPI or NGSC appeared to want the responsibility.

Mr Magee, in his EWS (document F74), expressed concern with the lack of information in the EES regarding the physical reconstruction. He said that the profile of the reconstructed Big Hill would not be similar to the existing hill and that some of the reconstructed slopes might be unstable. He also expressed the view that Outback Technology (the proponent's rehabilitation consultant) had limited experience with similar rehabilitation projects. Ms Bennett, in her presentation (document B78), raised concern that the Big Hill with constructed slopes and benches would not be returned its original topography. She also raised concerns that the current plans indicated that the hill would not be replanted with trees and understorey that would be needed to prevent erosion. She had concerns in relation to the proposed long term management of the site by NGSC. In her supplementary presentation (document B127), Ms Bennett raised concerns that there had been no genuine community consultation on the proposed concept plan for the reinstated Big Hill. Ms M Byass, in her presentation (document B84), indicated that Big Hill was a sacred site that could not be replicated.

Ms and Mr Kingston, in their presentation (document K86), were concerned that if the price of gold dropped and mining ceased, then Stawell would be left with a giant hole. Mr Kimber, in his presentation (document K102), stated that Big Hill could never be returned to its current 'glory', but would likely become a man-made mountain of grass. Ms Ware, in her presentation (document W104), expressed concern with the stability of the proposed reformed Big Hill and the lack of an agreed master plan or plan for its revegetation. Her concerns in relation to rehabilitation included the possibility of excessive settlement, cracking of the surface, inadequate topsoil being available, risks associated with low rainfall, competition with weeds and grazing by rabbits and kangaroos. She was also concerned that NGSC lacked the skills and resources needed for the long term management of the area.

Ms Hunt, in her presentation (document H106), was concerned that Big Hill would not be restored to its current topography, might be unstable and that the long term management arrangements were uncertain. Ms R Byass, in her presentation (document B110), was

concerned that on past experience, local management of the rehabilitated Big Hill would result in it becoming a weed infested knoll with some overgrown walking tracks. Mr McMahon, in his presentation (document M113), indicated that he was not convinced that SGM had ability to rehabilitate Big Hill and that there must be a guarantee (or bond) in place to ensure that Big Hill would be rehabilitated as soon mining ceased. Ms Raeburn, in her presentation (document R120), and Mr Raeburn, in his presentation (document R121), were concerned that Big Hill would not be restored to its original profile, that settlement might occur and the hill would remain unrestored if the project was put on hold. Dr Saunders, in his presentation (document S125), indicated that the reinstated Big Hill would be different from the current hill and that it would be difficult to re-establish vegetation on the reinstated Big Hill.

(ii) Rehabilitation bond

Information relating to rehabilitation bonds was included in Mr Power's submission to the Panel dated 14 July 2014 (document P87), bond methodology documents (documents P27, P28, P29) provided by Mr Power, and DSDBI's presentation (document DSDBI58). There was further clarification provided during the hearing.

Mr John Mitas, General Manager, Earth Resources Regulation Branch (ERR) of DSDBI explained the legislative basis for the bond and its coverage. Key elements were:

- The quantum of the bond is set by the Minister
- The rehabilitation requirements are specified in an approved plan
- The minister can use the bond money to carry out the rehabilitation
- The bond can be varied or an additional bond imposed
- Bond moneys can be retained for monitoring and completion of rehabilitation
- A bond calculator is available on the DSDBI web site.

Ms Bessie Abbott, Acting Manager of the South Western Region Office of DSDBI referred to the bond calculator as the method preferred by DSDBI to be used for calculating bonds. The bond calculator is an Excel spread sheet, accompanied by the following guidelines: *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries*⁵⁵. The calculator is based on specified typical rehabilitation activities and standard cost rates for each activity. The user calculates the magnitude of the activity, for example the volume of material displaced, and inputs this into the calculator. The calculator applies standard rates to determine the cost of carrying out that activity, which becomes part of the cost for reversing that activity. The standard rates are set at a rate that would be charged by an external contractor without access to the equipment of the operator and cannot be varied without documented justification.

Mr Power explained the application of the bond calculator to the Big Hill project. He said that only an initial bond calculation had been made by the proponent. The final bond value would be based on the following activities:

- Surface disturbance area
- Volume of material to be moved to back fill the pits and reconstruct Big Hill

⁵⁵ at <http://www.energyandresources.vic.gov.au/earth-resources/victorias-earth-resources/minerals>.

- Monument and infrastructure remediation works
- Amenity and monitoring.

Mr Power stated that 'The bonding is proposed to consist of seven separate bank guarantees with each guarantee representing a distinct stage of the operation.' He said that the bond would be calculated for different stages of the project based on the costs for maximum remediation remaining to be achieved at the end of each stage as follows:

- Initial works, end amenity, and monitoring bond. This is payable at the start of the project and would remain 'active' beyond the initial rehabilitation.
- Infrastructure work bond. This bond would apply from the start of infrastructure removal and remain active until the infrastructure would be replaced.
- Bulk material movement bond. The value of the bond would increase in five stages to cover the increasing amount of material movements required to achieve full rehabilitation. The value increases to a maximum at the start of Year 3 and would progressively decrease from thereon at six monthly intervals.

The bond calculation results were provided in documents P28 and P29 and indicated a maximum bond value of \$15.8million, and a residual value at the end of Year 5 of \$1.5million.

A number of submitters, including Ms Saunders, Mr McMahon (document S113), Ms Ware (document W103), and Mr Sellers (Document S122), as well as Mr Magee in his evidence (document S74), raised a variety of issues concerning the bond. The concern underlying these issues was that Big Hill might be left un-rehabilitated or poorly rehabilitated for a long time, possibly forever. A number of arguments were put forward that:

- The bond would not be sufficient to cover the remediation work. If this happened the proponent could forfeit the bond and walk away from the remediation if the economics of the project favoured this. This could also happen if the company became insolvent, or if ownership of the mine changed. Examples of bonds having been inadequate were put forward, including goldmines in Bendigo and Benambra, both of which changed ownership without rehabilitation having been completed.
- More gold might be discovered and the mine put in 'maintenance mode' pending further approvals to extend the life of the mine. Past extensions to the underground mine was used as an example.

During the hearing, DSDBI said that the rehabilitation bond system had been upgraded in recent times and now provided more surety. They gave examples of mines in Victoria that had been successfully rehabilitated including quarries in Lysterfield and Nunawading, and provided data that in the last three years, 19 mines and 41 mining licence areas had been successfully rehabilitated. Ms Abbott emphasised that the bond could be periodically recalculated and that sanctions could be applied, with the ultimate sanction for non-compliance being cancellation of the mining licence.

Although the proponent said that no extension of the project was proposed, the proponent provided no response to the concerns raised about the possibility of further gold discoveries delaying rehabilitation of the Big Hill.

11.4 Discussion

11.4.1 Rehabilitation

The Panel, after reviewing all the information presented, considers that Big Hill will not be able to be restored exactly to its current physical form and that this is a major negative aspect of the project. The Panel also considers that the vegetation on the reinstated Big Hill will not be the same as prior to mining. However, the Panel considers that the project area could be successfully revegetated in order to stabilise the surface of the project area. The Panel is also concerned that many of the details of the rehabilitation program remain unresolved and considers that if the details had been resolved prior to the EES being finalised, then some of the community concerns relating to the post mining component of the project may have been avoided. The Panel considers that the rehabilitation plan for the whole project area as part of the work plan variation should be developed as soon as possible. This would help to alleviate some of the stress being experienced by some members of the community as discussed in Chapter 6, Social Impacts.

The Panel understands the concerns expressed in written submissions and at the hearing that Big Hill will not be restored to its current character. The Panel appreciates that until vegetation other than grasses is well established on the hill (which could take some years) the hill will be a man-made landform with regularly spaced benches and evenly graded grassy slopes. The Panel appreciates that some members of the community will view this outcome as a serious loss compared with the current hill. The Panel considers that this is a major negative aspect of the project.

The Panel considers that it is important that the whole of the project area including the north and south pits and the haul road, is contoured to provide a final landform that is visually compatible with the overall Big Hill landscape. In particular the Panel considers that both the north and south pits should be back filled so that they are stable and do not constrain future land uses, are not prone to erosion, slipping or slumping and are suitable for vegetation establishment. The Panel considers that in order for the surface to support successful revegetation, topsoil should be salvaged, stockpiled separately and respread to a depth of 100mm on rehabilitated areas. The rehabilitated surface should include the construction of grass swales and other measures to drain and treat surface water.

(i) Big Hill north pit area

The Panel notes the recommendation of the Environment Conservation Council (accepted by the Government in 2002) provides for the Big Hill summit area to be managed as a community use area and the Panel considers that project outcome is in line with this recommendation.

The Panel considers that in order to satisfactorily reinstate Big Hill on the site of the north pit the following actions are required:

- The reinstated Big Hill needs to be built to a similar height to the existing summit and blend in with the unmined eastern ridgeline.
- High standard compaction of the back filled material is essential to ensure that settlement is minimal and damage caused to reconstructed infrastructure such as the Big Hill Road and the reinstated monuments and memorials is minimal (see also Chapter 10).

- Consistent, even compaction of the back filled material is essential to avoid uneven settlement that might compromise surface water drainage and lead to erosion.

The Panel considers that the successful establishment of a vegetation cover is essential to ensure the long term stability of the surface of the reinstated Big Hill and if irrigation is required to achieve this outcome, such irrigation should be installed prior to the planting of any trees.

In relation to the concept plan of the Big Hill area, the Panel is very concerned that the plan has not yet been finalised nor as indicated by several presenters has it been subject to comprehensive community consultation. The Panel considers that this should have occurred before the EES was finalised as many of the concerns presented to the Panel related to uncertainty in regard to the final rehabilitated form of Big Hill.

The Panel supports the major elements outlined in the draft concept plan prepared by David Turley Landscape Architects as these appear to generally reflect most of the community expectations as presented to the Panel including:

- Reinstatement of Big Hill and facilitation of the views of the surrounding region from the hill.
- Reinstatement of the Big Hill Road and constructing a small well designed car park on the summit.
- Reconstruction of the monuments and memorials.
- Installation of recreational facilities including picnic table and walking tracks.

The Panel considers that on the information presented by the proponent and NGSC, the process to finalise the concept plan for the Big Hill area could be improved by:

- Allowing the option for replanting indigenous vegetation at least in some parts of the project area and the option to reinstate Reefs Road and/or Scenic Road.
- Consulting the wider community early in the process rather than after stakeholders.
- Providing the timelines for exhibiting the draft concept plan, the period of public exhibition and for the approval process of the final plan.

The Panel considers that an attractive visual outcome could be to keep the reinstated Big Hill summit free of trees to facilitate the extensive views to the surrounding region, to plant trees in a parkland setting around the base of the reinstated Big Hill to satisfy the NGSC maintenance requirement.

(ii) Project area south of the Big Hill (south pit) area

In relation to the rehabilitation of the project area south of the Big Hill precinct, including the south pit and haul road areas, the Panel is concerned that no overall long term plan appears to have yet been developed.

The Panel notes that rehabilitating the project area post mining with Box Ironbark species was supported by many submitters and presenters at the hearing and was a recommendation by the Panel in 2000. The Panel notes that such replanting would be consistent with the SPPF and local planning policies which give support to the planting of local flora species and enhancement of bio-links.

The Panel was surprised by DEPI's view that once the mining operations have been completed within the project area, the core environmental and public land values will have been eliminated. The Panel considers that this assessment is inconsistent with the mapping in the EES which indicated that there are substantial areas of high and very high quality vegetation immediately surrounding the project area, especially adjacent to the haul road, that could be complemented by replanting Box Ironbark species in project area. The Panel also considers that if the project land in this area was to be used for another purpose or sold post mining, it would fragment the vegetated Crown land in this area. The Panel is also concerned that DEPI's decision appears to have been made without any community consultation.

The Panel further notes that in response to questions from the Panel, Ms Linley indicated that NGSC might not oppose post mining revegetation in the south of the project area if it were complementary with the NGSC position on the replanting and landscaping of the re-created Big Hill. The Panel does not believe that such an outcome would necessarily be inconsistent with fire management requirements.

However, the Panel understands that this approach would require agreement between the NGSC, DEPI, DSDBI and SGM and in particular it would require DEPI to consider more options in its approach to outcomes for the Crown land in this area.

The Panel considers that much the Crown land currently held under Mining Licence MIN 5260 could also be rehabilitated with the planting of Box Ironbark forest species on completion of mining. The Panel considers that this would not only complement the high value habitat in the area but also enhance the bio-link between the vegetated Crown land to the south of the project area and the Deep Lead Flora and Fauna Reserve to the north.

11.4.2 Post mining management

The Panel acknowledges the concerns raised in many submissions and presentations relating to the uncertainty of post mining management of the project area. The Panel considers that this matter should have been resolved before the EES was finalised as it appeared to the Panel that this uncertainty heightened the concern of some people with the long term impact of the project.

The Panel is concerned that the proponent's responsibilities post mining and DEPI's and/or NGSC's roles as potential future managers of the project area are still being determined. The very poor condition of much of the Crown land currently for which DEPI is currently responsible does not give the Panel confidence that DEPI would effectively manage any of the Crown land in the long term. The Panel notes that NGSC is prepared to accept management responsibly for some or all of the Crown land post mining, providing that certain conditions are met, in particular that the land is not replanted with Box Ironbark forest.

The Panel notes that monitoring of the project area would continue beyond the life of the operation of the project, especially in relation to the stability of the landform and functioning of the ecosystems. The Panel is concerned that the details of this monitoring and the responsibility for remedial action if required, have not yet been determined. The Panel does not accept that the estimate as stated in the EES that two years would be

sufficient time to ensure that the reinstated Big Hill was completely stable and the vegetation had been successfully established. The Panel considers that it will take a longer time period than two years and monitoring will need to continue in the long term. The Panel considers that the proponent should be responsible for all monitoring and for ensuring the successful establishment of vegetation until handover is agreed with the long term land manager.

11.4.3 Bond

The Panel accepts that the value of the rehabilitation bond would be determined according to the procedure described by the Earth Resources and Regulation Branch of DSDBI and that the unit cost parameters are built into the procedure and set at a value which has been estimated at the rate of an external supplier. However, the Panel notes that the work units are self assessed and could be underestimated. We note however that the Mineral Resources Act provides at section 79A that:

The Minister may require an authority holder to engage an auditor to certify that a rehabilitation liability assessment has been prepared in accordance with subsection (2) and that it is accurate.

The Panel also notes that there is also provision for the bond to be recalculated and for rates to be adjusted. It is therefore unlikely that an inadequate bond would remain in place if appropriately calculated. The current preliminary estimate of the maximum liability of \$15.8 million seems low when compared to the preliminary bond estimate of \$10.3 million for the refilling the northern pit alone (Appendix 7 of the 2000 Inquiry Report).

The Panel notes that the bond is secured by a bank guarantee and could be called on by the Minister irrespective of the solvency or otherwise of the mining licence holder. Therefore, even if the licensee walks away or becomes insolvent, this would not prevent rehabilitation from proceeding. There are also provisions for part of a bond to be finally withheld if rehabilitation is not judged to be satisfactory, and for a bond to be called upon if a licensee delays proceeding with the rehabilitation.

The Panel accepts that the current proposal for Big Hill entails retention of part of the bond to fund ongoing maintenance and restoration activities, including the establishment of vegetation which requires time, and the reinstatement of monuments and infrastructure that may involve waiting for adequate ground settlement. The evidence presented indicated that settlement that may impact on rebuilt infrastructure would continue for several years after completion of the reinstatement of Big Hill. The Panel notes that it was suggested by Mr Power that even if the licence were surrendered, the funds might be put in trust to complete the rehabilitation and compensate for any costs arising from ongoing settlement.

The Panel notes, however, that there is provision for a mine to be put into 'care and maintenance mode' and advice provided by DSDBI indicated that care and maintenance mode can delay rehabilitation for extended periods.

The Panel has some concerns that reassessment of the available reserves that may be accessible from the open cut mine, or insolvency of the operator during mining, are both events that could lead to the mine being put into care and maintenance mode pending the granting of necessary approvals or the sale of assets to another mine operator. This could

see the rehabilitation of the north or south pit or perhaps both pits in the current project being delayed for some time or perhaps indefinitely. The Panel therefore understands the concerns of some residents about the length of time that Big Hill might remain un-rehabilitated should the project be approved, even if a bond was in place.

11.5 Conclusions

The Panel concludes that:

- Big Hill will not be restored exactly to its current physical and that this is a major negative aspect of the project. However, the Panel concludes that the project area could be successfully rehabilitated in terms of vegetation cover and stability of the landform surface.
- The process that is being undertaken to involve the community in developing the rehabilitation outcomes especially for the Big Hill area could be improved. The Panel concludes that the constraints on the options available for the rehabilitation due to positions taken by DEPI and NGSC (especially in relation to not reinstating Box Ironbark forest in the project area) are unfortunate. The Panel also concludes that the wider community should be more actively involved at an early stage in the process proposed to finalise the rehabilitation plan for the overall project area as well as the master plan for the reinstated Big Hill.
- The above negative aspects of the project relating to rehabilitation are not in themselves sufficient to reject the project.
- The proponent's responsibilities and DEPI's and/or NGSC's roles as potential managers for part or the entire Crown land post mining have not yet been determined and should be agreed as soon as possible. The Panel concludes that the uncertainty with the long term management of the site is a negative aspect of the project.
- A bond of sufficient magnitude and security to reinstate and rehabilitate Big Hill could be provided if properly calculated and audited. However, the Panel has some concerns that despite the best intentions, the bond may prove to be inadequate to meet all unanticipated costs involved in the rehabilitation of the project area should it be required to do so. The Panel also has some concerns that events could occur during mining that may lead to the mine being put into care and maintenance mode thereby leading to rehabilitation being deferred and in particular, Big Hill not being reinstated in the projected time frame. The Panel considers that the probability of this happening is low, and the approval of the project should not be withheld solely on the basis of concerns with this possibility.
- Financial arrangements to cover any costs that might arise from the impact of settlement in the long term on the infrastructure constructed on the reinstated Big Hill need to be determined before the project commences.

12. Blasting

12.1 The issue

Blasting involves the use of explosives to fracture rock during mining to facilitate its extraction and to assist in subsequent transport and processing. During the process energy is transferred to the ground resulting in ground vibration and to the air creating air blast (noise). It also can result in flyrock, that is, material that is propelled into the air beyond the area of the blast. The issues associated with this are:

- Potential damage to buildings and structures from the ground vibration
- Annoyance to the public from the air blast
- Risk to public safety from uncontrolled fly rock.

12.2 Regulatory framework

Blasting is guided by DSDBI Environmental Guidelines – *Ground Vibration and Airblast Limits for Blasting in Mines and Quarries*, Minerals and Petroleum Victoria 2001, and controlled through the Environmental Management Plan in the Work Plan. The guidelines are included in Technical Appendix 6 of the EES which relates to blasting and state that the guideline limits applied to sensitive sites such as residences and schools are:

Ground Vibration:

- ≤ 5 mm/s for 95% of blasts in a 12 month period
- ≤ 10 mm/s for all blasts.

Airblast:

- ≤ 115 dBL for 95% of blasts in a 12 month period
- ≤ 120 dBL for all blasts.

The most sensitive sites for the purposes of blast vibration control are: houses closest to the blasting areas; the St Patrick's School; Stawell Secondary College; Skene Street School; the Stawell Library and Community Health Centre; Eventide Homes; and the Stawell Campus of the University of Ballarat. The DSDBI guidelines define a sensitive site as the land within 10m of a residence not necessarily the entire residential property (document P87).

In addition, flyrock must be contained within the mine property and not present a danger to people and property.

There is provision in Australian Standard AS 2187.2 – 2006 for higher vibration levels to be agreed with the house owner/resident.

12.3 Evidence and submissions

The proponent's evidence on blasting comes from the report in Technical Appendix 6 of the EES dated March 2014 by Terrock consulting engineers (Terrock); the expert witness statement of David Lucas dated 17 June 2014 (document P14) which related to geotechnical matters but also was relevant to blasting; and the evidence and discussion in his presentation (document P15) to the Panel on geotechnical issues. Mr Power for SGM also submitted a summary of other relevant material about blasting methodology in his submission (document P87).

12.3.1 Proposed blasting

SGM is proposing to mine the north and south part of Big Hill to recover gold reserves that they believe cannot be won by underground mining. The geotechnical investigation in the EES (Technical Appendix 9) has identified areas where hard rock will require blasting and these have been mapped. The blasting assessment by Terrock (Technical Appendix 6) states that this would be done in accordance with DSDBI guidelines.

Mr Power, in document P87, identified that blasting would be required in the bottom 30 metres of the north pit and the south pit. This would comprise approximately 8% of the area of each pit. The blasting in the north pit would occur in quarters 6 and 7, and in the south pit in quarters 11-14.

12.3.2 Blast design

Mr Power's submissions (document P87) indicated that the blasting assessment used data from 70 production blasts conducted during previous mining of the Davis Pit plus an additional seven single test holes to develop empirical blasting models for the project. The models and industry experience were used to design the critical parameters for a standard blast.

Technical Appendix 6 describes in more detail the models which are used in the assessment to predict ground vibration, air blast, and flyrock, and how they were derived. A model was developed for ground vibration and tested against Davis pit data. Models were also developed for airblast and flyrock throws⁵⁶. The airblast model developed from various data were tested against the former Davis pit blast records and claimed to be predicting '*airblast levels consistent with the measurements*'. The flyrock model was also applied to Davis pit records and predicted a minimum exclusion zone required of 88 metres compared to a separation distance of 140 metres to property boundaries and resulted in '*no reported flyrock incidents*'.

The information was used to derive the following specification for a standard blast:

Hole diameter	76mm
Face height / Hole depth	4m
Stemming Height	2m
Front Row Burden	2m
Explosive charge mass/m	3.6 kg (ANFO)
Column Length	2m

Technical Appendix 6 recognised that measuring the impacts of blasting at sensitive locations would be required to test the predictions and that it may be necessary to make adjustments to the blast design to comply with limits.

⁵⁶ Terrock Flyrock Model by Richards and Moore, 2004 and Terrock Airblast Models by Richards and Moore, 2002.

12.3.3 Vibration

The blasting assessment (Technical Appendix 6) provided evidence on the effects of blasts on ground vibration levels and property damage.

