Safety Assessment of Major Mining Hazards

Stage 3 – Critical Control Adequacy Assessment & Reduced Case Risk Assessment

for

March 2004

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DATE: April, 2004
JOB NO.: HAZ1M
REVISION NO.: 0
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DOCUMENT REVISION RECORD				
Title:	International Power Hazelwood – Safety Assessment of Major Mining Hazards – Stage 3			
Job No:	HAZ1M			
Rev	**Description**	**Prepared by:**	**Checked by:**	**Date**
A	Draft	A Deakin	P Herrmann	April 04
0	Final	A Deakin	P Herrmann	April 04

TABLE OF CONTENTS

EXECUTIVE SUMMARY

International Power Hazelwood ("IPRH") have commissioned Qest Consulting to assist them in completing a Safety Assessment of the Major Mining Hazards associated with their operations. This report present the methodology and results of Stage 3 of this process. This stage in the process includes:-

1 *Critical Control Adequacy Assessment (CCAA)* - An assessment of the adequacy of the critical and major controls identified during stage 2 (ie. Those controls critical to the safe operation of the major hazards associated with mining activity).
2 *Reduced Case Risk Assessment* - an estimate of the risk reduction achieved from introduction of the improvement actions identified from the CCAA process.
3 *Safety Action Plan* – prioritised improvement plan summarising the safety improvement actions

As per the previous stages in the Safety Assessment Process, this stage is reported as a standalone document. However, it is recommended that to ensure a comprehensive understanding of the safety assessment process, this report be read in conjunction with the reports from the previous two stages.

This stage involved two workshops which were held at IPRH on the 25th and 26th March 2004, facilitated by independent risk consultants from Qest Consulting. The workshops were split between the two identified main assessment areas of Operations and Maintenance.

A total of 13 Major Mining Hazards were identified in Stage 2 for review through the CCAA process. The Critical and Major controls for all but two of the 13 hazards were assessed during this stage. The two hazards not reviewed related to the construction of HV towers and the realignment of the public road associated with the West Field lease area. As these activities are to be completed by specialist sub-contractors and at a later stage, it was considered more practical to delay the assessment process until the processes for engaging and managing the contactors has been established.

The CCAA processes generated 51 improvement actions, which were prioritised and which form the Safety Action Plan for control of the major mining hazards at IPRH. The risk assessment process was reapplied considering these actions and the Risk Assessment Team estimated that the implementation of these actions would reduce the PLL from approximately 1 fatality every 29 years to 1 fatality every 33 years. This constitutes an 11.5% reduction in the risk profile of the major mining hazards reviewed.

1.0 INTRODUCTION

This report outlines the methodology and results of the third stage of this Safety Assessment of Major Mining Hazards ("MMH") for International Power Hazelwood's ("IPRH") coal mining operations.

This third stage in the process includes:-

1. *Critical Control Adequacy Assessment (CCAA)* - An assessment of the adequacy of the critical and major controls identified during stage 2 (ie. Those controls critical to the safe operation of the major hazards associated with mining activity).
2. *Reduced Case Risk Assessment* - an estimate of the risk reduction achieved from introduction of the improvement actions identified from the CCAA process.
3. *Safety Action Plan* – prioritised improvement plan summarising the safety improvement action

As per the previous stages in the Safety Assessment process, this stage is reported as a standalone document. It is recommended that to ensure a comprehensive understanding of the safety assessment process, this report be read in conjunction with the reports from the previous two stages.