The assessment stated that it had predicted vibration levels at various distances from the blasting areas and derived the 5mm/sec contour. Ground vibration reduces with distance from the blast. For a standard blast design the model predicted that the 5 mm/s contour was 130 metres from the blast. Ground vibration contours were provided in Appendix 1 of Technical Appendix 6.

Nine properties are within this distance of the project based on the above contours. Three of these were predicted to exceed or equal the peak particle velocity limit and modification of the charge mass would be required to comply with the limit. Sections of the blasting area where blasting using the standard specification caused vibration limits to be exceeded were delineated. These zones were mapped and a modified blast design using half the standard charge has been proposed for these zones.

Technical Appendix 6 cited Australian Standard 2187.2 – 2006 for recommended vibration limits for control of damage to unoccupied structures of reinforced concrete or steel, and identified values at which cosmetic cracks in plasterboard can occur. These values are 100 mm/s and 19 mm/s. The appendix also cited advice from GWMWater that 50 mm/s would be acceptable for the AC water main from the Aquatower facility, and also advice from SP Ausnet that 20 mm/s is not to be exceeded at any point on the gas transmission pipelines in Main Street.

The Terrock ground vibration assessment indicated that worst case ground vibration levels would be:

- below the 5 mm/s limit at nearby residences with appropriate blast design
- below protection levels for the underground gas pipeline and AC water pipeline
- below levels for cosmetic damage protection levels in plasterboard
- between 0.4 and 1.0 mm/s for public use and educational facilities: *'The worst case blasts will be just above perception levels of 0.5 mm/s for the nearest blasts.'*

(i) Voids

Mr Power, in document P87, referred to Mr Lucas' evidence *'that no ... ill effects have been recorded from current underground blasts and blasting for the Davis Pit ... for blasts which recorded up to 6.13mm/sec'*; that *'SGM has been conducting blasting in this environment for over 30 years with no evidence of impacts on existing mine voids'*; and *'concluded that it is very unlikely that blasting from the project will cause collapse of underground voids to the surface.'*

Mr Lucas stated in his expert witness statement (document P14) that since the exhibition of the EES, he had *'researched and formed an opinion on geotechnical issues around any potential impacts of blasting on voids.'*

The Panel questioned Mr Lucas as to whether blasting could lead to void collapse away from the mine site. Resident submitters and presenters also queried whether this could occur and cause property damage. Ms Scott Decosta, for example, in her presentation (document

S17), cited examples in New Zealand; Mrs Melbourne, in her submission (document M76), referred to examples of disappearing trees and sink holes in Stawell; and Mrs Ware and Mr Bradley Hunt, in their presentations (documents W104 and H109,) referred to property damage caused by blasting.

Mr Lucas responded by referring to the blast assessment (Technical Appendix 6) and pointed to the fact that blasting had been conducted in the area for many years without any apparent ill effects. In relation to the reported problems in New Zealand, he stated that ground conditions were harder and transmitted vibrations more efficiently in New Zealand than the weathered rock at Stawell. In relation to sink holes, he stated that collapse of unknown voids was a function of historical mining activity and could occur irrespective of blasting. He said he did not believe blasting vibration was a contributing factor at the low predicted displacement velocities, and stated:

SGM will (and should) monitor blast vibrations to ensure that PPV are within expected levels, and are able to adjust charge weights as required to further reduce vibration levels.

A number of presenters asked about procedures for compensation if their properties were damaged and in particular, how compensation would be assessed. No negotiated or agreed system appeared to be in place. Mr Power in response to questions on the issue said that compensation for property damage is available through the provisions of the *Mineral Resources Act*. However any personal injury claim would have to be pursued through legal action.

12.3.4 Air Blast

The model predictions on airblast in Technical Appendix 6 showed that the 115 dB levels would be met at the nearest residential addresses, but that the blasting design may need to be modified if the 115 dB level was to be met at the Middy's store in Upper Main Street, with topographical shielding provided. Airblast assessment contours were provided. At public use and educational facilities, the model predicted airblast levels in 93 to 96 dBL range and well below guideline values.

In his presentation, Mr Jason Lewis (document L112) questioned the effective barrier heights in the Terrock assessment, though these appear to have been measured from a different point on the blast area than that shown in the Terrock report.

(i) Flyrock

In relation to flyrock, the blast assessment predicted the maximum throw distance for both choke blasts and burden blasts to be 22.6 metres (document P87). A factor of 4 was applied to these to determine an exclusion zone around the blast.

Mr Power stated that the blasting assessment found that *'for flyrock, the worst case trajectory path is for the residential premises at 47 Fisher Street ... but no flyrock impacts at this residence are predicted'*. He advised that:

A zone of special blasting will be introduced at 90 metres from Middy's back fence to ensure compliance with the exclusion zone requirements. For some blasts in North Pit, enforcement of the exclusion zone may require stopping

traffic and pedestrians in Main Street, and excluding all members of the public from the exclusion zone area.

For a choke blast, an exclusion zone of 90 metres was estimated to be required. For a burden blast, the exclusion zone was estimated to be 260 metres if a 2 metre face burden was used. This could be reduced to 90 metres by using a 3 metre face burden. The report stated *'that the minimum front row burden for all free face blasts should be standardised at 3.0m.'*

The flyrock exclusion zone is shown in Appendix 2 of Technical Appendix 6.

The Panel sought information from SGM, in relation to the management of the exclusion zone, the use of blast mats, and whether blasting was really required. The Department of Health also raised the matter of the potential risk to public safety. Mr Niederle of DoH stated that the Department's position was that blasting should be undertaken in such a way that there was no risk that flyrock would leave the north pit.

Mr Lucas confirmed in evidence (document P16) that some blasts in the north pit may require *'stopping traffic and pedestrians in Main Street and excluding all members of the public from the exclusion zone.'*

Mr Lucas responded to the questions on the need for blasting. He stated that blasting would likely be needed in the deepest 30 metres of the pit where the rock is classified as requiring *'hard ripping'* and would need light blasting to rip or excavate economically.

The Panel was advised that the proponent is opposed to the use of blast mats. The Terrock report stated that:

Flyrock (and airblast) is more effectively controlled by ensuring the explosion is effectively confined by detailed measurement and logging of stemming material during loading practice. A minimum exclusion zone of 90m has been adopted by mine management which represents 4 times the maximum predicted throw (Factor of Safety 4.0).

DoH noted in their presentation that *'the expertise in blasting sits with DSDBI who have responsibility in administering Reportable Events to holders of Mining Licences and Work Authorities.'* DoH recommended that *'due consideration should be given to the proximity of residents to the mine and the possible impact of flyrock'*.

12.3.5 Complaints

Complaints about airblast are sometimes difficult to distinguish from those about ground vibration as they often occur together or close together.

In his submission on behalf of the proponent (document P87), Mr Power noted that 29 submitters had raised concerns or frustration with the current blasting regime, the potential for damage to houses from blasting and safety issues associated with flyrock.

In an email sent to the Panel during the hearing, Mr Gavin Scott from the Department of Health (document DoH38) wrote:

This project involves a number of regulatory agencies including the Environment Protection Authority (EPA) and also DSDBI, the latter especially from the

perspective of the Work Plan, and that these agencies along with the Northern Grampians Shire Council should understand how they should be working together in a coordinated complaints response approach if issues arise. This includes having clarity around the roles and responsibilities of each agency, and clarity about the complaints response process itself.

Given the complexity associated with this proposal and the number of agencies involved, it would seem prudent that an effective complaints protocol/process, that is capable of being implemented, is agreed to prior to the commencement of the project, should the project be approved.

Dissatisfaction was also expressed by a number of submitters with the complaints response system, leading to suggestions that an independent agency to monitor the mine's adherence to standards and act on lapses was required. Ms Bennett, for example, in her submission (document B78); stated that *'Residents long ago gave up ringing SGM regarding these blasts as there was no meaningful response.'*

An analysis of complaints relating to ground vibration from underground blasting was provided in the Terrock report. From 2004 to 2013 there were 111 events generating 243 complaints from 165 complainants. Surface vibration measurements of fewer than 15 % of these events were over the 5 mm/s limit. Many of the complaints were stated to have been related to blasts lasting for over 8-10 seconds. The report stated that:

Open cut blasting will be perceived differently to underground blasts because they will have a total duration of only 2 - 3 seconds. From experience at other sites, blast events become increasingly annoying to people if they last beyond about 5 seconds. Therefore, blast vibration from surface open cut blasts at the same peak particle velocity will be less annoying than from underground because they will be experienced for about one third of the time.

The Terrock report stated that there is an expectation that blasting vibration effects would still be perceived, but the level of annoyance would be reduced.

The issue of complaints response is further discussed in Section 14.3.4 in this report relating to noise complaints.

12.4 Discussion

Based on the number of complaints received and the number of complainants, it is apparent to the Panel that underground blasting is of ongoing concern to residents, despite vibration limits being set at levels designed to avoid damage to property. While sensitivity to vibration varies, it is clear to the Panel that a considerable number of individuals find it troubling at considerably lower levels. There is clearly a need for better coordination of complaints response and communication.

The Panel accepts that if the project were to proceed, blasting would continue. It would occur at the lower levels of the pits, would be of lower duration than underground blasting, and is expected to be less intrusive because of this. References appended to the Terrock report appear to support this. Nevertheless it would be at levels which would cause some individuals to be affected.

It is not clear to the Panel that involving another agency besides DSDBI in complaints response and enforcement action would be helpful in resolving issues, given action is largely defined by legislation. There could be merit, however, in independent monitoring and reporting.

The Panel considers that the evidence showed that compliance with vibration and airblast limits, and exclusion zones, could be achieved with appropriate attention to design and control of blasting events and by designing blasts to the parameters as listed above. Monitoring of effects would be required, however, to validate this and provide feedback for appropriate modifications. Appointment of a responsible officer to sign off on each blast is a mechanism which could reduce the possibility of mishaps and reduce uncertainty. The Panel considers that the factors that lead to unexpected blasting outcomes appear to be well understood and would be able to be controlled with appropriate management.

The Panel considers that, from a public safety point of view, uncontrolled flyrock is potentially the most problematic issue. This is recognised by application of a factor of safety of 4 to the maximum predicted throw distance.

The Panel considers, however, that if ensuring this safety factor for certain blasts would require the exclusion of public access from part of Upper Main Street, or householders staying indoors or vacating properties located in that street during blasting, this would not be acceptable. Smaller blasts that would not require such an extensive exclusion zone should instead be used. We consider that the blasts should be undertaken in such a way that the safety factor of 4 is met entirely within the site boundary.

The Panel notes that the supplementary use of blast mats is a contentious issue. The proponent has maintained that blasting can be most appropriately controlled through proper management and design of blasting. It is said that blast mats are not foolproof and there would be some practical issues in using them in this situation. The problems were not fully elaborated but we consider that, since only light blasting would be used in a predominantly rip and dig operation, other measures to control fly rock may be adequate. This is a matter which should be determined by DSDBI. Additionally, the proponent has proposed to conduct blasting at fixed times, and enhance the current system of forewarning residents of each blast.

The Panel accepts that damage to property resulting from blasting would not likely occur. Some resident submitters have suggested that property inspections should be undertaken before and after blasting to access for possible damage. The Panel notes that the predicted vibration levels are lower than the guidelines at most residences and that these guidelines are designed to avoid even minor damage. However, a few residences in Fisher Street were predicted to experience vibration levels that exceed the guideline values. The blasting in this area must be managed to ensure that these exceedances do not occur. For these properties, inspections would be valuable prior to any works on site commencing.

12.5 Conclusions

The Panel concludes that:

- Blasting might be undertaken in a manner that meets the guideline limits relating to vibration, airblast and flyrock.
- Although within guideline limits, vibration levels would be above the level of annoyance and likely to lead to complaints from more sensitive individuals.
- Blasting should only be undertaken in such a way that it would not require the exclusion of public access to part of Upper Main Street (or properties located in that street) and that this may require the use of smaller blasts than currently proposed in the EES.
- Blasting should be undertaken so that the exclusion zone with a safety factor of 4 is contained within the site boundary.
- Close attention to blast design parameters would be required to meet blast impact criteria.

12.6 Comparison with the 2000 EES Inquiry Report

The conclusions in the current assessment are in accord with those reached by the 2000 Panel. The conditions we have suggested in Section 8.3.2, which should be applied through the Work Plan Variation if the project proceeds, also broadly agree with those suggested by the earlier Panel, except as follows:

- Detailed specifications of the blast parameters have not been included for the current project because, as argued by the proponent, overly prescriptive requirements would limit the use of suitable options. We consider that blast controls can be adequately implemented through development of an approved blast management plan.
- The requirement for use of blasting mats for blasts within 100m of an occupied house has not been included by this Panel. In lieu, we have suggested a requirement that blasts be designed so that no houses or roads are within an exclusion zone designed with a safety factor of 4.
- A requirement to have all blasts approved by an appointed responsible officer has been added for the current project.
- The DSDBI limit of 5 mm/s has been adopted. The 2000 Panel had adopted a 3 mm/s limit which had been proposed by the proponent at the time.

13. Heritage

13.1 The issue

The key heritage issues are the impact on heritage sites and features already identified and the management of any unexpected features discovered during the project's detailed design and construction phases. The project will require the removal of most of the current Big Hill landform which has been associated with the mining history of Stawell since European settlers first developed the area. The project will also require the removal of many of the remaining relics of early mining activities on the hill.

Further, the project will involve the relocation, storage and reinstatement of a number of monuments and memorials currently located on Big Hill. Many submitters were concerned with the proposed relocation of the monuments and memorials currently located on Big Hill. Others were concerned that the assessed significance of the mining relics underrated their importance to the local community and that they would be destroyed. Some were concerned with the removal of the Big Hill landform itself as an element of the natural environment as they believed the hill could not be effectively recreated after mining is completed.

13.2 Legislative context

The *Commonwealth Environment and Heritage Legislation Amendment Act (No. 1) 2003* prescribes criteria for the nomination of places for listing on the National Heritage List and Commonwealth Heritage List. The Register of the National Estate (RNE) was formerly a statutory register that was established under the Australian *Heritage Commission Act 1975*. While this Act has been repealed, the RNE has been retained without any statutory standing.

The State *Heritage Act 1995* provides for the protection and conservation of structures, sites and places of State-wide cultural significance. It also provides legislative protection and for the issue of permits to regulate changes to sites, features or places of outstanding cultural significance that have been listed on the Victorian Heritage Register (VHR). These are generally above ground features. The Heritage Act also establishes the Victorian Heritage Inventory (VHI), which lists known areas where archaeological relics are located and all known occurrences of archaeological relics. Consent from Heritage Victoria is required to disturb or destroy historical sites, places, buildings or structures listed on the VHR or VHI.

The *Planning and Environment Act 1987* provides statutory protection of sites of at least local significance through Heritage Overlays in local government planning schemes. Municipal councils are responsible for issuing planning permits for the development of heritage sites and structures included in Heritage Overlays.

13.3 Evidence and submissions

13.3.1 EES information

The Historic Heritage Assessment, Chapter 8.4 and Technical Appendix 4 of the EES presented historic heritage information for the survey area which comprised the project area and some surrounding land including the whole of the Big Hill area. This survey involving both desktop and field assessment, identified 15 potential historic heritage sites

and features comprising a mix of monuments and memorials, mining relics, and archaeological relics associated with past gold mining activities. The survey found that the mining landscape on Big Hill is highly degraded with the surviving archaeological relics lacking the context of the fabric of the associated mines that produced them. Being post-1880, the sites do not relate to the most significant large scale mines of the early period of mining on Big Hill.

The EES indicated that there was one site included on the RNE which is partly located in the survey area ie Big Hill (western portion) which takes in the whole western area of Big Hill. Items noted in the listing include the Pioneer memorial, the Quartz Reef Memorial, the remains of the 1880's water supply system and the Apex arboretum. The registration states that the items do not individually reach the threshold of National Estate significance and that other sites in the Stawell region more ably demonstrate the mining heritage of the Stawell region.

The EES indicated that there were no sites in the survey area listed on the VHR, however there were four site listed on the VHI. These sites are listed below together with the implications of the project for each site.

- Big Hill Mine site – an undefined entry. It is proposed that in consultation with Heritage Victoria, this entry will be defined in terms of the extent and description outlined in the EES.
- Stawell District Memorial – As this is not an archaeological site feature, Heritage Victoria have requested that this site be removed from the VHI.
- Scotchmans and Sloan Co – This site covers a large area of land impacted by both the north and south pits, and the TWRS and therefore will be impacted by the project.
- Leviathan Mine Cyanide Works – This site is partially located within the area around the haul road north of Mt Micke, but will not be impacted by the project.

Figure 8: Apex Arboretum entrance
Source: Ms Byass



The EES indicated that no features within the study area were included in the Heritage Overlay of the Northern Grampians Planning Scheme. The Shire of Northern Grampians – Stage 2 Heritage Study (W Jacobs et al 18 August 2004: Volumes 1 & 9) recommended that the Big Hill Historic Precinct be included in the Heritage Overlay of the Northern Grampians Planning Scheme. However, action to achieve this outcome has not been taken by the NGSC.

The EES indicated that in relation to the 15 sites identified in the survey, all were assessed as being of local cultural heritage significance. Five sites relating to the mining history on Big Hill will be lost as a result of the project and these will be photographically recorded before work commences to ensure that the history of the area is recorded and made available to the Stawell community. One non-mining heritage site (the Moray water races) will also be lost.

The monuments, memorials and other non-mining historic sites assessed in the survey area and the impact of the project on each site is outlined as follows:

- Memorial arboretum, memorial seat and drinking fountain (site 1) – located between Upper Main Street and Big Hill Road. The project would require the removal of these features, temporary storage of the seat and drinking fountain and reinstatement after completion of mining.
- Apex Arboretum and gate (site 2) – located south west of the junction of Main Road and Big Hill Road. The project would require the removal of these features, temporary storage of the gate and reinstatement after completion of mining.
- Big Hill lookout, Pioneer memorial rotunda, Dane memorial seat and Water supply memorial (site 3) – located on the top of Big Hill. The project will require the removal of these features, temporary storage and reinstatement after completion of mining.
- Quartz reef discovery monument (site 4) – located about 75 metres southeast of the junction of Upper Main Street and Big Hill Road. The project will require its removal, temporary storage and reinstatement after completion of mining.
- Moray Graves and water races (site 5) – located in the western corner of a large paddock on the south side of Crowlands Road. The graves are outside the project area and will be protected by a 30 metre buffer from the TWRS, but the water races will be affected by the project. Prior to any work taking place that may impact on this site consent will be required from Heritage Victoria.

Figure 9: Big Hill Pioneer Memorial
Source: Ms Byass



The mining related historic sites assessed in the survey area and the impact of the project on each site is outlined below. It should be noted that prior to any work taking place at any of these sites, consent would be required from HV.

- Scott's open cut (site 6) – located north of the summit of Big Hill. The project will require the removal of this feature.
- Allen's open cut and haulage tunnel (site 7) – located south of the summit of Big Hill. The project will require the removal of this feature.
- Unnamed open cut (site 8) – located on the south side of Reefs Road just north of Davis open cut. The project would require the removal of this feature.
- Ulster tunnel (site 9) – the tunnel entrance is located beside a dirt track about 70 metres west to the Ulster ventilation shaft. The tunnel is located outside the footprint of the proposed south pit and will not be affected by the project as planned. It could be affected if the south pit was extended in the future further south beyond the currently proposed footprint.
- Engine beds, Scotchman's United mine (site 10) – located on the west side of a dirt track about 50 metres south of the Apex Arboretum gate. These features appear to be located within the project boundary but just outside the footprint of the north pit. They may be able to be buried prior to works commencing to provide protection.
- Engine bed and probable battery site (site 11) – located about 40 metres south east of Scenic Road down hill from the exit of Allen's open cut haulage tunnel. These features appear to be located within the project area, but just outside the footprint of the north pit. They may be able to be buried prior to works commencing to provide protection.
- Decantation tower ruins and dam and engine beds, A1 Perthshire mine (site 12) – located a short distance from the track behind the houses along Fisher Street, approximately opposite the junction of Fisher and Crudace Streets. This feature is outside the project area and care will be taken to ensure this site is protected from any works in this area.

- Shaft and engine bed, A1 Perthshire mine (site 13) – located on the east side of Scenic Road near the western end of Davis open cut. This feature lies within the footprint of the south pit and will be destroyed by the project.
- Albion cyanide works (site 14) – located south of the Davis open cut. This feature lies within the footprint of the south pit and will be destroyed by the project.
- Federal mine engine beds and shaft (site 15) – located about 100 metres east of the junction of Fisher Street and Duke Street. The feature is located outside the project area and no machinery will be permitted south of the existing dirt track to protect this site.

Figure 10: Mining Heritage
Source: Mr Cameron



13.3.2 Comparison with the 2000 EES Inquiry Report

As concern with the impact on heritage values was one of the factors that contributed to the Minister for Planning recommending against the Big Hill open cut mining project in 2000, consideration of the recommendations of the Panel and the Minister's assessment in 2000 is relevant to the current project. The key recommendations relating to heritage and the response of the proponent in relation to the current project are as follows:

- The 2000 Panel considered that the proposal should not be constrained by the existence of a number of heritage sites. *Response* – The current assessment has redefined the cultural heritage values and found that no specific sites or features have sufficiently high significance to reject the project.

- The 2000 Panel considered that all existing features should be recorded (including memorials which are to be reinstated). *Response* – all existing features and memorials have been recorded and if HV determines that further recording is necessary as part of its consent process, then this will be done.

The Minister's assessment in 2000 stated:

Several monuments of heritage value could be temporarily relocated and then replaced after the reconstruction of Big Hill, though the heritage values of the assemblage of monuments and remnants of nineteenth-century mining operations could not be satisfactorily maintained.

13.3.3 Other submissions and presentations

Many submitters and presenters expressed the view that the Stawell community highly values the connection with Big Hill and would feel a sense of loss more than the loss of a number of individual sites assessed as of local heritage significance may imply. Many submitters and presenters also believed the significance of Big Hill could not be recreated by the reconstruction of a new landform on the Big Hill site.

Mrs Melbourne, in her hearing presentation (document M76), stated that Big Hill (including Scott's and Allen's open cuts) reflects the former mining activities in the area and, together with the memorials to the pioneers, should be left intact. She was concerned that the proposal would lead to permanent loss of Scenic Road and Reefs Road. Ms Bennett, in her presentation (B78), expressed concern with the impact of the project on the Pioneers' memorial and the drinking fountain, and that the Quartz reef memorial could not be reinstated because it would need the skills of the person who originally constructed it who is not available. She also stated that the memorial seat is incorrectly called the Dane memorial seat in the EES. Ms Bennett was concerned with the loss of trees from the Memorial arboretum and the possible instability of the ground where the re-erection of the Pioneer memorial is proposed. Ms Kossowski, in her presentation (K80), and Dr Saunders in his presentation (document S125), expressed concern about the loss of the structures on Big Hill and the impact on the time capsule in the foundation stone of the Pioneer memorial. Ms M Byass, in her presentation (B85,) considered Big Hill a sacred place.

Mr Cameron, an employee of SGM and a member of the Stawell Historical Society, in his presentation (document C114), indicated that many of the historic mining sites that he was interested in will be destroyed by the project. He presented specific information on, and recommendations for, a number of specific sites as follows:

- Scott's and Allen's open cuts, and Albion cyanide works should be stripped of vegetation and comprehensively photographed (including from the air).
- Scotchmans United engine bed should be covered with dirt to protect the site and the dirt should be removed at the end of the mining operations.
- Engine bed and battery (site 11) should be covered with dirt to protect the site and the dirt should be removed at the end of the mining operations.
- A1 Perthshire engine bed should be relocated if possible and if not comprehensively photographed.

- Ulster tunnel should be preserved and any extension of the south pit should not be permitted.
- Alluvial mine working at the corner of Leviathan Road, Bulgana Road and Albion Road could be preserved if the proposed haul road is relocated.

Mr Cameron also proposed that any underground historic workings exposed by the project should be photographed wherever possible and a replica poppet head build on the reconstructed Big Hill.

The proponent advised (document P87) that NGSC on 5 May 2014 determined not to proceed with a planning scheme amendment (C17) that would have applied a Heritage Overlay to 500 heritage precincts and 524 individual properties, including some aspects of Big Hill.

The Panel inspected the heritage sites in the survey area several times including during the accompanied site inspection on 17 July 2014. The Panel viewed the memorials and monuments on Big Hill and many of the other 15 mapped heritage sites.

13.4 Discussion

The Panel considers that the survey of heritage sites in the study area outlined in the EES was comprehensive. The Panel accepts that the mining landscape of Big Hill is highly degraded with the surviving archaeological relics lacking context of the fabric of the mines that produced them. As no compelling evidence to the contrary was presented to the Panel, it accepts that the assessment of all 15 sites in the survey area are of local significance is appropriate.

The Panel understands that many submitters and presenters highly value the connection with Big Hill and its monuments and memorials and that this connection may not be able to be restored to their satisfaction by the reconstruction of the monuments and memorials on a reinstated Big Hill. The Panel also appreciates that some people might feel a sense of loss more than the loss of a number of individual sites of local heritage significance may imply.

The Panel has some concerns with the effectiveness of the re-creation of Big Hill (see Chapter 11), and that structural difficulties may be encountered with the dismantling and rebuilding of some of the monuments and memorials. However, the Panel does not consider that these considerations are sufficiently serious to reject the project.

The Panel appreciates the evidence presented by Mr Cameron and understands his position as an employee of SGM. Mr Cameron had obviously undertaken detailed research on individual historic sites on Big Hill and made some good suggestions in regard to their future management.

The Panel accepts that five sites relating to the mining history on Big Hill, and one other historic site will be lost as a result of the project. The Panel notes that in the Minister's assessment in 2000, his view was that the remnants of nineteenth-century mining operations could not be satisfactorily maintained if the then proposed project proceeded (which would have had a similar impact on heritage sites to the current project).

The Panel considers that the project will impact on the mining heritage of Stawell and Big Hill in particular and is most unfortunate, but this loss is not in itself of such significance so

as to reject the project. If the project proceeds, the Panel considers that these five sites should be comprehensively photographed before work commences to ensure that the history of the area would be recorded and made available to the Stawell community. The Panel also considers that the following action should be taken in relation to the specific sites as follows:

- Scotchmans United engine bed and battery (site 11) should be covered with dirt to protect the site (as proposed by the proponent) and the dirt be removed at the end of the mining operations.
- Ulster tunnel (site 9) should be preserved and protected from damage and any extension of the south pit should not be permitted.
- The impact on the alluvial mine workings at the corner of Leviathan Road, Bulgana Road and Albion Road be reduced by investigating the relocation of the proposed haul road at this site (see Section 17.3).

The Panel also agrees with Mr Cameron that any underground historic workings exposed by the project should be photographed wherever possible. The Panel does not agree with Mr Cameron that a replica poppet head should be built on the reconstructed Big Hill as it considers that interpreting existing mining era relics such as those located in the Moonlight Magdala Mine Historic and Cultural Features Reserve would be a better use of resources.

The Panel considers that it is regrettable that the NGSC has not adopted the recommendations of the report 'The Shire of Northern Grampians – Stage 2 Heritage Study' (W Jacobs et al 18 August 2004: Volumes 1 & 9) that the Big Hill Historic Precinct be included in the Heritage Overlay of the Northern Grampians Planning Scheme. The Panel notes that such inclusion would not lead to any additional permits being required for this project (as it is exempt from permits required under the planning scheme), but it would provide for better protection of sites relating to the mining era of Stawell not affected by this project.

13.5 Conclusions

The Panel concludes that the project will have a negative impact on the heritage assets relating to the mining history of Stawell and Big Hill in particular. The individual mining relic sites may have been assessed as of local heritage significance and may lack the context of the mines that created them, but the Panel concludes that, to many people in the Stawell community, the assemblage of mining relic sites on Big Hill has a greater overall significance than the assessment might imply. The Panel concludes that neither Big Hill itself, nor the existing monuments and memorials, may be able to be reconstructed and reinstated to the satisfaction of many people in the Stawell community.

The Panel concludes that the impact of the project on the relics of the alluvial workings at the corner of Leviathan Road, Bulgana Road and Albion Road may be able to be reduced by relocating the proposed haul road at this site (see Chapter 17.3).

The Panel also concludes that it is most unfortunate that NGSC has not included the heritage sites in the Big Hill precinct in the Heritage Overlay of the Northern Grampians Planning Scheme, as this would provide for better protection of sites relating to the mining era of Stawell that are not affected by this project.

The Panel concludes that the above negative aspects of the project recommend against the project but would not be alone sufficient to reject the project.

14. Visual and landscape

14.1 The issue

The key visual and landscape issue is that as the project will require the removal of a large part of the highly visible Big Hill located close to the centre of Stawell, it will have a major short to medium term impact on the Stawell landscape setting. However, in the long term, the impacts are less clear. While it is said by the project proponent that after Big Hill is reconstructed and the vegetation has become well established, the hill's appearance would be restored or even improved, including by the removal of the unattractive communications tower and fire lookout, the final built form outcome and planting plan remain unresolved.

Figure 11: Big Hill as visual backdrop to town (north pit site visible)

Source: Ms Byass



Key issues relating to visual and landscaping matters raised by the members of community during the preparation of the EES and at the hearing included concern with the reduced amenity arising from the removal of Big Hill during the project (especially for residents living near Big Hill) and a reduced sense of place and connection to Stawell (both in the short and long term). Other concerns related to the loss of views of Big Hill and its role as a site for viewing the surrounding area (particularly the Grampians) in the short term, and concern that the reinstated Big Hill may never satisfactorily visually replace the existing Big Hill.

A particular issue relating to the EES that was raised during the hearing was that some of the visual representations of the reinstated Big Hill showing it to be reforested, such as in the public brochure of the project and in the EES, no longer represented the current proposals of how Big Hill would be reinstated (as presented at the hearing).

Figure 12: View to Big Hill from Crowlands Road
Source: Ms Byass



14.2 Legislation and policy context

There are no national or state legislative requirements or policies specifically relating to visual or landscape impacts. However, environmental, heritage and planning legislation, and government policies that are indirectly relevant to visual and landscape impacts include the *Heritage Act 1995*, the *Aboriginal Heritage Act 2006*, the *Planning and Environment Act 1987*, the *Native Vegetation Permitted Clearing Regulations: Biodiversity Assessment Guidelines* (DEPI 2013) and the Northern Grampians Planning Scheme (Planning Scheme).

Notably, the State Planning Policy Framework (SPPF) of the Planning Scheme includes policies at Clause 12 relating to Environmental and Landscape Values. They include:

Planning should help to protect the health of ecological systems and the biodiversity they support (including ecosystems, habitats, species and genetic diversity) and conserve areas with identified environmental and landscape values

and

Planning should protect sites and features of nature conservation, biodiversity, geological or landscape value. (Panel emphasis)

Clause 12.04-2 relates to 'Landscapes' in particular. It includes an objective to '*protect landscapes and significant open spaces that contribute to character, identity and sustainable environments*' and a related strategy to '*ensure natural key features are protected and enhanced*'.

Clause 21.10 of the Local Planning Policy Framework (LPPF) of the Planning Scheme also recognises the landscape values of the Shire. The clause includes:

The environmental attributes and natural beauty of the Shire make the area a beautiful place to live and visit. Management of the environment, sustainability of land forms, biodiversity principles and catchment

management strategies are important tools to foster conservation of the environment and need to be embraced by the community in general.

14.3 Evidence and submissions

14.3.1 EES information

The Visual and Landscape Assessment, in Chapter 8.15 and Technical Appendix 14 of the EES, assessed the visual and landscape impacts that would occur as Big Hill was mined, backfilled and rehabilitated. These impacts included that the project would have a substantial short to medium term impact on the physically and culturally significant Big Hill, as well as on the monuments and memorials located on the hill. The assessment indicated that the visual impact would be greatest at locations closest to Big Hill where the viewing distance was the least and where there was the least foreground infrastructure to mitigate the impact.

The EES stated that, in the view of the proponent's consultants, Memla and Landdance Landscape Architects, the current Big Hill summit was at best extremely compromised, and at worst severely degraded. The EES indicated that although there would be an extensive temporary visual change to Big Hill, there was potential to improve the hill's visual amenity in the long term after completion of mining and reinstatement of the hill.

The EES presented many views including from the air and from the ground in the Stawell area of how Big Hill currently looked, how it would look at different stages during mining operations and how it would look after the assumed rehabilitation and revegetation. The representations showing how the rehabilitated Big Hill would look in the long term, however, appear to be no longer relevant (see below).

In relation to the TWRS, the assessment indicated that most people would regard the view of the TWRS, that is a hill of waste rock, to be inferior to a view of an open paddock, thus the visual impact of the TWRS would be high. However the EES suggests that, based on the low number of people who would view the TWRS from Crowlands Road and its temporary nature, the visual impact of the TWRS would be within acceptable limits.

The mitigation measures proposed in the EES and presented in the visual modelling assumed that Big Hill would be reinstated to approximately its current topography and the entire site would be revegetated with appropriate native species of plants. The site rehabilitation would also involve the reinstatement of at least some of the monuments and memorials on the top of Big Hill.

14.3.2 Comparison with the 2000 EES Inquiry Report

The 2000 Panel concluded that it was not prepared to recommend the then Big Hill Project as it would have resulted in an unacceptable void (south pit) in the immediate proximity to dwellings within the limits of the city's major landscape feature. The current project proposes to completely back fill the south pit, thus overcoming this objection. The Minister's assessment in 2000 also stated that some loss of amenity to the adjoining residents would be involved with the then proposal, since mining operations on the overlooking hill would cause at least a significant visual impact. The current project would have a similar effect.

14.3.3 Other submissions and presentations

Many of the written submissions raised concerns with the impact on the views of Big Hill and on the views of the surrounding region currently available from the summit of the hill.

DEPI, as the current land manager of much of the Crown land in the Big Hill area and most of the Crown land in the project area, in response to questions asked by the Panel, stated in a written reply dated 17 July 2014 that once the proposed mining operations were completed, DEPI would be neutral regarding the value of the need for restoration of the existing topography, revegetation and provision of infrastructure. The letter also stated that DEPI would not be supportive of large portions of the land being rehabilitated to native vegetation, that is Box Ironbark forest.

Included in the draft work plan variation (document P24) and Dr Jasper's EWS (document P12), was a draft concept plan for the reinstated Big Hill which proposed that none of the area of Big Hill be replanted with indigenous vegetation and the summit area planted only with grass (see Chapter 11 for details).

Ms Linley, Chief Executive Officer of NGSC in her presentation at the hearing (document NGSC34), stated that NGSC would prefer the site to be rehabilitated to parkland/garden rather than native bush (presumably Box Ironbark forest).

The proponent, in response to questions from the Panel, conceded that many of the visual representations in the EES were no longer relevant and that the proponent would be prepared to cover the cost of preparing revised visual representations that reflected the updated proposals for the rehabilitation of Big Hill.

At the hearing, Ms Saunders, in her presentation (document S73), referred to the draft rehabilitation concept plan for Big Hill included in the draft work plan variation. She said that the plan should have been subject to full community consultation before visual images were included in the EES. She indicated that her residence faced the north west side of Big Hill and the hill's destruction would be unacceptable to her. Mrs Melbourne, in her presentation (document M76), expressed concern about the loss of Big Hill as a viewing point especially of the Grampians.

Ms Kossowski, in her presentation (document K80), indicated that the visual representations in the EES were inadequate and that the view points had been chosen to give the least favourable impression of the visual contribution of the hill. She also said that photographs of the project in year one should have been presented. She stated that the photographs of the current conditions appeared to present a 'more arid' view than the post-mining representations. Ms Kossowski presented critical information on particular photographs included in the EES and did not consider that Big Hill was an 'eye sore' as suggested in the EES but a much admired and frequently visited site. In response to Panel questions she said the towers on Big Hill were accepted by the community and were not considered to be unacceptably unattractive.

Ms M Byass, in her presentation (document B84), indicated that the Big Hill landform formed an iconic skyline. Ms Ware, in her presentation (document W103), expressed concern that the loss of the current vegetation on Big Hill would impact on the views from her house. Dr Letts, in his presentation (document L117), was concerned with some aspects of the visual

assessment including the description of the current vegetation being modified/scattered. He stated that as the crest of hill will be lowered and the ridge turned in to a step, the current view will be reduced to a bare rock wall. Dr Letts also included some visual presentations. Ms Collins (C124) stated that the 360 degree views Big Hill were ‘amazing’ and were important for viewing fires in the area.

The Panel inspected Big Hill and the site of the TWRS on several occasions including during the accompanied site inspection on 17 July 2014. The Panel observed the extensive views from the summit in different weather conditions and also viewed Big Hill from different locations around the Stawell township, including some of the sites referred to in Ms Kossowski’s submission.

14.4 Discussion

The Panel understands the concerns expressed in many written submissions and in many presentations at the hearing that, in the short to medium term, the project will have a major adverse impact on the views of Big Hill and its utility as a viewing point and place of recreation and contemplation. The Panel appreciates that Big Hill is a significant landmark for the Stawell community. It is clear that many residents highly value the views of Big Hill and are distressed by the prospect of the loss of these views as well as loss of physical access to the site.

In the Panel’s view, Big Hill and adjoining parts of the ridge provide a visually strong treed setting for the town. The Panel agrees that the project will have a major short to medium term adverse impact on the town backdrop especially when viewed from within Stawell township but also from further away. The Panel agrees with Ms Kossowski and other presenters that some of the visual representations presented in the EES were misleading. The Panel’s concerns in this regard include that:

- The photographs of the existing situation appeared to have been taken during dry conditions and therefore the before and after representations are not strictly comparable.
- The views of the rehabilitated Big Hill appeared to be based on the assumption that the hill would be substantially revegetated with indigenous Box Ironbark vegetation (as confirmed in the EES text). This was acknowledged as incorrect by the proponent, the reason being that it had become clear only later that neither DEPI (the current manager of most Crown land in the project area) nor NGSC (the future potential land manager of some or all the Crown land in the project area), support Big Hill being replanted with indigenous vegetation.

The Panel notes that the draft rehabilitation concept plan for Big Hill included in the draft Work Plan Variation updates the revegetation concept in line with the NGSC and DEPI views and indicates that only grass will be planted on the upper part of Big Hill. Nevertheless, the proponent continued to say that the rehabilitation concept was not finalised and community consultation on the plan was still to be undertaken. It therefore appears to the Panel that there was still confusion and uncertainty, at least around the revegetation component of the visual outcome of the project.

The Panel considers that it has been most unfortunate that the brochure outlining the project that was made available to the public during the preparation of the EES included a

representation of the rehabilitated Big Hill planted largely with native vegetation when this option has apparently now been abandoned. The Panel agrees with Ms Saunders and other presenters that the concept plan included in the draft Work Plan Variation should have been subject to full community consultation and finalised at least before the Inquiry hearing if not before the EES documentation was completed. This would have avoided the uncertainty which now exists around the visual presentation of the reinstated Big Hill.

The Panel notes that the proponent is prepared to cover the cost of preparing revised visual representations that reflect the current proposals for the rehabilitated Big Hill. Such visual representations would give the community a more accurate understanding of what Big Hill would look like after rehabilitation and would be likely to assist community involvement in finalising the concept plan.

The Panel considers that, not only would the open cut mining activities on the current Big Hill cause significant short and medium term adverse visual impacts, but some Stawell residents would feel that the rehabilitated Big Hill would be an inadequate or indeed specious replacement. The Panel agrees that a recreated landform could never completely replicate the existing Big Hill and the visual impact to some degree will be permanent. However, in the Panel's view, if the project were to proceed, in the longer term, after Big Hill was reconstructed and the vegetation was well established, in the Panel's view the hill's appearance might not be unacceptable. The Panel also considers that the removal of the unattractive communications tower and to a lesser extent the fire lookout tower would be visually beneficial. The Panel nevertheless appreciates that the trees that are planted on the reinstated Big Hill will take some years to grow and in the meantime, the hill will look like a grass-covered man-made hill. The Panel considers that this is a major negative aspect of the project.

Many submissions and presentations indicated that the views currently available from Big Hill of the surrounding region, and in particular the Grampians, are excellent. These claims are irrefutably accurate. It was also said by presenters such as Ms R Byass that the hill offers a place for quiet contemplation. The Panel understands that the relative psychological remoteness of elevated parts of the hill from the urban environment combined with the expansive sky and landscape views would be appreciated by many people as creating a peaceful or reflective place. The Panel appreciates the concern expressed by many about the loss of access to the views and to the site for recreational and contemplation purposes during operation of the project and perhaps for some time afterwards. The Panel considers this to be a negative social impact of the project (see Chapter 6). However, given public access to the hill is proposed to be restored after its reinstatement, the loss of these views and access to the hill for five years (and perhaps for some more years) would be insufficient grounds alone to reject this project.

14.5 Conclusions

The Panel concludes that the activities associated with the open cut mining will have major short to medium term adverse impacts on the views of Big Hill especially from within Stawell township but also from further away. The Panel also concludes that a recreated land form will never completely replicate the existing Big Hill and the visual impact to some degree will be permanent. The Panel further concludes that planted trees will take some years to grow

on the reinstated Big Hill and in the meantime, the hill will be look like a grass-covered man-made hill.

The Panel also considers that it is most unfortunate that neither DEPI nor NGSC support any of the project area being revegetated with indigenous vegetation.

The Panel concludes that these are negative impacts associated with the project.

The Panel also concludes that the above visual impacts would cause significant distress to many residents. This, in combination with community concerns about loss for some years of physical access to the hill and the views it offers, as well as uncertainty around the reinstated outcomes, comprise a negative social impact to be weighed when the approval of the project is considered.

15. Flora and fauna

15.1 The Issue

The project will impact on native vegetation and flora and fauna species listed under the State FFG Act. However, the EES suggests that it will impact on any flora, fauna or ecological communities listed under the Commonwealth EPBC Act.

The project will result in the removal of areas of remnant Box Ironbark forest and a number of scattered trees associated with the Box Ironbark community and will require a native vegetation offset plan. The project will also require the removal of most of the trees in the Apex and Memorial Arboretums.

Many written submissions and presentations at the hearing raised concerns with the impact of the project on native vegetation and also on the existing non-indigenous trees on Big Hill, including in the Apex Arboretum.

15.2 Legislative and policy context

The Commonwealth EPBC Act provides that any actions that are likely to have a significant impact on matters of national significance as defined by the EPBC Act are subject to rigorous assessment and require approval by the Australian Government.

The Victorian FFG Act requires a permit to take and/or disturb protected flora and fauna as declared under the Act. However the Flora and Fauna Guarantee (Mineral Resources Development) Order 1994 authorises the taking of protected flora authorised by or incidental to mining works under a mining licence, providing that such works comply with the specified terms and conditions set out in the Order (refer document P30).

The *Wildlife Act* 1975 requires a permit to be obtained for the inspection, removal or relocation of any fauna species.

The *Planning and Environment Act* 1987 requires planning scheme provisions to contain native vegetation requirements (Clause 52.17). These provisions require a permit to remove, destroy or lop native vegetation on a site of more than 0.4 hectare. However, these provisions do not apply to this project, as being subject to an EES process, it is exempt from requiring a permit under the Northern Grampians Planning Scheme.

The 2013 *Native Vegetation Permitted Clearings Regulations: Biodiversity Assessment Guidelines* by DEPI (DEPI Clearing Guidelines), have the primary objective to achieve 'no net loss in the contribution made by native vegetation to Victoria's biodiversity'. These guidelines require avoiding impact on native vegetation if possible, minimising any impact, and offsetting any unavoidable removal. Such offset required is to be achieved in accordance with a vegetation offset management plan.

15.3 Evidence and submissions

15.3.1 EES information

The Flora and Fauna Assessment, Chapter 8.2 and Technical Appendix 2 in the EES, presented flora and fauna information for the survey area which comprised the project area and adjacent land on Big Hill, adjacent land to the proposed TWRS site and land adjacent to the proposed haul road to Mt Micke. The EES indicated that the survey area was within the Goldfields bioregion which in this area contained only one Ecological Vegetation Class ie Box Ironbark Forest (EVC61), with the exception of a very small area of Grassy Woodland around the eastern edges of Mt Micke. The EES indicated that the surveys included targeted flora surveys conducted during the flowering periods of significant species that were considered likely to be found in the study area.