This stage involved two workshops which were held at IPRH on the 25th and 26th March 2004, facilitated by independent risk consultants from Qest Consulting. Qest also supplied a second consultant to ensure accurate minutes from the workshops were taken. The workshops were split between the two identified assessment areas of Operations and Maintenance. The sessions were attended by relevant personnel from each of these areas as well as the Safety Manager and Mine Engineering Manager. A short presentation was completed at the beginning of the workshop to introduce the participants to the risk assessment process and the definitions used. The workshop teams are listed in Table 1-1

Table 1-1 - SQRA Workshop Team

Name of Participant	Role
Workshop 1	**Operations**
Ian Quail	Operations Manager
Richard Polmear	Mine Engineering Manager
David Eves	Safety Manager
Kevin Myrteza	Operator
Anthony Deakin	Qest Consulting
Peter Herrmann	Qest Consulting
Workshop 2	**Maintenance**
Bill Estrada	Maintenance Manager
Noel Coxall	Shift Maintenance Supervisor
Ian Wilson	Shift Fitter
David Eves	Safety Manger
Anthony Deakin	Qest Consulting
Peter Herrmann	Qest Consulting

1.1 Major Mining Hazards Assessed

A total of 13 Major Mining Hazards were identified in Stage 2 for carrying through to this stage of the assessment process. These hazards were those that had an estimated risk above the adopted site defined risk criteria of 1E-03 (1 in 1,000yrs) or selected through the team-based review as requiring a rigorous control analysis.

All but two of the 13 MMHs were analysed in this stage. The two hazards not analysed related to the relocation and establishment of infrastructure for the new West Field lease area. The controls for these hazards have been referred for later assessment. These hazards were:

- IW32 – Public incident during road alterations
- IW28 - 220KV tower incident, including construction activities

The reason for deferring the assessment of these hazards is that they are to be completed by contractors and as such the IPRH controls principally relate to the processes for selection and management of a specialist(s) contractors. It was considered more effective to defer the review of these processes until closer to the commissioning date and once these processes have been further established. This study has highlighted the importance of these processes and IPRH are committed to reviewing them at a later stage to ensure that they are adequate to guard against a potential incident.

Table 1-2 - Major Mining Hazards and PLL Values

SQRA Rank	MMH No.	Hazard Title	PLL value
1	IPRH-NO1	Vehicle incident while accessing worksite	1.15E-02
2	IPRH-IW32	Public vehicle incident during road alterations	1.00E-02
3	IPRH-NO24	Heavy Mobile equipment interactions on mine roads	6.67E-03
4	IPRH-NO4	Dropped objects from major mining plant (onto personnel / equipment)	6.00E-03
5	IPRH-NO37	Failure whilst field jacking of major mining plant	4.40E-03
6	IPRH-IW28	220KV tower incident, including construction activities	2.50E-03
7	IPRH-NO5	Uncontrolled movement of major mining plant	1.65E-03
8	IPRH-NO38	Unplanned movement of equipment	1.37E-03
9	IPRH-NO42	Fall from or tipping of EWP	1.10E-03
10	IPRH-NO26	Batter failure	1.00E-03
11	IPRH-NO39	Confined spaces	3.00E-04
12	IPRH-NO8	Explosion of electrical components on major mining plant	2.20E-04
13*	IPRH-NO7	Major mining plant fire	1.00E-04
Total Estimated Site Major Mining Hazard PLL			**4.72E-02**