The assessment stated that no flora or fauna species or ecological communities listed under the EPBC Act were found during the surveys or were predicted to occur in the study area. The EES includes that the listed Swift Parrot (*Lathamus discolor*) may visit the study area, but higher quality habitat is available within close proximity such as the Deep Lead Flora and Fauna Reserve. Following referral by the proponent of the project to the Australian Government Minister for the Environment, Heritage and Water, the project was determined on 9 December 2013 not to have a significant impact on any matter of national environmental significance and therefore no approval was required under the provisions of the EPBC Act (see EES main report Appendix C).

The EES assessment also stated that in relation to flora and fauna, and native vegetation:

- Several orchid species protected under the FFG Act were recorded in the project area. However, only one flora species listed as Vulnerable on the Victorian Advisory List of Rare or Threatened Plants in Victoria (DEPI) ie Small-leaf Goodenia (*Goodenia benthamiana*) was recorded at one location along the artificial embankment adjacent to the storage yard in the project area. Given the lack of other records of this species within 10 kilometres of the study area, this record was considered to be an outlier.
- A total of 82 terrestrial fauna species comprising nine mammals, 64 birds, five reptiles and four frogs were recorded in the study area. However, only one state significant bird species - Brown Treecreeper (*Climacteris picumnus victoriae*) and one State significant reptile species Bearded Dragon (*Pogonia bartata*) were identified in the study area.
- The project would result in the loss of 15.732 hectares of native vegetation, including 14.537 hectares of Box Ironbark forest (which is listed as depleted in the Goldfields bioregion) and 17 scattered trees associated with the Box Ironbark EVC.

The EES also presented information and maps on the conservation status of the Box Ironbark vegetation in the study area and the impact of the different components of the project on the various habitat areas. The maps indicated that the proposed haul road and the access road to the site of the relocated communications tower and fire lookout would impact Very High conservation status habitat areas.

In response to the findings of the assessment, the EES indicated that:

- The proposed vegetation removal would be unlikely to have a proportional impact on the habitat of any rare or threatened species above the specific offset threshold and therefore no specific offsets would be required for these species.
- A Native Vegetation Offset Management Plan would be developed to ensure that the vegetation removal would be offset in accordance with the DEPI Clearing Guidelines which apply to this project. A total of 4.743 biodiversity equivalence units would be required to satisfy the general offset guidelines. Suitable habitat areas are likely to be available to meet the offset requirements.
- The haul road, which would extend from the north pit to Mt Micke in the south, would be aligned along existing cleared tracks where possible, avoid areas of Very High conservation significance and designed to minimise the number of mature trees (Very Large Old Trees or Large Old Trees) that would need to be removed.

In addition, the following measures would be undertaken to mitigate the impact of the project on significant flora and fauna species:

- A detailed Conservation Management Plan would be developed as part of the EMP.
- Appropriate soil stabilisation and erosion control measures would be incorporated into the Work Plan for areas located both inside and outside the project area.
- Temporary fencing would be constructed to protect areas of native vegetation adjacent to the project area and these protected areas would be clearly marked as 'no go areas'.

15.3.2 Comparison with the 2000 EES Inquiry Report

As discussed earlier concern with the impact on biodiversity values was one of the factors that contributed to the Minister for Planning recommending against the Big Hill open cut mining project in 2000. Consideration of the recommendations from the Panel and the Minister's assessment in 2000 is therefore relevant to the current project. The key recommendations relating to flora and fauna and the response of the proponent in relation to the current project are as follows:

- The 2000 Panel recommended that proposed TWRS should be reappraised to minimise the flora and fauna impacts. *Response* - The TWRS proposed as part of the current project reduces the loss of high quality Box Ironbark forest from nine hectare proposed in 2000 to two hectare achieved by relocating most of the TWRS onto already cleared grazing land owned by GMMWater.
- The 2000 Panel recommended that where possible the haul roads should be aligned along existing cleared tracks and where possible avoid the removal of remnant native trees. *Response* - No vegetation of Very High conservation value is proposed for removal for the construction of the haul road. However, there is to be considerable clearing for the haul road – a 30 metre wide strip required.
- The 2000 Panel recommended that indigenous plant species should be used in site revegetation and buffer planting associated with the mine area of haul roads. Also seeds should be propagated from seeds collected on site and species from the appropriate Ecological Classes. *Response* - This matter is unresolved at present for the current project (see discussion on rehabilitation in Chapter 11).

- The 2000 Panel recommended that weed populations in remnant native vegetation on land managed by SGM and in areas being rehabilitated post mining should be monitored and controlled on an at least annual basis. *Response* - These measures will be incorporated into the Work Plan.
- The 2000 Panel recommended that selective handling and stockpiling of topsoil should include consideration of weed occurrence and weed control practices should take place throughout the rehabilitation program. *Response* - These measures will be included in the Rehabilitation Plan and Works Plan.
- The 2000 Panel recommended that retained areas of native vegetation should be actively managed to protect and enhance their conservation values including the development of detailed conservation plans for these areas, implementation of weed control programs and the fencing these areas before development. *Response* - These measures will be included in the Work Plan.

15.3.3 Other submissions and presentations

DEPI, in its written submission prior to the hearing (number 312),⁵⁷ indicated that, as a member of the Technical Reference Group (TRG), it was satisfied with the TRG process and the EES assessment documentation. This submission indicated that DEPI considered that the EES adequately addressed the environmental values, in particular those relating to flora and fauna (including native vegetation removal). It also indicated that the impact assessment and proposed mitigation measures were sound and provided for the appropriate management of biodiversity. DEPI also indicated that it was satisfied that the assessment of native vegetation removal and proposed provision of offsets were in accordance with the DEPI 2013 Clearing Guidelines. DEPI considered that these offsets could be adequately addressed through the development of a Work Plan Variation and subsequent approval by DSDBI under the Victorian Mineral Resources Act in accordance with the Memorandum of Understanding between DSDBI and DEPI (November 2011).

Ms Bennett (document B78) and Dr Letts (document L117), in their presentations at the hearing, raised concerns with the adequacy of the flora surveys undertaken by the proponent including in relation to orchids. They also raised concerns that the fauna survey periods were too short (possibly missing some migratory species) and were not undertaken at the time of year when migratory species such as the Swift Parrot, were most likely to be in the area. Ms Bennett also raised concerns that the proposed haul road to Mt Micke, which would only be used for a short time, would significantly impact on Yellow Gum trees where it is proposed cross Albion Road. Dr Letts also presented comprehensive information relating to the Apex Arboretum and was concerned that those planted trees in the Arboretum that were not spreading, were not assessed in the flora survey.

Ms Marian Byass, in her presentation at the hearing (document B85), raised concerns with the loss of the Box Ironbark forest from Big Hill especially as only limited areas of Box Ironbark forest remain in Victoria. She also indicated that Big Hill was of special significance because it was higher in altitude than most of the remnant areas of such forest.

⁵⁷ Note DEPI did not present information relating to flora and fauna matters at the hearing.

A number of submissions and other presentations at the hearing, including Mrs Melbourne (document M76), Ms Kingston (document K86), Ms Ware (documents W103 and W104), Ms Sherrie Hunt (document H106) and Mr Brad Hunt (document H109), addressed the loss of trees and other vegetation and/or the loss of opportunities to observe birds and animals on Big Hill that would occur as a result of the project proceeding. Mrs Melbourne was also concerned about the loss of trees from the Memorial Arboretum planted in 1938. Mr Trevor Hunt, in his presentation (document H107), as a bird watcher, was concerned about the loss of habitat and fauna, including birds, which may never return to the Big Hill area.

Ms Saunders, in her presentation at the hearing (document 73), and Dr Saunders, in his presentation (document S125), considered that the vegetation on Big Hill was part of a bio-link to the Deep Lead Flora and Fauna Reserve, the Black Ranges and Grampians. They considered that the area's natural values were greater than the expected benefits to the community of the project. Dr Saunders was also concerned that the project would remove trees that were currently regenerating and have the potential to become old growth trees which would provide fauna habitat. He was also concerned about the loss of the Apex Arboretum.

The Panel inspected the vegetation in the survey area several times during the hearing including on the accompanied site inspection on 17 July 2014. The Panel viewed the trees in the Apex and Memorial Arboretums, other vegetation on Big Hill, the Box Ironbark forest in the vicinity of the proposed access road to the relocated fire lookout and communications tower, and at the area of the crossing by the proposed haul road of Albion Road.

15.4 Discussion

The Panel appreciates that the loss of the vegetation on Big Hill and the trees in the arboretums could have a significant personal impact on some members of the community that an objective flora assessment may not indicate. This aspect of tree and vegetation loss resulting from the project is covered in Chapter 6.

The Panel has considered the information provided in the EES and the evidence provided at the hearing, including by Ms Saunders and Dr Letts, in relation to the flora and fauna surveys. The Panel's view is that the flora surveys undertaken by the proponent, including the targeted flora surveys conducted during the flowering periods of significant species that would likely be found in the study area, were appropriate to detect flora species of significance in the study area. In relation to fauna species the Panel appreciates Ms Saunders' and Dr Letts' views that the survey was too short to detect migratory birds such as the Swift Parrot (*Lathamus discolor*), however, the Panel accepts the EES evidence that this bird is more likely to visit higher quality habitat in nearby areas such as the Deep Lead Flora and Fauna Reserve.

The Panel accepts the evidence in the EES that, as no nationally significant flora or fauna, or ecological communities, were found nor are likely to occur in the study area, then such species are unlikely to be impacted by the proposed project.

The Panel considers that one flora species of State significance – Small leaf Goodenia - which was recorded in the study area, is likely to be impacted. However, as the occurrence of this plant is most likely an outlier, the Panel considers that any potential impact is not

unacceptable. It also considers that the two fauna species of State significance - Brown Treecreeper (*Climacteris picumnus victoriae*) and Bearded Dragon (*Pogonia bartata*) - that were found in the study area could potentially relocate to nearby suitable habitat, and therefore the Panel considers that the impact on these fauna species is also not unacceptable.

The Panel carefully considered the submissions and presentations from the community in relation to the impact of the loss of trees (including from the Apex Arboretum and Memorial Arboretum). The Panel accepts Dr Letts' evidence and that of other submitters that there are some good specimen trees in these arboretums and that many of these trees may have high significance to some people. However the Panel observed on its inspection that the maintenance of the Apex arboretum was very poor and although the loss of mature trees from both arboretums would be regrettable, new specimens to replace these trees could be replanted after mining was completed and Big Hill reinstated.

The Panel understands the concerns expressed by many presenters in relation to the loss of native vegetation from the Big Hill area even though the higher quality Box Ironbark vegetation generally occurs in the south of the project area. The Panel notes the evidence presented by Ms Saunders and Dr Saunders and the Panel accepts that the indigenous vegetation in the project area may provide some value as a bio-link between the Deep Lead Flora and Fauna Reserve to the north and the vegetated Crown land to the south. However, the Panel does not consider that the value of retaining the remnant indigenous vegetation for this reason would alone be sufficient to reject the project. It is, however, a negative impact to be weighed in assessing the project together with other environmental impacts.

The Panel considers that the areas of Box Ironbark forest vegetation that would be lost as a result of the project works, and especially the habitat areas mapped as Very High of High Conservation Status, is most unfortunate. In particular the Panel is concerned with the areas of High Conservation Status Habitat that would be lost by the construction of the 30 metre width haul road and the new access road to the relocated communication tower and fire lookout tower. In relation to the proposed access to the latter, the proponent advised the Panel that much of the clearing would result from the clearance of a 20 metre wide easement for new power lines to the new towers. The Panel consider that if power could be provided without such extensive clearance (for example by using insulated aerial bundled wire) then the width of the easement that would need to be cleared may be able to be reduced.

The Panel also appreciates Ms Bennett's concerns that the proposed haul road to Mt Micke where it crosses Albion Road, which would only be used for a short time, would significantly impact on Yellow Gum trees in this area. The Panel considers that the haul road may be able to be realigned to reduce the area of clearance of Very High Conservation Status vegetation in this area (see Section 17.3).

The Panel accepts DEPI's advice that a Native Vegetation Offset Management Plan would ensure that the vegetation that is required to be removed for the project would be offset in accordance with the 2013 DEPI Clearing Guidelines. The Panel understands that if no reduction in the area of Box Ironbark forest can be achieved by the measures outlined above, then the project would result in the loss of 15.732 hectares of native vegetation,

including 14.537 hectares of Box Ironbark forest (which is listed as depleted in the Goldfields bioregion) and 17 scattered trees associated with the Box Ironbark EVC. The Panel accepts that a total of 4.743 biodiversity equivalence units would be required to satisfy the general offset guidelines and that suitable habitat areas are available to meet the offset requirements.

The Panel considers that much of the Crown land currently held under Mining Licence 5260, including the area subject to this proposal (especially south of the south pit), could on completion of mining, be rehabilitated with the planting of Box Ironbark forest species. This would not only complement the value of the existing vegetation as a habitat area but also enhance its value as a bio-link.

15.5 Conclusions

The Panel concluded that overall the project will have a negative impact on flora and fauna in the project area and in particular on the Box Ironbark forest and the trees in the Memorial and Apex Arboretums. Specifically the Panel concludes that:

- It is unlikely that any nationally significant flora or fauna, or ecological communities (listed under the EPBC Act) are likely to be impacted by the proposed project.
- One flora and two fauna species listed under the FFG Act are likely to be impacted by the project.
- There would be a loss of some good specimen trees from the Apex and Memorial Arboretums.
- There would be loss of Very High and High Quality Box Ironbark forest. However, this loss may be able to be reduced by reducing the width of the proposed power line easement to the site of the relocated communications tower and by realigning the proposed haul road where it crosses Albion Road. The Panel considers that a Native Vegetation Offset Management Plan could be developed to ensure that all the losses of Box Ironbark forest are offset in line with the 2013 DEPI Clearing Guidelines.

The Panel concludes that the above losses are a considerable negative effect of the project but the impacts would not be of sufficient significance alone to reject the project.

16. Economic

16.1 The issues

There are two main issues that emerge from the economic impact assessment of the Big Hill Development project. They are:

- Does the assessment provided by the proponent accurately reflect the net economic benefits?
- Whether the assessment adequately addresses the issue of the distribution of benefits and dis-benefits.

16.2 Evidence and submissions

Dr Martin van Bueren presented expert evidence to the hearing (document P50) on behalf of the proponent, referring to his witness statement dated 16 June 2014 (document P49) and the Aether report (at Appendix 16 of the EES).

Dr van Bueren described the 'TERM' model, a generalised equilibrium economic model used in the assessment of the economic effects of the Big Hill mining project. The base case used in the assessment was closure of the existing SGM gold mine in 2014, and projections were made for a period of 12 years. The model computed changes from the base case for a range of economic outputs including gross regional product (GRP), housing rental, direct and indirect employment, investment, aggregate consumption and net welfare benefit, at various scales including at the national level. A 5% discount factor was used in the analysis to account for the time value of money. Changes were measured from the base case, thus a change in for example, rents, could be assessed as positive, even if where there was a predicted decrease, as it may be a lesser decrease.

Key assumptions affecting the impacts were:

- The levels of investment at different phases of the project.
- Projected revenue from the project which depends on the gold price and gold output. Both were sourced from SGM and were considered reasonable and taken as given.
- Source of labour inputs.

The model assumed that labour would be sourced from the existing labour force which would be up-skilled. In response to suggestions in submissions that imported rather than local labour would be used, Dr van Bueren's evidence was that his assumption of all local staff was reasonable since around 70% of the current staff was local and up-skilling of 30 employees through a voluntary retraining program had started based on SGM statistics.

Key outputs of the model were that the project would produce:

- 286 jobs throughout the economy with 100 in Stawell at the project's peak in year 2. The jobs in Stawell would decline to 35 in the last year of the project.
- A \$47 million (4.9 %) increase above baseline in GRP in the North Grampians-Stawell economy.
- An aggregate consumption increase of \$6.4 million.
- A net welfare gain of \$38 million for Victoria.

The model also predicted some limited negative impacts on competing industries due to predicted wage rises, and a 6 % increase in Stawell rental values.

Ms Justine Linley, CEO of the NGSC, in discussing the Council submission presented a range of economic statistics about mining and other industries including modelling results based on the REMPlan, Regional Economic Model. The mining industry was stated to cover all mining including mineral sands. Ms Linley stated that the Aether modelling '*... is a more conservative model and estimate of economic benefit than the modelling traditionally used by Council....*' (document NGSC34).

In response to a question by Mr Power, Dr van Bueren stated that he considered the Aether modelling to be more realistic than the results obtained in the Council analysis.

Dr van Bueren also presented the following statistics from the 2011 Australian Bureau of Statistics census on importance of mining for the Stawell urban centre (a subset of the Northern Grampians- Stawell SLA), Northern Grampians-Stawell (a subset of South Wimmera SDA), and South Wimmera SDA.

Table 6: Value of mining locally and regionally

	South Wimmera	N Grampians-Stawell	Stawell urban
GRP	\$3,873 M	\$904 M	-
Mining % value added	5%	15.5%	22%
Mining % of workforce	1.9%	5.9%	7%

Dr van Bueren advised that care needs to be taken in making comparisons between the different sets of statistics because of the different regions covered and the different models.

A relevant statistic for Stawell noted by the Panel is that mining produces 22% of the value added but employs only 7% of the workforce. It is not stated what proportion of these values are associated with SGM. The Panel also notes for the Wimmera Southern Mallee region '*...the low amount of local expenditure undertaken by the mining sector relative to its input (13%....)*' that '*.....indicates that there is room to develop opportunities to increase the amount of regional expenditure undertaken by the mining sector.....*'(document NGSC34).

The Panel and presenters sought clarification from Dr van Bueren about what was included in the model, specifically why some obvious costs had not been factored into the analysis.

Unaccounted for costs included:

- Adverse impacts on physical and mental health from air pollution, noise and stress.
- Loss of amenity.
- Loss of Big Hill and its value for many residents for its spiritual and contemplative values and as a rallying point in crises and special events.
- Ecological degradation.

Dr van Bueren advised that he had not provided a full cost benefit analysis of the project but had focussed on variables that could be assigned a market value. He considered that variables such as adverse health impacts could not be easily valued and any monetary value assigned would be subjective and contentious. He acknowledged, however, that these were

matters that needed to be weighed at least qualitatively in considering the overall costs and benefits of the project.

Questions were asked about how the model handled labour. Dr van Bueren acknowledged that in relation to workers residing outside the region, the economic benefits could be diverted elsewhere depending on where earnings were spent. In response to an assertion that surface and underground miners have different skill sets (encouraging non-local labour sourcing), Dr van Bueren responded that retraining or importing workers from outside the region would be required and catered for. Again, he said that the economic consequences for the local area would depend on where the workers' income was spent.

In answer to a question as to why wages in the area would be expected to rise when SGM was moving from 24 hour operations to a weekday daytime operation only, where earnings would be lower, the reply was that employees are considered to be units of labour and the model relied on competition in the general economy in pushing up wages compared to mine closure and no wages payments.

Dr van Bueren was asked what proportion of the \$38M in net welfare gain and \$6.4M in aggregate consumption expenditure would accrue to the Stawell township and its residents. He responded that the model could not determine this. He said the distribution of benefits, and the effects on this of personal preferences and choice, are microeconomic in nature. He said that the model does not have the '*granularity*' to handle issues such as the distribution of benefits (winners and losers), and the effect that redundancies would have on the local economy, the effect being reliant on the choices made by affected individuals about whether to leave or stay in the town.

Dr van Bueren clarified that the 6% increase in rental value in the town was relative to what rents were predicted to be if SGM ceased operations, that is, it represents a lower decrease in rents. He was asked if a rental market survey had been conducted to verify this but he indicated it had not. He also said that Stawell businesses had not been contacted.

Mr Anthony Hurst, Executive Director of Earth Resources Development Division of DSDBI, made a written submission (submission 313) relating to economic benefits of the project. The submission referred to the figures produced by Dr van Bueren's modelling, and included that the project would improve the welfare of households in Stawell and the local region as well as have flow-on benefits to several South Wimmera industries, including construction, housing, utilities and government administration. It was also claimed that the project, by extending the mine life, would enable SGM to work towards the planned closure of underground operations. It was further said that the project would bridge the gap between mining of known resources and potential new discoveries. Mr Hurst's submission noted that SGM holds three exploration licenses in the Northern Grampians Shire and is in the process of defining new resources. The alternative scenario was said to be to lessen further gold exploration by the company and reduce the feasibility of recommencing mining operations in the future.

Mr Wayne Morgan, of Mineral Development Victoria at DSDBI and assigned as principal facilitator for the Big Hill Project, also addressed the Panel about the economic benefits of the project. Mr Morgan emphasised that, if the project did not proceed, mining and processing activities at SGM would cease in 2014/2015. He said that the project would

provide time for transitioning to alternative opportunities and provide the bridging of the gap between mining of known resources and potential new resource discoveries referred to in DSDBI's written submission.

Council, through their CEO Ms Linley expressed, similar views. Ms Linley stated that *'The SGM operations have contributed to the local, regional and state economy over 30 years.'*

Ms Linley added that, although the Stawell Gold Mine is nearing the end of its life underground, *'...there is still a major continuing role for mining as a sector both in Stawell and the broader region.'*, and further stated:

'The Big Hill Enhanced Development Project presents an additional opportunity to extend the life of active mining in Stawell, to provide employment opportunities, retain a skilled workforce and provide ongoing economic benefits to Stawell and the region albeit for a shorter period of time.'

Mr Peter Baker (submission 221 and documents B64-B68), who appeared at the Inquiry hearing, asserted that the project would be very profitable for the proponent. He based this on the Mining One Consultants' economic analysis report on the gold mine for Crocodile Gold Corporation and on public statements by that company available on the internet. A projected internal rate of return of 125% and a net present value (8% discount rate) of \$38M are projected. Mr Baker was opposed to the project, but if the project was to be approved, he suggested that a share of the profits should be returned to the community for funding community projects. A figure of \$5M was suggested.

A number of other submitters questioned the economic assumptions and outcomes of the economic analysis. Mr Juliusz Kossowski (submission 322), for example, pointed to falling house prices in Fisher Street and questioned why this had not been factored into the analysis. Mr Kossowski considered that the stated economic benefits of the project were 'highly speculative'. He said the economic effects could in fact be negative due to Stawell losing potential visitors and tourists, and residents leaving because of environmental degradation and the loss of Big Hill.

Mr Bradley Hunt (submission 256 and document H109) suggested that the importance of mining to Stawell's employment was overstated as it is based on 2011 employment data when employment at the mine employed 288 workers. He stated that employment at the mine has since halved to the present time and will fall to around 80 over the life of the project. Mr Hunt also pointed out that the conclusion that house prices would rise required competition for housing from imported labour and was not consistent with the claim of all employment being local.

Ms Linley and Dr van Bueren both addressed opportunities for economic development projects for Stawell that they said are being explored and could be developed given time. They supported the gold mine project on the basis that it would buy time for these projects to be developed. The Panel was advised that the *'Golden Legacy Project'* was commenced in June 2013 to explore opportunities post mine closure. In response to submissions suggesting there was dubious value in the argument of buying time to strengthen other economic bases given that the closure of the mine had been anticipated for a some considerable time, Dr van Bueren stated that:

In my opinion, at a community level, the Project will be valuable if it retains a skilled and educated workforce and a critical mass of business confidence in Stawell while other opportunities are evaluated. If there are alternative economic opportunities for Stawell ready at hand, then the value of the Project as a mechanism for 'buying time' is lessened particularly if the Project is crowding out those alternative opportunities.

In response to questions as to whether mining had been at the expense of such other opportunities, Dr van Bueren replied that he was not aware of any opportunities that were ready to implement. The Council had completed a broad feasibility study of number of future uses for the Stawell gold mine site, he said, and was proceeding to prepare business cases for the most promising options. We were told that they were also looking more broadly than just the mine site, but there were no concrete proposals at present.

16.3 Comparison with the 2000 EES Inquiry Report

The former Inquiry Panel agreed with the general findings of the economic assessment provided at that time which indicated that ceasing mining would have negative impacts whereas approval of the proposal would provide positive effects on the local economy.

16.4 Discussion

It is clear from the evidence and submissions that the project would provide some gross economic benefits for Stawell, the region, and the State. It is also clear that closure of the Stawell gold mine would have some negative economic effects on the region. However, the Panel considers that the extent of the economic changes when considered in net terms, allowing for the economic costs of the project, are less certain as is the relative distribution of these effects to the local area rather than the region or State.

In this respect, the differences between the results of the Council's economic impact assessment and that in the EES support the existence of such uncertainty, though it is acknowledged that because of the different bases, the comparison between the two analyses is not straightforward. The omission of different negative elements from the two analyses increases the uncertainty in the overall outcomes.

16.4.1 Distribution of economic benefits

The TERM model used in the EES is a macroeconomic model that deals with employment as units of labour in the broader economy, and as such, Dr van Bueren acknowledged, it does not have the resolution to account for micro economic issues such as local employment and wages effects. The distribution of local benefits is similarly difficult to estimate and depends on assumptions about sources of labour and expenditure patterns.

As an example, the model can predict certain economic benefits for the units of employment, but it cannot predict the geographic distribution of the benefits. It would depend on where the additional income was spent and it may be that this would be outside Stawell. As has been noted in the evidence above only 13% of expenditure on mining is undertaken in the region.

The Panel considers that there is an absence of clear information about the geographic distribution of the calculated economic benefits, and about where labour will be sourced from.

In the absence of this clear information, it appears to the Panel that the positive economic benefits of the project and its negative effects would accrue to different geographic groups. While the negative economic impacts of the project on health and wellbeing (and other negative economic effects not accounted for in the modelling) would largely fall on residents in Stawell, the positive economic benefits predicted by the model would be spread more widely, even nationally. What portion of the benefits would accrue to the local area is less than clear.

The Panel considers that the equity of this outcome concerning the distribution of positive and negative effects is something that warrants consideration. On this basis, the case for a compensatory fund to be established from SGM profits to fund local community projects, as was suggested by Mr Baker, may have some merit.

16.4.2 Net economic effects

Dr van Bueren was careful to point out that a full cost benefit analysis was not undertaken for this project. This was partly because of the perceived difficulties in valuing non-market parameters, but also because it was considered that there are other models that are better suited to such a task.

The Panel considers that without the inclusion of matters such as the costs of health management, effects on tourism and land values, the modelled outcomes are of limited value.

The Panel also has some concerns about the factors which were modelled. In terms of the base employment assumptions in the model, as was pointed out, the ABS data for 2011 showed that mining, including the Stawell gold mine, accounted for 7% of employment in Stawell. Since then, however, employment at the mine has dropped from 288 to less than 150, and will drop further to a peak of 100 in year 2 of the project. The contribution of the mine to employment in Stawell today is therefore considerably more limited than assumed in the model.

We agree with the view by Mr Hunt that the increase in house rental values expected must assume either that new persons will move into Stawell to work at the mine which is inconsistent with the advice that workers would be kept on or be sourced locally; or when persons would be put off from the mine as it would close, they would leave town for work elsewhere. The latter seems inconsistent with the advice that work had been found elsewhere in the town by those who had already lost jobs at the mine.

The Panel also agrees with those submissions which suggested that the 'buying time' argument has been overstated. The Panel was also told through the Social Impact Assessment that of those who had been put off by the mine in recent years, a high

proportion had obtained work in the town, principally in the abattoir⁵⁸. The Panel is also conscious of the fact that closure of the mine has been expected for more than 10 years and considers that the 'buying time' argument cannot be accepted as an only recently emergent justification.

The Panel further notes that no serious analysis has been presented of the impact on economic benefits of a dramatic fall in the price of gold. We understand that this was seen as SGM's risk. The Panel is aware that without the Big Hill Project, underground mining was projected to cease in 2003 at a then assumed price of gold of \$A467 per ounce (2000 Big Hill Inquiry Report), and notes that mining has continued till the present time as the gold price has risen over this period. A sustained downward trend would seriously affect the profitability of the project and risk mine closure and loss of benefits while perhaps leaving a legacy of negative impacts.

16.5 Conclusions

The Panel concludes:

- The project will have a positive gross effect on employment, GRP, and aggregate expenditure in the region and in Stawell. However the distribution of benefits to different areas and groups cannot be determined from the modelling undertaken.
- It has been acknowledged that there would be a number of negative economic impacts of the project including the costs of effects on health and wellbeing and on housing values. These have not been costed or included in the economic analysis.
- The project may have a net welfare benefit for Victoria but this cannot be ascertained because of un-costed impacts.
- The negative impacts of not proceeding with the project have been overstated.
- The benefits of the project in allowing time for the local and regional economy to react and adapt to the later mine closure have also been overstated.

The current assessment is broadly in line with the assessment of the former Panel that accepted the general findings of the economic assessment done at that time which concluded that ceasing mining would provide negative impacts whereas approval of the proposal would provide positive effects on the economy.

⁵⁸ While the Panel hearing was proceeding, there were announcements in the local press that the abattoir was expanding and would be employing another 98 persons.

17. Other issues

17.1 Aboriginal cultural heritage

17.1.1 The issue

As no issues relating to Aboriginal cultural heritage were identified during the preparation of the EES or at the hearing, the key issue relates to the management of any unexpected sites or features discovered during the operation of the project.

17.1.2 Legislation

The Aboriginal Heritage Act 2006 provides for the protection and management of Victoria's Aboriginal heritage with processes linked to the planning system. Cultural Heritage management plans (CHMPs) and cultural heritage permits are used to manage activities that may affect Aboriginal cultural heritage. The Act recognises Registered Aboriginal Parties (RAPs) as having the responsibility for the management of Aboriginal cultural heritage under the Act. A CHMP is required for the project under section 49 of the Act because of the requirement to prepare the EES.

17.1.3 Evidence and submissions

The Aboriginal cultural heritage assessment for the project area is outlined in Chapter 8.3 and Technical Appendix 3 of the EES, and the approved CHMP is also included in Appendix 3. The EES indicated that the Stawell area is the traditional land of the Djad Wurrung people and their name for Big Hill was '*Kobram*'. The EES stated that there were 44 Aboriginal places within 10 kilometres of the project area and one site within the former tailing storage facility. The EES also indicated that at time of preparation of the CHMP there was no RAP in the vicinity of the project area, although the Barengi Gadjin Land Council Aboriginal Corporation had applied to be the RAP for this area.

The EES indicated that extensive disturbance of the area as result of the gold rushes and recent activities, such as construction of roads and settlement, would have resulted in the destruction of almost all features relating to Aboriginal cultural heritage that may have formerly existed in the area. The EES stated that Aboriginal places containing isolated stone artefacts were unlikely to occur in the project area and the survival of scarred trees of Aboriginal origin was unlikely, due to the widespread and nearly total clearance of indigenous trees during the gold mining period in the 19th century.

There were no submissions or presentations relating to the Aboriginal cultural heritage of the project area with the exception of the notice of approval of CHMP number 12677 for the project presented by the proponent (document P26). The CHMP outlines procedures to be followed if a feature of Aboriginal cultural heritage is found during the operation of the project.

17.1.4 Discussion

The Panel considers that the assessment of the Aboriginal cultural heritage of the project area as outlined in the EES was comprehensive and that no features relating to Aboriginal cultural heritage are likely to occur in the project area. The Panel also notes that the CHMP

which has been prepared and approved, outlines procedures to be followed if a feature of Aboriginal cultural heritage is found during the operation of the project.

17.1.5 Conclusions

The Panel concludes that the project is unlikely to have any impact on any features of Aboriginal cultural heritage.

17.2 Greenhouse gas

17.2.1 The issue

The SEPP (AQM) requires all generators of emissions in Victoria to manage emissions of greenhouse gases and energy efficiency by the application of best practice measures.

The scope of works for this greenhouse gas (GHG) assessment as part of the EES for the proposed project included the following:

- Review of baseline GHG/energy data for existing operations
- Review of proposed energy use for construction activities
- Estimation of energy uses for construction and operating phase
- Identification of means of reducing energy usage and GHG during construction
- Review of proposed on-going energy use of the facility and how can it be minimised
- Preparation of a technical study report on energy consumption and GHG emission for the purposes of an EES.

17.2.2 Regulatory framework

(i) State Environment Protection Policy (Air Quality Management)

The SEPP (AQM) requires that facilities emitting GHG must manage their emissions in accordance with its provisions at Clauses 18 and 19. The Protocol for Environmental Management (Greenhouse Gas and Energy Efficiency) has been developed as an incorporated document to the SEPP (AQM) and establishes the framework for assessing GHG and energy efficiency for industry in Victoria. This protocol applies to generators of GHG which are subject to works approvals and licenses, but also applies to all the generators of GHG in Victoria who fall within the categories specified in the PEM. The PEM establishes the statutory framework for managing GHG and energy efficiency in Victoria.

(ii) National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) establishes a national framework for reporting GHG emissions, GHG emission abatement actions and energy consumption and production by Australian corporations.

The *National Greenhouse and Energy Reporting Regulations 2008* (NGER Regulations) provide the necessary details that allow compliance with, and administration of, the NGER Act.

To estimate GHG emissions for compliance with the NGER Regulations and the NGER Act, the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER (Determination)) sets out methods, and criteria for methods, for the estimation of GHG

emissions. It also sets out methods for estimating or calculating the production and consumption of energy. Facilities are required to report under the NGER Act if they exceed the GHG emission threshold of 25 kt CO₂-e/year (kilotons of carbon dioxide-equivalent per year) or the energy threshold (produced or consumed) of 100 TJ/year (tera joules/year). According to the EES, SGM undertakes NGER reporting annually.

The Department of Climate Change and Energy Efficiency 2011 document: 'National Greenhouse and Energy Reporting System: technical guidelines for the estimation of greenhouse emissions and energy at facility level: energy, industrial process and waste sectors in Australia' provides additional guidance to the NGER (Determination).

17.2.3 Evidence and submissions

There were no submissions on the GHG issues associated with the project and no evidence was given at the hearing.

17.2.4 Discussion

The assessment undertaken in the EES has assessed the GHG emissions and energy usage associated with the proposed project and compared it with the current underground operations. The approach taken is consistent with the assessment methods used for the NGER reporting.

The results of the assessment as presented in the EES shows that GHG emissions and energy consumption for the proposed Project is expected to be less than historical figures. It is suggested in the EES that this is due to the fact that current underground electricity consumption will cease in 2014.

The assessment process for the NGER reporting breaks the assessment into three stages. These have been presented in the EES as:

- Scope 1: Direct GHG emissions
- Scope 2: Indirect GHG emissions from electricity use
- Scope 3: Other indirect GHG emissions.

The assessment identified that the most energy intensive activities for the existing operations include:

- Electricity consumption at the processing plant
- Ventilation of the underground mine
- Diesel consumption from underground truck movements (ore and waste rock handling).

For the proposed open cut operation the Direct GHG emission (Scope 1) sources were identified as diesel transport fuel, diesel stationary fuel, explosives, process chemicals, natural gas and LPG gas. These emissions occur at the site.

The Scope 2 emissions arise from purchased energy usage and occur at the point of energy production, for example, in the Latrobe Valley. The emissions for this source were calculated on electricity usage at the processing plant. It is based on energy consumption for the current operation for 2011-12 excluding the electricity usage for underground operations. It is unclear whether electricity usage for lighting on and around the site has been included in the assessment.

Scope 3 emissions were not included in the assessment.

The conclusion of the EES is that, compared with the current underground mining operations (2011-12), the total GHG emissions averaged over the five year timeframe of the project will be reduced by 67% and energy usage reduced by 59%.

As discussed above, the SEPP (AQM) requires that all generators of emissions in Victoria, whether they are licensed by the EPA or not, must manage their emissions of GHG and energy efficiency by the application of best practice. There is no discussion of how the proposed operation meets these requirements. The assessment that has been done is just a comparison of emissions from current operations compared with the proposed project.

In the EES, the mitigation measures for GHG emissions considered as part of the project are discussed. These include:

- Reduced project duration when compared to a much longer project life if optimising resource recovery was the only development criterion. The proposed timeframe proposed in the 1999 EES was 8 years
- Optimisation of the truck fleet size to minimise haulage (100 tonne trucks instead of 50 tonne trucks)
- Location of TWRS adjacent to north and south pits reducing GHG emissions from haulage by 4% compared with using the Wonga Pit option
- Progressive rehabilitation of the site which is considered to increase uptake of GHG emissions.

No consideration appears to have been given to the use of low energy lighting options or any other measures that could reduce energy consumption.

The Panel is of the view that an assessment of best practice for energy efficiency and reduction of GHG emissions should be undertaken in compliance with the PEM for GHG and Energy Efficiency. This assessment should be done to inform the finalisation of the site EMP. Any measures that are identified should be included and implemented through the EMP.

17.2.5 Conclusions

The GHG assessment that has been done as part of the EES shows that compared with the current operations, the proposed project will result in significant reductions in GHG emissions and energy usage. However, the assessment has not included an assessment of best practice measures for management of GHG emissions and energy efficiency. The Panel is of the view that if the project were to proceed, an assessment of best practice for energy efficiency and reduction of GHG emissions should be undertaken in compliance with the PEM for Greenhouse Gases and Energy Efficiency. This assessment should be done to inform the finalisation of the site Environmental Management Plan (EMP). Any measures that are identified should be included and implemented through the EMP.

17.3 Traffic and transportation

17.3.1 The issue

The key issues relating to traffic and transportation are: the temporary closure of Big Hill Road; the proposed permanent closure of Reefs Road and Scenic Road; and the proposed location of the crossing of the new haul road with Albion Road and Jubilee Road.

17.3.2 Evidence and submissions

The Traffic and Transportation Assessment, Chapter 8.14 and Technical Appendix 13 of the EES presented information on traffic and transportation. The assessment indicated that all the roads in the area were managed by NGSC and the background road traffic on these roads would reduce as a result of reduced staff numbers employed by SGM on the project as compared with the present operation. The EES indicated that there would be no impact on existing school bus routes, all intersections would be well below capacity limits and most intersections would not require mitigation measures. The EES indicated that during the mining stage of the project, truck movements of mined and stockpiled material would be only be within the project site and there would be no use of external roads. In quarters 19 and 20 (year 5), during the rehabilitation stage of the project, waste rock would be moved from Mt Micke to the south pit, peaking in quarter 20 when a maximum of 150 haul trucks movements (75 in each direction) with load of 100 tonne in each truck would cross Albion Road and Jubilee Road.

The EES stated that the existing movement of mine trucks to Mt Micke required trucks to enter into and travel south along Leviathan Road to Bulgana Road, turn left into Bulgana Road and travel east to and turn right into Jubilee Road before leaving Jubilee Road just south of the intersection. This involves travelling 270 metres on public roads while other traffic is stopped by traffic lights for about 50 seconds. As motorists cannot see the mine trucks from the traffic signals, cars have been observed to continue through the red signal. The EES indicated that in order to reduce the safety hazard it was proposed to construct a new haulage road crossing of Albion Road east of the intersection with Leviathan Road and Jubilee Road, south of the same intersection. The EES indicated that it was also proposed, subject to NGSC approval, to:

- Construct a new intersection including temporary traffic signals where the haul road would cross Albion Road.
- Close Jubilee Road in this area and close the connection of Bulgana Road and Leviathan Road during the movement of haul trucks in this area.

The EES stated that a new access road would be constructed from Albion Road to the relocated fire lookout and communications tower at the site of the current SGM's stores area. This would involve upgrading the existing off-road vehicle track and would require the clearing of an area of Very High Quality Box Ironbark forest vegetation (see Chapter 15 for further information).

The EES stated that during mining operations Big Hill Road, Reefs Road and Scenic Road would be closed and while Big Hill Road would be reinstated following the reconstruction of Big Hill it was not intended that either Reefs Road or Scenic Road would be reinstated.

17.3.3 Comparison with the 2000 EES Inquiry Report

The key relevant recommendation of the 2000 Panel in relation to traffic and transportation and the proponent's response in relation to the current project are:

- The 2000 Panel recommended providing additional signage to direct visitors and trucks to the mine via the modified main road network. *Response* – Signs will be reviewed and altered as required. Trucks will continue to enter the site via Leviathan Road.
- The 2000 Panel recommended providing directional signage throughout Stawell to guide tourists to the interim interpretive facility and lookout tower. *Response* – Adopted for the project.
- The 2000 Panel recommended providing access from either Upper Main Street of Crowlands Road to the interim interpretive facility and the final viewing area, together with car and bus parking. Also that the road should be built to NGSC or DEPI standard. *Response* – This is being investigated as part of the land use master plan.
- The 2000 Panel recommended that provision of a separate pedestrian track from the nearest road to the viewing centre should be investigated in the final design. *Response* – This is being investigated as part of the land use master plan.
- The 2000 Panel recommended that reinstatement of Scenic Road should be investigated. *Response* - This is not proposed in the current project.

17.3.4 Other submissions and presentations

A number of written submissions and presentations at the hearing raised matters relating to traffic and transportation.

In response to questions from the Panel, Ms Linley for the Shire indicated that neither Reefs Road nor Scenic Road were Council roads and Council did not consider any traffic issues would arise from their permanent closure. She also stated that the main use of Reefs Road was for access to SGM treatment plant which would not be required after the completion of the project.

Mrs Melbourne, in her presentation (document M76), and Ms Bennett in her presentation (document 78), both stated that it was important for residents to keep Reefs Road and Scenic Road as access routes to Big Hill. Ms Bennett also raised concerns that the proposed haul road to Mt Micke, which would only be used for a short time, would significantly impact on Yellow Gum trees where it was proposed to cross Albion Road. Mr Cameron, in his presentation (document C114), stated that the relics of alluvial mine workings at the corner of Leviathan, Bulgana Road and Albion Road could be preserved if the proposed haul road was relocated away from this area.

The Panel on a number of occasions inspected the roads in the area including Big Hill Road, Scenic Road, Reefs Road, Crowlands Road, Leviathan Road, Albion Road and Bulgana Road. It also inspected a number of these roads and sections of the existing haul road on the accompanied site inspection 17 July 2014.

17.3.5 Discussion

The Panel accepts that there will be no additional impact on the NGSC roads in the vicinity of the project as the number of staff employed by SGM for the duration of the project will be less than with the present operation. The Panel also accepts that, with the exception of a period of the rehabilitation stage of the project, all truck movements of mined and stockpiled material will only occur within the project site and there will be no use of external roads by mine haulage trucks.

The Panel accepts that the existing crossing of the haul road and Leviathan, Bulgana and Jubilee Roads is unsatisfactory and potentially unsafe, and a new crossing would be required in quarters 19 and 20 (year 5) during the rehabilitation stage of the project, when waste rock is proposed to be moved from Mt Micke to the south pit. The Panel notes Ms Bennett's opinion that the proposed haul road to Mt Micke, which would only be used for a short time, would significantly impact on Yellow Gum trees where it is proposed to cross Albion Road. The Panel also notes Mr Cameron's view that the relics of the alluvial mine working at the corner of Leviathan, Bulgana Road and Albion Road could be preserved if the proposed haul road was relocated.

In order to address these issues, the Panel considers that, if the project proceeds, the proponent should investigate whether the crossing of the haul road of Albion Road could be moved to the east close to the intersection of Leviathan and Bulgana Roads. The Panel considers that as it is already proposed to close the northern section of Jubilee Road, as well as the intersection of Leviathan Road and Bulgana Road, for the duration of these the movements, this relocation may be feasible without causing any safety concerns. If this relocation were possible, then the Panel considers that there would be less impact on the Box Ironbark forest and relics of alluvial workings in this area.

The Panel accepts that Big Hill Road, Reefs Road and Scenic Road have to be closed for the duration of the project. The Panel strongly agrees that Big Hill Road should be reinstated after completion of mining, but sees little long term need to reinstate Reefs Road as its primary current use is for access to the mine processing plant, which presumably will not be required post mining. In relation to Scenic Road, the Panel is not convinced on the evidence presented that there is a need to reinstate the road post mining.

17.3.6 Conclusions

The Panel concludes that there would be no additional impact on the NGSC roads in the vicinity of the project as a result of the project. The Panel also concludes that, with the exception of during the rehabilitation stage of the project, all movements of mine haulage trucks will only occur within the project site.

The Panel considers that the relocation of the crossing of the haul road of Albion Road to the east of its proposed location should be investigated to reduce the impact of the project on the Box Ironbark vegetation and relics of alluvial working in the area.

The Panel also considers that Big Hill Road should be reinstated on completion of mining, but Reefs Road and Scenic Roads need not be reinstated.

17.4 Waste rock management

17.4.1 The issue

The overarching issue is the sheer volume of material that has to be handled and stored in an environmentally benign manner. Many of the environmental impacts are discussed in other sections of this report:

- Wind blown dust from exposed surfaces, roads and dumping in Section 3.3.1
- Stability of the TWRS because of its height (50 metres) in Section 10.4.1
- Effects on the security of the town's potable water supply by contaminated run off and dust deposition in Section 8.4.

The other main issues discussed here are the segregation of materials to isolate potentially acid forming soils, and the availability of sufficient material of the right quality for reconstruction and rehabilitation.

17.4.2 Evidence and submissions

Section 8.15 and Technical Appendix 9 of the EES contains the main evidence. Other evidence is contained in memoranda from Mr Wayne Chapman from SGM dated 6 July 2014 (document P53 on the materials balance and voids, and document P55 on TWRS material segregation).

The EES relies on core sampling and soil analyses and tests to assess whether the waste rock from the mining has a low acid forming potential. It states that:

The majority of waste rock tested shows it to be non-acid forming (NAF), and exhibiting relatively benign characteristics due to the low to very low total sulphur content (Resources Strategies, 1999).

A small number of potentially acid forming (PAF) samples (taken from below the base of South Pit) were identified by the waste rock characterisation program. Extensive weathering has occurred to a depth of some 60 to 90 metres below the present surface of Big Hill. The majority of the pre-existing sulphide mineralisation above these levels has been partly or completely oxidised. Elevated sulphide and metal concentrations are likely to be restricted to deeper sections of and below the floor of, both open pits and within inter-waste zones (i.e. waste rock within delineated 'ore zones').

The EES recommends that in back filling the pits, PAF material be 'encapsulated in waste rock emplacement areas within compacted zones of non-acid forming waste rock (cells) in order to isolate it from rainfall and restrict the ingress of oxygen...'. PAF materials on the pit floor would be similarly encapsulated.

PAF materials extracted during mining would be isolated to a specific area of the TWRS. The EES states that:

The TWRS area is sufficient to enable separate stockpiling of different types of waste rock. Management methodology for waste rock is controlled by the Waste Rock Management Plan.

Consistent with this, document P55 states that the total storage capacity is 3.1M m³ and the maximum storage volume required is 2.7M m³.

Mr Chapman explained and discussed the work described in the above documents. The results of testing of the material in the north pit, south pit, and Mt Micke was used to classify the material. The bulk of the material was classified into Emerson scale classes. The less erodible material (>Class 3) would be stored apart from the more erodible remainder in the TWRS. Separate areas would be set aside for high quartz material, and for high silica and PAF materials. A concept diagram is contained in document P55.

Mr Chapman also described the materials balance approach. The material excavated, the volume of ore removed and bulking and swelling factors were combined to calculate the volume of material required to fill the holes. He said that two test pits were excavated and refilled and compressed to simulate the mining and rehabilitation operations and determine the local bulking and swell factors.

The mass balance indicated a shortfall of 800,807 cubic metres of material and this would be sourced from the Mt Micke stockpile which is currently being reprocessed as low grade ore. Sufficient material is expected to be available to be quarantined from Mt Micke at current ore processing rates and assumed swell factors. Mr Chapman indicated that more fill material would be available from other locations on site.

Mr Magee stated in his evidence (document S74) that there was not enough material to rebuild the hill because of the effect of the intensive mechanical mixing required to successfully introduce 30% fines to the bulk waste rock. Mr Raeburn in his submission (document R121) also stated that there would not be sufficient material because of the amount of ore removed.

17.4.3 Discussion

The Panel understands the basis for the issues raised by the submitters. The evidence provided by the proponent on the reconstruction process based on the testing of materials is, however, convincing. The mass balance evidence appears also to be sound. The proponent has indicated that in any case there are several areas on the mining lease site where materials could be obtained to make up any shortfall and there does not appear to be any basis for disputing this.

17.4.4 Conclusions

The Panel concludes that:

- The waste rock stored at the TWRS will be sufficient to partially to fill the void left by mining of the south pit allowing bulking and swelling factors.
- Sufficient material can be found on site, mainly from Mt Micke (provided that quantities of material reprocessed is limited) but also from other areas on site, to make up for any shortfall in material to fill the void.
- The TWRS provides sufficient area for adequate segregation of materials of different qualities necessary for successful rehabilitation.

17.5 Hazard and risk

17.5.1 The issue

The hazard and risk analysis was conducted to provide a summary of the comparative risks and impacts across the project. Particular attention was given to those impacts and risks which were linked to the project evaluation objectives which include biodiversity, landscape, health and social wellbeing, amenity and cultural heritage.

The analysis was done in accordance with the Australian Standard AS/NZ ISO 31000:2009 for risk management.

17.5.2 Evidence and submissions

No evidence or submissions were received on this issue.

Technical Appendix 18 of the EES provides the assessment of the risks and hazards associated with the project. The risk assessment was done through a workshop with the technical specialists involved in the development of the EES and an assessment of the information contained in the other specialist technical reports.

A four stage process was undertaken:

- Risk assessment
- Risk identification
- Risk analysis
- Risk evaluation.

A risk register was developed and the likelihood and consequences of the risk events and known events were assigned. The risk register contained 96 known risks or risk events. Forty six were considered in detail. Twelve were known risks and 34 were risk events. Of the 12 known impacts three were expected to cause a moderate level of impact on the wider environment. These included changes to the landform which were considered temporary, change in land use from a recreational perspective, and noise. Nine other known impacts were expected to have a minor or negligible impact. No major or extreme impacts were identified.

Of the 34 identified risk events none were identified as extreme risks. Two were identified as major risks, eight as moderate risks, six as minor and 18 as negligible. The residual risks that remained after mitigation measures were implemented were all negligible except for noise and dust. The assessment assumes that the proposed mitigation and management measures were adequate.

The assessment and subsequent risk rankings for dust and noise were based on the original technical assessments done for the EES. They did not take into account the revised air quality and noise impact assessments that show that the impacts are greater than originally predicted especially for air quality. The revised results of the health impact assessment, as a consequence of the changes to the air quality assessment, have also not been included. The approach that was taken assumes that the technical reports and the assessment of the technical specialists are correct.

Technical Appendix 18 states that there was no consideration of other project risks such as the drop in gold price. The risk of changed economic impacts for the town such as the use of non-local workers was also not considered. The assessment assumes that the mine operation will use all local labour and states that SGM has committed to this. This conflicts with submissions made by SGM at the hearing in which no commitment was made to using solely Stawell residents at the mine.

It was also stated that rehabilitation risks were not considered as it is assumed that they will be adequately covered by the rehabilitation bonds.

The hazard and risk assessment (Technical Appendix 18) stated that it was assumed that any risks that were ranked moderate or below would be considered as acceptable for the project given the stated benefits of the project.

Technical Report 18 quotes that the stated objectives of the project are to:

- Provide SGM with an essential source of mill feed and cash flow which will improve the mine's overall economic environment
- Extend gold mining operations at Stawell for about 3.5–4 years following the conclusion of underground operations and processing of current surface stocks
- Provide a facility to the Stawell community post closure.

It also stated that in undertaking the project, SGM aims to achieve complementary objectives of:

- Providing a further 3.5 – 4 years of employment for 80 to 100 employees
- Continuing to contribute to the local, regional and State economies through capital expenditure, multiplier benefits to local businesses, and employment
- Continuing to conduct operations in an environmentally responsible manner by understanding and managing environmental impacts.

The hazard and risk assessment concluded that, bearing these objectives in mind, and given the project size, the occurrence of Major (100) or Extreme (1000) negative impact levels due to the project would be unacceptable. However, on the basis of the considerable project benefits, the assessment concluded that some Moderate negative impacts (levels of around 10) should be considered acceptable, provided that they can be managed appropriately and relevant management measures are implementable and achievable. Minor and Negligible impact levels were considered to be potentially acceptable. The hazard and risk assessment report stated that there was no discussion with the community or other stakeholders as to whether this assessment would be considered as appropriate to be applied to this project.

Applying the approach outlined above, the hazard and risk assessment concluded that the top six residual risks were:

- Noise
- Increased erosion
- Dust as PM₁₀
- Dust as PM_{2.5}
- Stormwater containment failure
- Revegetation survival.

Three of the four highest risks – noise, PM₁₀ and PM_{2.5} – will occur during the active phase of the mine when most activities will occur. Increased erosion is mainly a post closure risk. All other risks were ranked as negligible, with the exception of noise and dust which were ranked as minor.

17.5.3 Discussion

The Panel accepts that the application of the Australian Standard AS/NZ ISO 31000:2009 for risk management is appropriate for the assessment of the hazards and risks associated with this project.

The Panel does have concerns though about the reliance only on the views and assessment of the specialists who developed the technical reports in deciding the relative rankings of the risks. The process would have benefitted from having independent people at the workshop or as a minimum have an independent review of the outcomes of the risk ranking. This has not been done.

Related to this, the ‘acceptability’ of the risks reflects only the views of SGM and the specialists working on the EES. The assessment of the risks is therefore likely to have been influenced by the perceived project benefits and has not taken into account the views of others in the community who would be placed at risk. The Panel believes that not including the views of the community or even the views of an independent reviewer of the risk assessment may well mean that the assessment of the severity of the risks posed by the project is biased, and that a different ranking may have been obtained if an alternative process had been followed. It is possible that some of the risks associated with the project have been underestimated.

We also consider it unsatisfactory that the assessment of the potential risks from dust and noise on health, has been undertaken using the initial assessments done for the EES and not the most recent versions. As discussed in Chapter 3 of this report, the revised air quality assessment predicted that, even with strict dust mitigation measures applied, significant exceedances of the relevant air quality standards would occur. The Panel is of the view that, if this new modelling had been considered, it may have resulted in a different ranking of the risk associated with dust and the consequent health effects. A similar situation may also exist for noise.

The Panel has concerns that the project risks assessed did not include the impacts of a potential drop in gold price. The Panel considers that this is a significant risk to the viability of the project and there would be major consequences if the price dropped to the point that it was no longer economic to continue the operations. The flow on effects from this situation would be significant for others, including social impacts on the community.

The Panel further questions the assumption that the rehabilitation bond would address all risks associated with rehabilitation and is concerned that this has not been assessed as a risk associated with the project. The adequacy of the bond to cover the costs of reinstatement and rehabilitation of Big Hill is a significant risk factor. If the rehabilitation bond is not adequate, then, as discussed at the hearing, the costs of rehabilitation could ultimately fall to the Government. The bond needs to be adequate to cover the maximum costs of reinstatement and rehabilitation which would arise if operations ceased before backfilling

occurred. The bond arrangements also need to account for the risk associated with the mine going into 'care and maintenance mode', as there would be an increased rehabilitation cost over time. Albeit there is an ability to recalculate the bond requirements from time to time, the Panel believes that these are real risks to the project and should have been considered.

The Panel notes that stormwater containment failure was identified as one of the top six project risks. However, there was no assessment of this issue in the EES. The Panel finds it difficult to understand why this omission occurred elsewhere in the EES.

17.5.4 Conclusions

The Panel accepts that the framework set out in Australian Standard AS/NZ ISO 31000:2009 for risk management is appropriate for assessing the risks from the project. However, a number of potentially significant risks for the project overall have not been considered. These include the possible drop in gold prices and the resultant impact on the viability of the project and the certainty of the adequacy of the rehabilitation bond. These are significant risks and should have been assessed. The failure to include independent experts and members of the broader community in the ranking of the risks may also have led to a bias in the outcomes of the risk ranking process.

17.6 Environmental management

17.6.1 The issue

The key issues relating to the Environmental Management Plan (EMP) are the content of the EMP, how the EMP relates to the overall environmental management framework for the project and whether actions proposed in the EMP are key environmental actions required for the project or operational matters. The approval processes required for changes to the EMP which forms part of the overall Work Plan is also an issue, especially if the EMP includes operational matters.

17.6.2 Legislation and policy context

The Mineral Resources Regulations 2013 require a rehabilitation plan and an EMP as part of a Work Plan for a mining licence. Schedule 15, Part 1, Section 7 of these regulations state that the information required in a Work Plan includes an environmental management plan that:

- (a) identifies the key environmental issues for the proposal and includes details of background data, baseline studies of existing condition in relation to environmental issues; and*
- (b) includes proposals for the management of environmental impacts including nomination of targets and proposals for the mitigation, control or reduction of impacts; and*
- (c) includes proposals for the management of wastes including principles of waste management; and*
- (d) includes a proposed monitoring program addressing the key environmental issues; and*
- (e) includes a proposal for reporting outcomes of the plan to the local community.*

17.6.3 Evidence and submissions

The environmental management framework for the project is outlined in Chapter 11 of the EES and a draft EMP is included as Appendix H of the EES. The EES indicated that the EMP provides the mechanism for recording the procedures, practices and documentation required to meet the required level of environmental management of the mining operation. The EES stated that the overall environmental management system for the project provides the environmental framework and included a range of documents and systems including:

- Environmental policy statement.
- Management plans (including the EMP and specific plans that support the EMP).
- Environmental aspects, impacts and risk register and obligations register.
- Environmental procedures.
- Staff position descriptions (including responsibilities and reporting structure).
- Environmental monitoring program.
- Reporting structure.

The EES indicated that a wide range of mining operations would be covered by the EMP including land management, heritage, noise management, air quality, water management, waste management, rehabilitation and community interactions. The draft EMP in the EES contained detailed information such as the identification of individual staff positions responsible for specific monitoring activities.

In response to Panel questioning about possible conflict with earlier EMPs, Mr Power advised on Day 4 of the hearing that the Appendix H EMP was a draft consolidated plan relating to all of SGM's operations (including the proposed project) and there was already a consolidated EMP in place for SGM's current operations (Document P51).

The draft Work Plan Variation (WPV) (document P24) tabled by the proponent included a section titled 'environmental management plan' which covered traffic, blasting, noise assessment, air quality, flora and fauna, Aboriginal heritage, cultural heritage, surface water, groundwater, public health, aesthetics and monitoring issues. This 'environmental management plan' section referred to a separate EMP listed as Appendix A (to be prepared) to the WPV. The document indicated that when the EMP in the appendix was prepared, it would address operational and environmental risks associated with the project, and would form part of the WPV as required under the regulations.

The list of WPVs (document 25) tabled by the proponent indicated that there had been a number of such variations for the current operation over recent years. It was not apparent whether any or all of these WPVs had also changed the incorporated EMPs.

Mr Coe representing the proponent stated at the hearing that the EMP for the current operation was used by SGM to specify environmental procedures and staffing matters and that any changes were approved within SGM, and not submitted to DSDBI for approval. He also that the Work Plan EMP should contain the key management requirements.

17.6.4 Discussion

The Panel accepts that if the final EMP covers all the matters listed in the Work Plan Variation (document P24) section titled ‘environmental management plan’, namely traffic, blasting, noise assessment, air quality, flora and fauna, Aboriginal heritage, cultural heritage, surface water, groundwater, public health, aesthetics and monitoring issues, then this would appear to meet the requirements of the regulations.

However, the Panel found it very confusing and unhelpful that in the documents provided, the term EMP was used in two different contexts, that is the draft EMP in the EES (EES Appendix H) and the ‘environmental management plan’ section of the draft Work Plan Variation (document P24). The Panel’s understanding of the EMP was not assisted by the reference in the draft Work Plan Variation to another EMP document which has not yet been prepared and would form Appendix A of the draft Work Plan Variation. The Panel is therefore unclear as to which specific environmental actions for the project would be required under the EMP (to be prepared as Appendix A to the WPV) and be approved by DSDBI as part of the Works Plan Variation.

The Panel assumes that the draft EMP document for the project included in the EES (EES Appendix H) gives an indication of the content that will included in the EMP for the project, that is the completed Appendix A of the work plan variation. The Panel notes that the Appendix H document includes detailed operational matters that may need to be changed as mining progresses and circumstances change. The Panel has difficulty understanding how the proponent would be able to use the EMP as a flexible working document for procedures, staff allocation, etc, while meeting the legal requirement to refer every proposed EMP change (that is part of a Work Plan Variation) to DSDBI for approval.

It appears the Panel that there may be a need for two separate documents, namely: an EMP addressing key environmental outcomes of the project which would form part of the Work Plan subject to DSDBI approval; and a separate SGM working document which would outline operational matters such as procedures, staff responsibilities needed to achieve the outcomes required by the EMP.

The Panel considers that, for clarity of environmental outcomes for the project, there would need to be a consolidated EMP at every stage of the operation of the project. However, the Panel is unclear on how such a revised and consolidated EMP would be prepared should the EMP component of the Work Plan be changed by any new Work Plan Variation in response to changing operational needs.

17.6.5 Conclusions

The Panel concludes that the use of the term EMP for different documents with differing content is confusing, and the term EMP should only be used for the document that requires approval by DSDBI as part of a Work Plan or Work Plan Variation. The Panel also concludes that the content of the EMP should relate to overall environment issues and outcomes, and operational matters such as staff rostering should be included in a separate flexible operational document. **The Panel considers that when future revisions are made to the consolidated EMP by future Work Plan Variations, they should be made publicly available.**

**PART C: CONSIDERATION OF THE EFFECTS AND
 RESPONSE TO TERMS OF REFERENCE**

18. Consideration of the issues

18.1 Discussion

The foregoing chapters of this report set out the Inquiry Panel's considerations and findings in relation to the range of identified potential environmental effects of the project.

As can be seen, the Panels principal concerns are in relation to air emissions and their effects on public health. We are also concerned about inadequate mitigation of noise effects, and identify social issues in the town including high stress levels. Other issues of note include:

- The unresolved nature of the rehabilitation proposals and management arrangements for the site post-mining
- Issues around settlement and risk associated with reconstruction of the hill
- The proposed use of the existing tailings dam (TSF2) which continues to have unresolved seepage problems
- The adequacy of management proposals for blasting near dwellings and public roadways
- Effects on the natural conservation values of the area and archaeological heritage
- Protection of potable water supplies
- Fail-safe management of stormwater.

There are a number of common factors which have underlain many of the main problems we have identified with the project:

- There is a level of uncertainty around the timeframes being contended for the project. Some of the support given to the project has been based on the perception that the project would represent a short term (4-5 year) disruption to nearby households and users of the Big Hill reserve. This was seen to be off set by the economic benefits especially of retained mine employment for some.

Timeline uncertainties exist, however, in terms of the project:

- The rates of settlement of Big Hill after backfilling suggest that it may not be available for public usage for up to 10 years.
- At the hearing, the Panel noted that many of the previous conditions imposed on this mining project through WPVs and the mining licence contained no time frames. The DSDBI representatives indicated that they were reluctant to impose restrictions of this kind on the basis that it was important that the resource was extracted however long it took.
- There is a mining industry practice of permitting mines to cease work and be considered as in '*care and maintenance*' mode. This appears to allow work to cease when economic conditions are unfavourable and restart when the price for the mined resource improves.
- Much of the difficulty for this project in meeting required emission standards stems from the close proximity of the mine site to dwellings – as close as 37 metres in some cases. This is considerably different from the 250 metres recommended in the current EPA Buffer Guidelines and the 500 metres in the guidelines' predecessor document.

The Panel asked the proponent to identify other situations in Australia where open cut mining was sites as close to dwellings as the proposed pits but the examples provided were not directly comparable either in terms of distance or dwelling density.

The EPA, in its submission concerning the Ambient Air Quality NEPM and PEM requirements relating to air emissions, said that the mine proposal should be viewed, not as being at the edge of the town, but within the township. This in our view is correct also in a general sense. The site for the pits is adjacent to a large number of urban dwellings on its western, northern and part of its eastern boundary.

We suggest that that the siting of the project so close to town dwellings is perhaps something not contemplated in the PEM which prescribes the modelling and sets the air quality standards. The PEM, at section 3.5, notes the limitations of modelling results and how they are highly dependent on the quality of input data including emissions estimates, meteorological data and background data, and comments:

For mining and quarrying operations all of these inputs have a high level of uncertainty associated with them due to the nature of the activities being undertaken.

That uncertainty we suggest may not have been viewed as acceptable in the circumstances of dwellings within 40 metres of mining activities. Albeit the PEM differentiates requirements by close proximity and proximity to residences⁵⁹, we note, as was referred to by DoH, that it was developed at the time that the EPA Buffer Guidelines predecessor document contemplated a minimum separation distance between mines and dwellings of 500 metres.

Related to this is the proximity of the proposed north pit to the public roadway of Upper Main Street which the proponent proposes to close to traffic when blasting occurs.

- A further general difficulty is the elevated siting of the project area upslope of the dwellings and above the township.

This makes the management of noise for dwellings through use of acoustic barriers difficult if not impossible. It means that there are concerns about fail-safe stormwater management by owners of dwellings downslope of the retention basins, as well as concerns about mine face and bund stability. It means also that clearing and mining work is highly visible in views across the township.

These site limitations and temporal uncertainties being said, we note that there was virtually no opposition, even by submitters opposed to the current project, to the continuation of underground mining in the township. Although some concerns were expressed about the damage caused to buildings by current underground blasting, and it appears to cause stress for some individuals, there appears to be a general acceptance of mining as part of the life of the town.

Objectively, if this had been put forward as an underground project, the concerns identified in our report about noise and air emissions and their consequent health effects would have been considerably lessened.

⁵⁹ See summary table at page 15.

18.2 Conclusions

The Inquiry Panel has found overall that, in the circumstances of the close siting of this project to the town dwellings, the off site emissions of noise, fine particles as PM₁₀ and arsenic laden dust, will not be able to be satisfactorily managed so that statutory standards are met.

We also consider that it would not be satisfactory to proceed with the project on the assumption that some exceedances of emissions criteria are acceptable. The statutory air quality criteria have been derived from a consideration of the protection of public health in general, and this particular community in Stawell is acknowledged as having relatively poor existing health and other characteristics which make it especially vulnerable in terms of the health effects of pollutants and stress.

We consider that there are some further negative impacts of the project including effects on natural and archaeological heritage values, social impacts and risks associated with water management and blasting. These also recommend against the project and some of these adverse effects are not reparable.

The Panel, in adopting Mr Power's submissions⁶⁰ that a net community benefit is required to be determined, does not consider that the benefits claimed for the project should be assessed as outweighing its negative environmental impacts.

In considering the economic benefits, the net economic effects have not been fully explored and the limited analysis which has been undertaken overstates the gross benefits especially to the local area. This includes the argument that the project would buy time to find other enterprises to replace mine employment in the town. The claimed other benefit of the project of improvement to the Big Hill land use and community facilities is not universally agreed. The required rehabilitation plans for the site remain unresolved. In terms of net benefits, we consider that the potential health costs associated with emissions from the mine are likely to be significant.

Mr Power was at pains to point out that winnable gold can only be mined from where it lies and, if the project is refused, the gold would remain in the ground⁶¹. We suggest that in deciding whether gold is winnable and should be extracted, the considerations are not to be confined to the issues of principal concern to a mining company such as the ratio of waste rock and bulk ore to refined gold or the market value of gold. Whether gold is 'winnable' and should be extracted is a decision to be made having regard to the net environmental and other public costs as have been assessed through this process.

18.2.1 Response to Terms of Reference

Specifically, our response to the key output requirements of the Terms of Reference is:

- i. Our findings on the likelihood and significance of environmental effects and associated risks of the project are that unacceptable environmental effects would occur. No project alternatives were suggested as feasible in the EES.

⁶⁰ See Section 4.3 of his opening submissions (document P2).

⁶¹ See for example Paragraph 79 of his opening submissions (document P2).

- ii. We conclude that it is not feasible that the project could achieve acceptable environmental outcomes in the context of the applicable legislation, related policy, relevant best practice, and the principles and objectives of ecologically sustainable development.
- iii. Concerning recommendations on any modifications to the project and any specific measures that are needed to prevent, minimise or compensate for adverse effects in order to achieve acceptable environmental outcomes, in the context of relevant standards, objectives and guidelines established under relevant legislation; see the discussion in section 18.3 below.
- iv. Concerning recommendations on the framework for environmental management for the project, including in relation to the necessary Environment Management Plans required in association with different approvals; see also discussion in Section 18.3.
- v. Concerning recommendations on any conditions or matters that should be incorporated in the approval of a work plan or in any other statutory instrument applying under Victorian law, if the project is to be approved, in particular under the *Mineral Resources (Sustainable Development) Act 1990*; see discussion in Section 18.3.

18.3 Inquiry recommendations

18.3.1 Principal recommendation

The Panel therefore makes the principal recommendation that the project should not proceed. Our full reasons for that conclusion are set out in this report.

This is not a recommendation made on the basis that the weight of negative factors only marginally exceeds that of benefits. We consider that this project has major difficulties which cannot be fully addressed by mitigation.

18.3.2 Secondary recommendations

The Panel is of course conscious in undertaking this Inquiry that its role is advisory and that it is possible that our conclusions and recommendations will not be adopted by the Minister for Planning. This is demonstrated by the departure of the Minister's assessment from the Panel recommendations in 2000 on the previous Big Hill project.

It is also possible that the Minister for Energy and Resources who must consider the Minister for Planning's advice once it is provided, may not follow it.⁶² In this respect we have noted the submissions by DSDBI at the Inquiry hearing⁶³ that the Work Plan Variation (WPV) which might authorise this project would need not only to be consistent with the regulations, but also '*will need to be consistent with the Minister for Planning's assessment of the EES*'. We have reviewed the relevant legislation and it is not clear to the Panel on what legal basis the

⁶² See section 8C(1)(b) (ii) of the *Environment Effects Act 1978*.

⁶³ Comments by Mr John Mitas for Earth Resources Regulation Branch, DSDBI as part of his presentation (document DSDBI57).

claim for required consistency of the WPV with the assessment advice is founded.⁶⁴ It appears to us that consideration of that advice is required but not necessarily its adoption.

However, mindful of our advisory role and the possibility that decision makers may consider that the balance of negative and positive effects of the project is not as we see it, we have made recommendations concerning conditions and requirements which we believe must be applied either before or as part of statutory approvals if the project were, contrary to our recommendations, to proceed.

We have had considerable difficulty in defining such conditions, as many are not capable of achievement and/or would not satisfactorily ameliorate the environmental impacts which we regard as unacceptable. We have noted that, in imposing conditions, the decision maker is required to apply a presumption of compliance and that there are some difficulties with that presumption in the case of this project. Non-compliance with statutory requirements is predicted and it has been said for the proponent that non-compliance in the form of exceedances of air emissions criteria and noise limits will have to be accepted.

In preparing these requirements and conditions we have taken into account the further ameliorative measures suggested by the proponent, the suggestions made by some submitters and by the NGSC. We have not adopted the suggestion made by DoH, and supported by EPA, that the mine workings should be relocated so that they are no closer than 250 metres from sensitive receptors⁶⁵. It appears to us that this would be a different project from the one which is being proposed.

(i) Things that must be done before the WPV would be approved

In addition to the usual approvals process requirements, we suggest that the following matters must be addressed prior to the grant of approval of the Work Plan Variation.

The rehabilitation plan, the bond and future management

- Urgent attention to the intended post-mining usage of Big Hill and finalisation of the statutory rehabilitation plan that is required under the *Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013* as part of the Work Plan Variation, including:
 - Formalisation of an agreement between DEPI, NGSC and the proponent on the key aspects of the management of the project area post mining. This agreement should address: funding responsibilities; the management responsibility for the Big Hill summit precinct as well as the remainder of the rehabilitated project area; responsibility for reconstructing specific infrastructure on Big Hill; management of vegetation, fire, weeds and pest animals; management of surface water flows; management of the ongoing settlement of the reinstated Big Hill; and responsibility for any liabilities arising from settlement for 10 years after completion of the reinstatement of Big Hill. This agreement should also outline handover processes.
 - A process with timelines to be made publicly available outlining the stages involved in developing the rehabilitation plan, including consultation with stakeholders and

⁶⁴ The *Mineral Resources (Sustainable Development) Act 1990* refers to 'consideration' of the supplied assessment, see for example ss 77T and 41.

⁶⁵ Being the separation distance required in the EPA Buffer Guidelines.

engagement of the wider community on a draft plan, and the development of a final plan taking into account community feedback on the draft plan, as well as the approval stage involving DEPI, NGSC and the proponent.

- The rehabilitation plan must be developed for the whole of the project area in line with the process outlined. This plan should include a specific master plan for the Big Hill precinct which should indicate the facilities proposed to be constructed on the reinstated Big Hill including the monuments and memorials, the Big Hill access road, walking tracks, car parking area, picnic area and viewing area. The master plan should also include planting plans for the Big Hill precinct.
- Preparation by the proponent of revised visual representations that reflect the proposals for the rehabilitated Big Hill presented at the Panel hearing to give the community a more accurate understanding of what Big Hill would look like after rehabilitation and to assist community involvement in finalising the concept plan.
- Provision and approval of details of the proposed compaction methodology for reconstruction of the Big Hill land form to ensure the hill is reinstated as a stable land form as soon as practicable and capable of being utilised in accordance with the final rehabilitation plan.
- That the cost of implementing the final rehabilitation plan (including the concept plan for the Big Hill precinct) be independently assessed after approval by all parties and then be used in the calculations for the bond required for each major stage of the project.
- A certified independent audit of the bond liability at each stage of the project must be undertaken before the end of the first year of the project and at twelve monthly intervals thereafter. The bond should include a contingency for site maintenance should works be discontinued before a period before the site is rehabilitated and to allow for the increased higher costs of delayed works.

Revised air emissions modelling

- Revised modelling of air emissions with new inputs relating to work practices, revised proximity to houses and other mitigation measures to illustrate that air quality compliance standards can be achieved without stopping work as part of normal operations.
Consideration should be given to:
 - More extensive road sealing and the use of wheel washers to reduce dust emissions from roads.
 - Making an offer of purchase to the property owner of R6 in Crowlands Road adjacent to the TWRS.
 - Relocation of residents for periods that it is predicted that they will be impacted most severely by emissions from the mine.
- Commitment by the proponent to adoption of the work practices and other mitigation measures on which the revised air emissions modelling is based. The committed practices and other mitigation measures should also be included as requirements of the Work Plan Variation.

Noise management

- Investigation and approval of additional noise mitigation measures including:
 - Source treatments and temporary screening
 - Fixed barriers at selected locations including a temporary acoustic wall close to the rear or side of dwellings in Fisher Street, Upper Main Street and Crowlands Road to ameliorate noise effects
 - Criteria for eligibility for architectural treatments or temporary relocation for relief from noise.
- Development and approval of:
 - A detailed noise monitoring plan for inclusion in the Work Plan Variation that includes:
 - real time monitoring and reporting
 - independent auditing and reporting
 - assessment of the mine contribution to noise levels exceeding the noise limits.
 - Clear guidelines for compensation and reimbursement of expenses for residents eligible for architectural treatments or relocation
 - A coordinated complaints response and resolution process including assigned responsibilities for action
 - A system for monitoring of action taken in response to complaints and to exceedances of noise limits.
- In fulfilling the above noise management requirements, the licensee must consult with representatives of the EPA, DoH, NGSC, GMMWater and the public.

Potable water

- Finalisation of the agreement between SGM and GMMWater. The agreement must contain the details of water quality monitoring program and a contingency for the project extending beyond the proposed five years of operation.
Before the agreement is made:
 - Further assessment of the impact of air emissions on water supply and water quality should the project be delayed beyond the proposed five year timeframe, must be undertaken to inform the agreement. The assessment should take into account the impact of any delay in the reinstatement of the water supply infrastructure on the security of the Stawell water supply.
 - Assessment of the impact of dust deposition on the potable water supply must be undertaken using the Stawell air quality and meteorological data.

Greenhouse gas

- An assessment of best practice for energy efficiency and reduction in GHG in compliance with the PEM for Greenhouse Gases and Energy Efficiency and any measures identified through this process included in the EMP for the site.

Resolution of TSF seepage

- A remedial strategy for seepage of the TSF2 tailings facility must be developed and shown to be operating effectively.

Reduced clearing/ protection of heritage

- The location of the crossing of the haul road of Albion Road is to be reviewed to determine whether it could be relocated further east, close to the intersection of Leviathan and Bulgana Roads, in order to reduce the impact of the project on the Yellow Gums and relics of alluvial workings in this area.
- The width of the proposed power line easement to the relocated communications tower must be reduced by using aerial bundled insulated wires or other method to reduce the clearing of Very High and High Quality Box Ironbark forest to the satisfaction of DEPI.

In the Inquiry Panel's view, there may be benefit in the remodelling of the effects of the project and the development and adoption of ameliorative measures as above all being evaluated as part of a supplementary EES. This could be directed by the Minister for Planning under section 5 of the Environment Effects Act.

(ii) If the project proceeds the Panel recommends the following should be applied as conditions of the Work Plan Variation.

The list of matters below is not an exclusive one. More usual requirements upon a mine project including those relating to limitations on hours of operation and the permitted hours for particular activities; security lighting and light spill baffling; availability of personnel on site at all times authorised to direct modification of work practices (including stopping work if necessary) and implementation of other measures to ensure compliance with prescribed emissions standards; agreement to reinstate/repair damaged Council assets, should also apply.

Air quality, health and amenity

- Monitoring and management of air emissions from the mine must be undertaken and include real time predictive/reactive modelling and monitoring, and a response strategy, to ensure that health risks are minimised at all times. The real time air quality monitoring data must be made available to the public and the Environmental Review Committee.
- Before any works begin, a community alert system must be developed and implemented in consultation with the Department of Health to provide advice to the community on potential health issues arising from air emissions and how to respond to elevated levels of the emissions.
- Before any works begin, a plan must be developed in consultation with Department of Health for short and long term respite for residents impacted by the mine operations. The plan must be implemented upon commencement of the project and maintained for the life of the project.
- Before any works begin, a monitoring program for rainwater tanks must be developed in consultation with the Department of Health for properties where tank water is used for drinking water. The program must be implemented and maintained thereafter for the life of the project.
- Before any works begin, a health surveillance study must be initiated and continued for the life of the project using readily available health statistics from local GPs and hospital admission and emergency attendance data. A Steering Group must be established to guide this study and is to be chaired by a representative of Department of Health. The

Steering Group must also include local residents, SGM representatives and local health professionals.

- In advance of its application, the mine must make public the type and make of any dust suppressant to be used. Any suppressant used must not be detrimental to the health and safety of nearby residents or to the environment.
- Any dwelling or residentially zoned land owned by the licensee in the immediate vicinity of the mine must be maintained so as not to cause detriment to the amenity of the area to the satisfaction of NGSC.

Storm water

- Before any works begin, a fail-safe storm water system must be designed and approved including:
 - The sediment detention basins must be provided with an overflow connected to the NGSC drainage system
 - The distance between the TWRS and GWMWater storage increased to more than 15 metres if possible so as to provide an improved safety margin in the event of an unforeseen catastrophic event.

Management of heritage sites and monuments

- Before any works begin, the five heritage sites on Big Hill that will be destroyed by the project must be comprehensively photographed and recorded to ensure that the history of the area continues to be available to the Stawell community.
- Before any works begin, the Scotchmans United Engine Bed, and the Engine Bed and Battery (site 11 in the EES) must be covered with soil to protect the site and the soil must be removed at the end of the mining operations.
- Before any works begin, the Ulster tunnel (site 9 in the EES) must be protected from damage and any extension of the south pit that may impact on this site is not permitted.
- Before any clearing begins, at the cost of the licensee, the recording of the arboretum trees must be undertaken and suitable specimens relocated to other public land to the satisfaction of the NGSC.
- The recording of all heritage features and sites must be by a suitably qualified heritage professional.
- The Big Hill monuments and community structures must be stored in a secure place for the life of the project before being returned and reconstructed. The licensee must meet the costs of removal, storage and reinstatement.

Reconstruction, settlement and subsequent use

- Due to the predicted rate and extent of settlement, no infrastructure is permitted to be constructed on the reconstructed Big Hill within 18 months of the completion of back filling.
- The proponent is to be responsible for all costs associated with ongoing monitoring and rectification of any impacts arising from settlement of back filled areas for 10 years after completion of the project.

Off sets

- Before any works begin, a Native Vegetation Offset Management Plan must be developed to the satisfaction of DEPI to ensure that all losses of Box Ironbark forest are

offset in line with the 2013 DEPI *Native Vegetation Permitted Clearing Regulations: Biodiversity Assessment Guidelines*.

Blasting plan

- Before any works begin, a blasting plan must be prepared to the satisfaction of DSDBI upon the advice of EPA, DoH, NGSC and the ERC. The plan must be included in the approved Work Plan Variation. The plan must include:
 - The following blasting limits:
 - Ground vibration 5 mm/s
 - air blast 115 dBL.
 - Provision for a suitably qualified or experienced mine staff member to be appointed to oversee and approve each blast
 - A program for monitoring all blasts be developed and implemented and detailed records maintained of
 - blast parameters
 - measured vibration
 - airblast levels
 - fly rock.
 - Provision for blast parameters to be reviewed and altered if necessary to achieve impact criteria
 - Provision for probe drilling conducted for all blasts to identify old underground workings which may promote high overpressure levels by permitting premature gas venting
 - Provision for blasts to be video recorded at regular intervals and analysed to closely scrutinise blast design and effects.
- Blasts to be conducted in a manner which ensures that the exclusion zone does not extend beyond the site boundary.
- Blasts be carried out at a fixed afternoon time period and an effective system implemented for forewarning residents of the time of the intended blast.

Appendix A List of Submitters

No.	Submitter
1	James Dunn
2	Jacqueline Gay
3	Roma Bennett
4	Leslie Murray
5	Margaret Hattersley
6	Greg Robson JP
7	Rob Stewart
8	Dot and Bill McIntosh
9	Margaret Black
10	Jean Black
11	Kel Purvis
12	Mark McLean and Bronwyn Bant
13	James Freebairn
14	Brian Adamson
15	Mick Wiecek
16	Margaret Johnston
17	David Long
18	Rose Altmann
19	Russell Altmann
20	Trudy Scott Decosta
21	Ruth West
22	Maureen Knight
23	John Knight
24	Stephen Read
25	Daniel Gurney
26	Barry Robertson
27	Cory Gilbert
28	Chris Nicholson
29	Chris McNaughton
30	Jaymen K McNaughton
31	T Ranton
32	Sarah Martin
33	Dorothy Russell

34	Julie Dunn
35	Martin Dunn
36	Stephen Dunn
37	Rhonda Bird
38	Pam Patterson
39	Luke Norsworthy
40	Emma Norsworthy
41	Mitchell Ranton
42	Bob Ranton
43	Gary Ranton
44	Margaret Ranton
45	Nola Dunn
46	Shirley Rickard
47	Katherine Lewis
48	Nicole Nicholson
49	Colin Dunn
50	Raymond John Grinham
51	Maree Hayter
52	Jack Hahn
53	Marion Murtagh
54	Carla Thomas
55	Lauren Murtagh
56	Brian Thomas
57	Danielle Gilbert
58	William Murtagh
59	Richard L Dodds
60	Andrew J Reading
61	Malcolm Hirst
62	Alan Jack
63	Gerard Fry
64	Leonie Clayton
65	Kathryn Wiecek
66	Steven Collins
67	Joanne Cooper
68	Allan Cooper

69	James Cass
70	Sandra Collins
71	Kristy Lewis
72	Brian O'Shannessy
73	Narelle O'Shannessy
74	Mark Stainsby
75	Sarah Martin
76	Cory Gilbert
77	Barry Robertson
78	Daniel Gurney
79	Stephen Read
80	Mick Wiecek
81	Bryan Adamson
82	Matthew Flavell
83	Jodie Grinham
84	Kay Grinham
85	Andrew Grinham
86	Don Wright
87	Joel Dowsett
88	Chris McNaughton
89	Dorothy Russell
90	Julie Dunn
91	Pam Duffy
92	Alan Duffy
93	Martin Dunn
94	Chris Nicholson
95	T Ranton
96	Jaymen K McNaughton
97	Ronald Winton
98	Robyn Beazley
99	Russell Bird
100	Karen McCarthy
101	James Pyle
102	Aaron McCarthy
103	Kim Simmons

104	Shelley L Dowsett
105	Lynne Jenkinson
106	Estelle Hirst
107	Darryn Jenkinson
108	Daniel Gurney
109	Lawrence Bennett
110	Diane Raeburn
111	Gary Withers
112	Mary Wrigley
113	Len Graham
114	Irene Elliot
115	Kathleen Petch
116	Elizabeth Dumesny
117	Geoffrey Elliot
118	Robert Dumesny
119	Yvonne Watson
120	Kerry and Fred Kingston
121	Kim Harvey
122	Karen Ware
123	Kelly Cosson
124	Doreen Chisholm
125	Glen and Valma Robson
126	Margot Gardner
127	Kerry Hapgood
128	Greg Cameron
129	Geoffrey Lee Richards
130	Dr G A Letts
131	Kristen Ankerson
132	Paul Klemke
133	Helen Kennedy
134	Maxwell Kennedy
135	Cory Butt
136	Mark Redford
137	Ben Wallace
138	David Forth

139	Adam Clayton
140	Carlee Vokes
141	Wayne Clayton
142	David Crow
143	Mac Limbourne
144	Nick Limbourne
145	Geoffrey Limbourne
146	Jeremy Sargent
147	Edna Smith
148	Darren Raeck
149	Matthew Delzotto
150	Michael Sullivan
151	Peter Lewis
152	Noel Cameron
153	Annette Lewis
154	Matthew Moloney
155	Sharon Moloney
156	Nigel East
157	Jake McInerney
158	Thomas Fenwick
159	Trent Neagle
160	Tracey Fox
161	James Lawrie
162	Ashley Fox
163	Madeline Hopper
164	Narelle Smith
165	Paigen Smith
166	Darren Smith
167	Deborah Lawrie
168	Fred Cooper Jnr
169	Graeme Fox
170	Neil Beaton
171	Shallan Cooper
172	Simon Marshall
173	Stuart Finlayson

174	Derick Mitchell
175	Robert Virgona
176	Corey Smith
177	Ross Walker
178	John Repper
179	Madison McCartney
180	Caitlan Slorach
181	Shannon Notting
182	Nick Thomas
183	Tom McCord
184	Sue Blakey
185	J B Barnham Real Estate
186	John Teasdale
187	Keaton Sellers
188	Geoff Blachford
189	Noel Henry Raeburn
190	Lorraine Hackwill
191	John Griffiths
192	Robert Freeland
193	John McMahan
194	Valerie Findlay
195	Dot McIntosh
196	Geoff Bullock
197	Norm McIntosh
198	Andrew and Valerie McCann and Thelma Argall
199	Brenda and David Clark
200	Stawell Historical Society Inc.
201	Ross Lumley
202	Dorothy Brumby
203	Graeme and Christine Trickey
204	Deborah Evans
205	Peter and Maureen Cazaly
206	Rosalind Byass
207	L Bennett
208	Marlene Kay

209	V Gilmartin
210	Marion Bypass
211	Simon Crow
212	Doreen Cross
213	Xavier Hamilton
214	Isabella Simmons
215	Tom Simmons
216	Joan Burke
217	Luke Russell
218	Robert Loustley
219	Debbie Cousley
220	Robert Pitman
221	Peter Baker
222	Jane Atkins
223	Peter Muszhieta
224	Jye Smith
225	Leighton Dunn
226	Moira Hateley
227	Leonard John Hunter
228	Brett Tonkin
229	Ben Mitchell
230	Westlift Crane Hire
231	Beau Simmons
232	Jack Simmons
233	Sharon Crow
234	Gordon Crow
235	Cecilia Crow
236	Jaclyn Crow
237	Jim Sherwood
238	Jayden Fowkes
239	Garry Lewis
240	Gabrielle Sherwood
241	Colleen Salkowski
242	Jeffrey and Barbara Savage
243	Denis McAdie

244	Maureen Hunter
245	Anthony Unger
246	Darryl Hunter
247	Peter Barham
248	Rodney Clarke
249	Christopher Colin Waack
250	Val Kennedy
251	James Barham
252	Zach Blachford
253	Breanne Rush
254	Marion Kossowski
255	Trevor Hunt
256	Brad Hunt
257	Dean and Selena Cameron
258	Tracy Buddy
259	Sherrie Hunt
260	Leanne Blachford
261	Peter Wemyss
262	Walter Bowers
263	Hayden James Melbourne
264	Wendy Melbourne
265	St Hamilton and Son Constructions Pty Ltd
266	Darren Hamilton
267	Richard Blakey
268	Daniel Fitzell
269	Leigh Blackmore
270	Thelma Spicer
271	Tracey McCartney
272	Jason Lewis
273	Lorraine Millikin
274	Scott Blachford
275	Cameron Kings
276	Wade Boustead
277	Anne McGregor
278	Michael Dingan

279	Mal McCombe
280	Nigel Waldon
281	Grant Wells
282	Brett Williams
283	Darren Smith
284	Kyle Henskes
285	Steve Barnett
286	John Pye
287	Moya and Tamantha Williams
288	Northern Grampians Shire Council
289	Andrew Davidson
290	Laurie Millikin
291	Lois Nuske
292	Rodney and Edith Rickard
293	Stephen Ware
294	VicRoads Western Region
295	Julie Andrew
296	Ben Kimber
297	John Pollock
298	Great Western Garage
299	Alison Martin
300	Ben Martin
301	Owen Martin
302	Patricia Martin
303	Luke Martin
304	Heath Hemley
305	Caitlin Cooper
306	Kerri Meagher
307	Simon Jones
308	Allan Jeffery McMillan
309	Judith McMillan
310	Gary Raeburn and family
311	Rhian Jones
312	Department of Environment and Primary Industries
313	Minerals Development Victoria, Department of State Development Business and Innovation

314	Roy Fox
315	Peter Seeary
316	Lesley Seeary
317	Thomas Parkes
318	Earth Resources Division, Department of State Development Business and Innovation
319	EPA Victoria
320	Hugh Williams
321	Sam Cocks
322	Juliusz Kossowski
323	Andrew Hemley
324	Sue Terbos
325	Jill Prins
326	Daniel Monaghan
327	Joan Brilliant
328	Coralie Gibson
329	Stawell Bearings
330	Phillip Scott
331	Donald Eric Pohlner
332	Ian J Howard
333	Laura Hyslop
334	Judith McGregor
335	Joyce Hall-Kenyon
336	Debra Herd
337	Norman Kenyon
338	Tracey Ekman
339	Rikki Ekman
340	Laetitia Ekman
341	John Ekman
342	GWMWater
343	Helga Saunders
344	Robyn Iles
345	Suzanne Greene
346	Gordon Smith
347	Simon Smethurst
348	Andrew Kuhne

349	Hartley and Eline Belitz
350	Amelia Kingston and Ross Horsey
351	David Johnston
352	Department of Health
353	Environment Victoria
354	Heritage Victoria
355	Gary Saunders
356	Jennifer Collins
357	Ôerry Mills
358	Diana Isaac
359	Bev Isaac

Appendix B Terms of Reference for Inquiry



Inquiry appointed under Section 9 of the *Environment Effects Act 1978* to report on the Big Hill Enhanced Development Project

Name

1. The Inquiry is to be known as the 'Big Hill Enhanced Development Project Inquiry' (the Inquiry).

Purpose

2. The purpose of the Inquiry is to inquire into the potential effects of the proposed Big Hill Enhanced Development Project (the project). The report of the Inquiry will inform the Minister for Planning's Assessment of the project under the *Environment Effects Act 1978* (the EE Act).
3. In overview, the Inquiry is to:
 - i Consider and report on the potential effects of the project, taking into account the procedures and requirements the Minister specified for the preparation of the Environment Effects Statement (EES) under section 8B(5) of the EE Act (see Attachment 1), and
 - ii Address matters relevant to the design and implementation of the project.

Background

Project

4. The project comprises excavating two new open cut pits at Big Hill in Stawell, the extraction of ore from the pits and the backfilling of the pits with waste rock to re-establish the original topography of Big Hill. Ore would be processed at Stawell Gold Mines' (SGM's) existing processing plant about a kilometre south-east of Big Hill, and tailings disposed of to the existing tailings storage facility 3-4 kilometres further to the south-east. Approximately 2.3 million tonnes of ore are proposed to be mined from the pits to produce about 108,000 ounces of gold over a projected five year operating life, including rehabilitation.
5. Existing infrastructure such as the processing plant and the tailings storage facility would continue to operate under the terms of existing approvals.
6. A similar project at Big Hill was subject to an EES that resulted in an unfavourable Minister's Assessment, issued in October 2000. The current proposal differs in several respects from the earlier proposal, with some changes responding to issues identified in the Minister's Assessment.

EES decision

7. On 23 April 2013, the Minister for Planning determined that an EES was required for the project under the EE Act. The EES has been prepared by the proponent in response to Scoping Requirements issued by the Minister for Planning in October 2013.
8. The EES was placed on public exhibition from 28 March until 13 May 2014.

Commonwealth decision

9. The project was referred to the former Australian Government Minister for Sustainability, Environment, Water, Population and Communities, and determined not to be a controlled action under the *Environment Protection and biodiversity Conservation Act 1999* (EPBC Act).

Planning approval

10. Because the mining project is subject to an EES and Minister's Assessment under the EE Act, under section 42(7) of the *Mineral Resources (Sustainable Development) Act 1990* mining works within the Licence are exempt from requiring a planning permit under the Northern Grampians Planning Scheme.

Other approvals

11. Under Victorian law, the project requires the following approvals:
 - i Work Plan for work under the Mining Licence and a Work Authority, under the Mineral Resources (Sustainable Development) Act 1990.
 - ii An approved Cultural Heritage Management Plan under the Aboriginal Heritage Act 2006 to manage works in areas of cultural heritage sensitivity.
 - iii Consent to remove protected flora under the Flora and Fauna Guarantee Act 1988.
 - iv Authority to take or disturb wildlife under the Wildlife Act 1975.

Method

12. The Inquiry may inform itself in any way it sees fit, but must consider the exhibited EES, any submissions received in response to the exhibited EES, the proponent's response to submissions and other relevant information provided to, or obtained by, the Inquiry, having regard to relevant statutory provisions, policies and associated plans.
13. The Inquiry must conduct a public s and may make other such enquiries as are relevant to its consideration of the potential environmental effects of the project.
14. The Inquiry must conduct its hearings in accordance with the following principles:
 - i. The hearings will be conducted in an open, orderly and equitable manner, in accordance with the rules of natural justice, with a minimum of formality and without the necessity for legal representation.
 - ii. The Inquiry process will aim to be exploratory and constructive, where adversarial behaviour is minimised.
 - iii. Parties without legal representation will not be disadvantaged – cross-examination will be strictly controlled and prohibited where deemed not to be relevant by the Inquiry Chair.
15. The Inquiry will meet and conduct hearings when there is a quorum of at least two of its members present including the Inquiry Chair.

Submissions are public documents

16. The Inquiry must retain a library of any written submissions or other supporting documentation provided to it directly until five years has passed from the time of its appointment.
17. Any written submissions or other supporting documentation provided to the Inquiry must be available for public inspection until the submission of its report, unless the Inquiry specifically directs that the material is to remain *in camera*.

Outcomes

18. The Inquiry must produce a written report for the Minister for Planning presenting the Inquiry's:
- i Findings on the likelihood and significance of environmental effects, and associated risks, of the project and alternatives documented in the EES.
 - ii Conclusions on the feasibility of the project achieving acceptable environmental outcomes in the context of applicable legislation, related policy, relevant best practice, and the principles and objectives of ecologically sustainable development.
 - iii Recommendations on any modifications to the project and any specific measures that are needed to prevent, minimise or compensate for adverse effects in order to achieve acceptable environmental outcomes, in the context of relevant standards, objectives and guidelines established under relevant legislation.
 - iv Recommendations on the framework for environmental management for the project, including in relation to the necessary Environment Management Plans required in association with different approvals.
 - v Recommendations on any conditions or matters that should be incorporated in the approval of a work plan or in any other statutory instrument applying under Victorian law, if the project is to be approved, in particular under the Mineral Resources (Sustainable Development) Act 1990.
 - vi Relevant information and analysis in support of the Inquiry's conclusions and recommendations.
 - vii A description of the proceedings conducted by the Inquiry and a list of those consulted and heard by the Inquiry.

Timing

19. The Inquiry is required to report in writing to the Minister for Planning within six weeks from its last hearing date.

Fee

20. The members of the Inquiry will receive the same fees and allowances as a panel appointed under Division 1 of Part 8 of the *Planning and Environment Act 1987*.
21. The costs of the Inquiry will be met by Stawell Gold Mines Pty Ltd.

APPROVED:

MATTHEW GUY MLC
Minister for Planning

Date:

15.4.14



Attachment 1

DECISION ON PROJECT: Big Hill Enhanced Development Project

Decision under section 8B(3)(a) of the *Environment Effects Act 1978*

Assessment through an Environment Effects Statement (EES) under the *Environment Effects Act 1978* **is required** for the reasons set out in the attached Reasons for Decision.

Procedures and requirements under section 8B(5) of the *Environment Effects Act 1978*

The procedures and requirements applying to the EES process, in accordance with both section 8B(5) of the Act and the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Ministerial Guidelines), are as follows:


- (i) The EES is to document investigations of potential environmental effects of the proposed project, including the feasibility of associated environmental mitigation and management measures, in particular for:
 - a. Potentially significant effects on air quality and related consequences;
 - b. Potentially significant effects on amenity, including noise, and social well-being during the project construction and operation;
 - c. Potential safety hazards associated with open cut mining adjacent to residential areas;
 - d. Effects on cultural heritage values;
 - e. Effects on landscape values and visual amenity;
 - f. Other effects on land-uses and the community.
- (ii) The matters to be investigated and documented in the EES will be set out more fully in scoping requirements. Draft scoping requirements will be exhibited for 15 business days for public comment, before final scoping requirements are endorsed by the Minister for Planning.
- (iii) The proponent is to prepare and submit to the Department of Planning and Community Development (DPCD) a draft EES study program to inform the preparation of scoping requirements.
- (iv) The level of detail of investigation for the EES studies should be consistent with the approach set out in the scoping requirements and be adequate to inform an assessment of the acceptability of its potential environmental effects, in the context of the Ministerial Guidelines.
- (v) DPCD will convene an inter-agency Technical Reference Group (TRG) to advise DPCD and the proponent, as appropriate, during the preparation of the EES on the scoping requirements, the design and adequacy of the EES studies, and coordination with statutory approval processes.

- (vi) The proponent is to prepare and implement an EES Consultation Plan for informing the public and consulting with stakeholders during the preparation of the EES, having regard to advice from DPCD and the TRG.
- (vii) The proponent is also to prepare and submit to DPCD its proposed schedule for the completion of studies, preparation and exhibition of the EES, following confirmation of the scoping requirements. This schedule is intended to facilitate the alignment of the proponent's and DPCD's timeframes, including for TRG review of technical studies for the EES and the main EES documentation.
- (viii) The proponent is to apply appropriate peer review and quality management procedures to enable the completion of EES studies to a satisfactory standard.
- (ix) The EES is to be exhibited for a period of 30 business days for public comment, unless the exhibition period spans the Christmas–New Year period, in which case 40 business days will apply.
- (x) An inquiry will be appointed under the Environment Effects Act 1978 to consider environmental effects of the proposal.

Notification

The following parties (proponent and relevant decision-makers) are to be notified of this decision in accordance with sections 8A and 8B(4)(a)(i) of the *Environment Effects Act 1978*:

- Crocodile Gold Corporation (proponent)
- Minister for Energy and Resources
- Northern Grampians Shire Council
- Heritage Victoria



MATTHEW GUY MLC
Minister for Planning

Date: 23.4.13

Appendix C Documents from Inquiry hearing

DOCUMENT NUMBER	NAME OF DOCUMENT	SUBMITTED BY
DTPLI1	DTPLI Presentation	Mr Jack Krohn, Principal Assessment Officer, DTPLI
P2	Opening Submissions for proponent	Mr Tim Power, Herbert Smith Freehills, lawyers
P3	Mr Christophe Delaire presentation/overheads	Mr Tim Power
P4	Mr Christophe Delaire expert witness statement	Mr Tim Power
P5	EPA Publication 1411: Guidelines: Noise from Industry in Regional Victoria (NIRV) (October 2011)	Mr Tim Power
P6	URS Revised Air Quality Modelling Report, 1 July 2014	Mr Tim Power
P7	EPA Publication 1412: (SEPP N-1 and) NIRV Explanatory Notes, October 2011	Mr Tim Power
P8	EPA Publication 1413: Applying NIRV to Proposed and Existing Industry, October 2011	Mr Tim Power
P9	Overheads from Proponent submissions	Mr Tim Power
P10	Mr Stephen Darmawan presentation/overheads	Mr Tim Power
P11	Mr Darmawan expert witness statement	Mr Tim Power
P12	Dr David Jasper expert witness statement	Mr Tim Power
P13	Dr Jasper presentation/overheads	Mr Tim Power
P14	Mr David Lucas expert witness statement	Mr Tim Power
P15	Mr Lucas presentation/overheads	Mr Tim Power
P16	Mr Lucas presentation on voids	Mr Tim Power
S17	Ms Trudy Scott Decosta submission	Ms Trudy Scott Decosta
P18	URS Updated Air Quality Impact Assessment 3 July 2014	Mr Tim Power
P19	Appendix A to Updated Air Quality Impact Report (P18)	Mr Tim Power
P20	Addendum to Mr Frank Fler expert witness statement	Mr Tim Power

P21	Addendum to Mr Robin Ormerod expert witness statement	Mr Tim Power
P22	Addendum to Mss Victoria Lazenby and Jean Meaklim expert witness statement	Mr Tim Power
P23	Variation of Mining Licence 5260 dated 6 May 2011	Mr Tim Power
P24	Draft Work Plan Variation for Big Hill Enhanced Development Project, 27 March 2014	Mr Tim Power
P25	Summary of Work Plan Variations to Big Hill licences	Mr Tim Power
P26	CHMP Notice of Approval, 12 June 2014	Mr Tim Power
P27	Bond Methodology	Mr Tim Power
P28	SGM Part Draft Bond Calculations	Mr Tim Power
P29	SGM Part Draft Bond Calculators	Mr Tim Power
P30	Order in Council of 29 September 1994 providing mining exemption from <i>Flora and Fauna Guarantee Act 1988</i>	Mr Tim Power
P31	Cardno Lane Piper: Environment Audit Report for TSF 2, June 2014	Mr Tim Power
P32	Mr Glenn Weston overheads/presentation	Mr Tim Power
P33	Mr Weston expert witness statement	Mr Tim Power
NGSC34	Northern Grampians Shire Council submission	Ms Justine Linley
P35	Ms Victoria Lazenby (and Ms Jean Meaklim) expert witness statement	Mr Tim Power
P36	Ms Lazenby overheads/presentation	Mr Tim Power
P37	EPA Publication 1191: Protocol for Environmental Management (Mining and Extractive Industries), December 2007	Mr Tim Power
DoH38	Department of Health Email to Panel on 4 July 2014 re complaints management	Panel Chair
P39	Public Place Social Impact Survey questions	Mr Tim Power
P40	Section 15 MRSD Act Regulations 2013: Information Requirements for Work Plan	Mr Tim Power
P41	Dr Harry Grynberg expert witness statement	Mr Tim Power
P42	Dr Grynberg overheads/presentation	Mr Tim Power

P43	Mr Frank Flee expert witness statement	Mr Tim Power
P44	Mr Flee overheads/presentation	Mr Tim Power
P45	Mr Robin Ormerod expert witness statement	Mr Tim Power
P46	Mr Ormerod overheads/presentation	Mr Tim Power
R47	Press clippings re economic issues	Mrs Diane Raeburn
P48	Mr Lance Wackett expert witness statement	Mr Tim Power
P49	Dr Martin van Bueren expert witness statement	Mr Tim Power
P50	Dr van Bueren overheads/presentation	Mr Tim Power
P51	Current EMP for Licence MIN5260, November 2012	Mr Tim Power
P52	Work Plan Variation to Mining Licence 5260 including Wonga Pit, 18 April 2011	Mr Tim Power
P53	Big Hill Minerals Balance-void update, 6 July 2014	Mr Tim Power
P54	Information on Reconstruction of Big Hill	Mr Tim Power
P55	TWRS Materials Segregation	Mr Tim Power
P56	Bulldozer diagram showing reconstruction methods	Mr Tim Power
DSDBI57	Letter to SGM re Clarification of Statutory Approval Requirements, 5 December 2013	Mr Wayne Morgan
DSDBI58	Mr John Mitas overheads/presentation	Mr John Mitas
DSDBI59	Letter to PPV re Tailings Dam 2	Mr John Mitas
EPA60	EPA overheads/presentation	Dr German Ferrando-Miguel and Mr Tony Robinson
DoH61	DoH overheads/presentation	Mssrs Graeme Gillespie and Tom Niederle
DoH62	DoH presentation with Notes	Mssrs Graeme Gillespie and Tom Niederle
GWM63	GWMWater presentation	Mr Bernie Dunn
B64	Further submission	Mr Peter Baker
B65	SGM Capital and Operating Costs financial document	Mr Baker
B66	SGM Economic Analysis	Mr Baker

P67	Crocodile Gold web site information concerning reserves	Mr Baker
P68	Further feasibility information from Crocodile Gold web site	Mr Baker
F69	Professor Barry Noller expert witness statement	Mr Roy Fox
F70	Professor Noller overheads/presentation	Mr Fox
F71	Air Quality Assessment Report by Dr Jonathan Streeton, expert witness statement for 1999 EES Inquiry	Mr Fox
F72	Mr Roy Fox submission	Mr Fox
S73	Mrs Helga Saunders submission	Mrs Helga Saunders
S74	Mr Ian Magee expert witness statement	Mrs Saunders
P75	Map showing submitter locations	Mr Tim Power
M76	Mrs Wendy Melbourne submission	Mrs Wendy Melbourne
M77	Big Hill Action Group letter to NGSC Mayor re Waihi, 17 August 1999	Mrs Melbourne
B78	Ms Lesley Bennett submission	Ms Lesley Bennett
F79	Mr Fox Multiple Stressors notes	Mr Fox
K80	Mrs Marion Kossowski presentation including overheads	Mrs Marion Kossowski
P81	Examples of Mines and Quarries near residential areas	Mr Tim Power
P82	Additional Tables from Community Survey	Mr Tim Power
P83	Information on Boral Quarry Montrose	Mr Tim Power
B84	Dr Daniel Perkins Community Survey	Ms Marion Byass
B85	Ms Marion Byass presentation	Ms Byass
K86	Ms Kerri and Mr Fred Kingston presentation	Ms Kerri Kingston
P87	SGM Submission 2	Mr Tim Power
P88	Noise Monitoring Notes Marshall Day	Mr Tim Power
P89	Noise Monitoring Logs Marshall Day Site Visit to Mill	Mr Tim Power
P90	Noise Monitoring notes Marshall Day Stawell Loggers	Mr Tim Power

P91	URS letter to Freehills re Additional Information Assessment of Arsenic in HIA, 13 July 2014	Mr Tim Power
P92	Benambra Mine Rehabilitation information	Mr Tim Power
P93	Not finalised - Work Plan Variation TSF1, January 2013	Mr Tim Power
DSDBI94	Work Plan Variation for Licence 5396 Ballarat Gold Pty Ltd	Ms Bessie Abbott
DSDBI95	EPA Discharge Licence 18092 Ballarat Gold Pty Ltd	Ms Abbott
DSDBI96	DSDBI/Dept of Health Media Release Report into Antimony at Costerfield, 11 July 2014	Ms Abbott
DSDBI97	DSDBI Fact Sheet from web site: Regulation of Mandalay Resources Costerfield mine, 11 July 2014	Ms Abbott
DSDBI98	Golders report: A Rapid Risk Assessment of Antimony Levels at Costerfield, Victoria, 20 June 2014	Ms Abbott
P99	Mr Wackett written response to questions from Panel	Mr Tim Power
P100	Mr Wackett written response to questions from Dr Gary Saunders	Mr Tim Power
P101	URS Mobile Base Station and Fire Watch Building Draft Concept Plan, 28 August 2013	Mr Tim Power
K102	Mr Ben Kimber submission	Mr Ben Kimber
W103	Mrs Karen Ware overheads/presentation	Mrs Karen Ware
W104	Mrs Ware submission	Mrs Ware
C105	Mr Dean and Ms Selena Cameron submission	Mr Dean and Ms Selena Cameron
H106	Mrs Sherrie Hunt submission	Mrs Sherrie Hunt
H107	Mr Trevor Hunt submission	Mr Trevor Hunt
H108	Mr Trevor Hunt overheads	Mr Trevor Hunt
H109	Mr Bradley Hunt submission	Mr Bradley Hunt
B110	Mrs Rosalind Byass submission and photographs	Mrs Rosalind Byass
B111	Mrs Rosalind Byass Poem	Mrs Byass
L112	Mr Jason Lewis and Ms Kylie Murtagh submission	Mr Jason Lewis and Ms Kylie Murtagh

M113	Mr John McMahon submission (read out)	Mrs Melbourne
C114	Mr Greg Cameron submission	Mr Greg Cameron
C115	Mr Greg Cameron slides	Mr Cameron
P116	Site Visit Itinerary	Mr Tim Power
L117	Dr Goff Letts submission	Dr Goff Letts
L118	Dr Letts presentation on Apex Arboretum	Dr Letts
M119	Mr Ian Magee Hard copy of electronic documents	Mr Ian Magee
R120	Mrs Diane Raeburn submission	Mrs Diane Raeburn
R121	Mr Noel Raeburn submission (read out)	Mrs Raeburn
S122	Mr Keaton Sellers submission (read out)	Mrs Melbourne
G123	Ms Margot Gardner submission	Ms Margot Gardner
C124	Ms Jennifer Collins submission	Ms Jennifer Collins
S125	Dr Gary Saunders submission	Dr Gary Saunders
S126	Dr Saunders overheads/presentation	Dr Saunders
B127	Ms Bennett final presentation	Ms Bennett
M128	Mrs Melbourne final presentation	Mrs Melbourne
F129	Mr Fox final presentation	Mr Fox
P130	Advice from Marshall Day re relocation of residents due to excessive noise, 14 July 2014	Mr Tim Power
P131	Draft Strategy for Development of Master Plan for Rehabilitation of Big Hill	Mr Tim Power
P132	Current Stawell Gold Mine Community Engagement Plan, May 2009	Mr Tim Power
P133	Enlarged maps based on earlier maps in EES (6)	Mr Tim Power