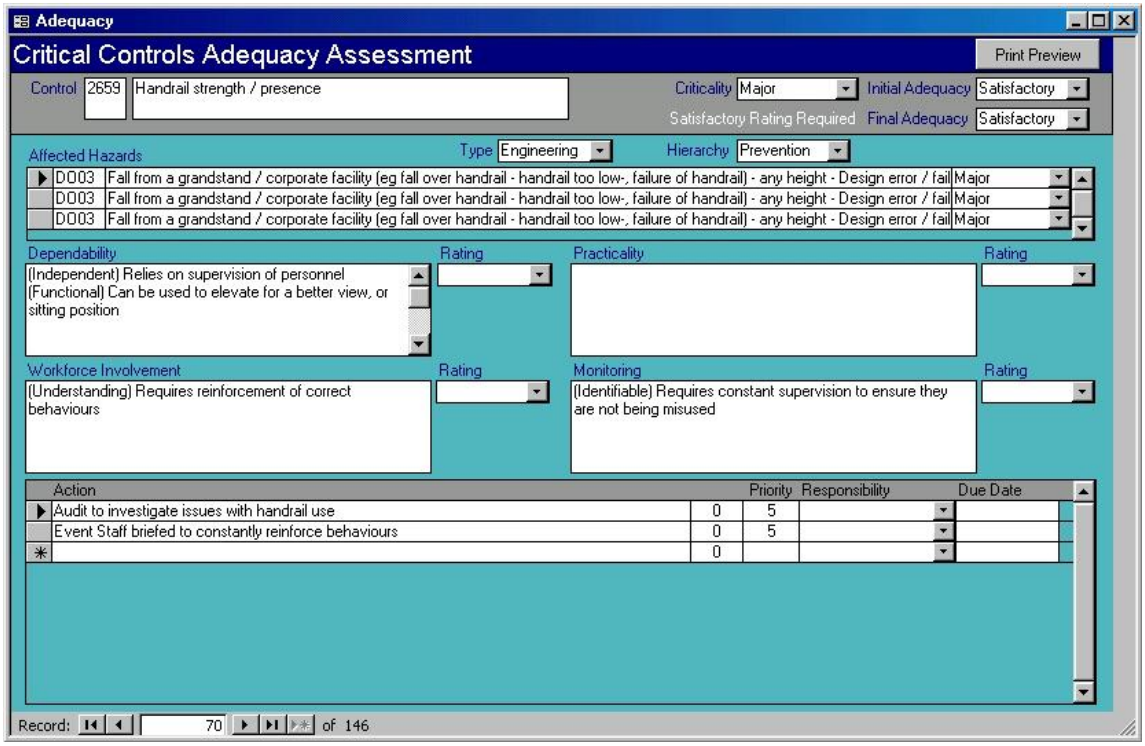
* MMH NO7 was ranked as hazard number 15 in stage 2 but identified for inclusion in this stage.

2.0 Methodology

2.1 Critical Control Adequacy Assessment (CCAA)

This stage in the safety assessment process is the review of adequacy of existing controls selected as either Critical Control or Major Controls. The output from the CCAA is an assessment of the current adequacy of each control and the potential measures required to improve the adequacy if its assessed rating does not meet the requirements for that level of control. As with previous stages the adequacy assessments are recorded in the risk register database (refer to Figure 2-1 below).

Figure 2-1 - Risk Register Control Adequacy Assessment Worksheet



The process for assessing adequacy of individual controls is to take each identified critical or major control and review the adequacy of the control against an established criteria, as outlined overleaf (Please note that a further breakdown of this criteria is included in APPENDIX 1). For each area of consideration, record the key points of the discussion about the control, and the areas in which it was found to be deficient. Based on the findings of this review, the adequacy of that component of the control may be determined and rated as very high, high, adequate, fair or poor.

Table 2-1 - Control Adequacy Assessment Process Checklist.

Checklist No.	Checklist Parameter	Comment
1	Control Location	Record where the control sits on the overall hierarchy of possible controls ie Elimination, Prevention, Reduction and Mitigation
2	Control Type	Record the type of control
3	Dependability	Assess control against checklist (see APPENDIX 1)
4	Practicality	Assess control against checklist (see APPENDIX 1)
5	Monitoring	Assess control against checklist (see APPENDIX 1)
6	Workforce Involvement	Assess control against checklist (see APPENDIX 1)

An *overall* adequacy rating (high, satisfactory or unsatisfactory) is then assigned to the control based on the 4 categories. Critical Controls should preferably have a High adequacy rating, and Major Controls require a Satisfactory adequacy rating. Note: for different types of controls, some of the 4 categories may not be applicable.

This gives the control an initial adequacy rating. If this adequacy rating is not sufficient for it to operate at the level of a Critical or Major Control then improvement measures have to be developed to increase the effectiveness of the control. Once these improvement measures are determined then the control is reassessed to see if the improvements have lifted it into the required level of adequacy rating. Potential additional controls as identified in the Hazard Identification stage, provide a good reference for identifying improvement measures.

Critical and Major Control Adequacy Assessments are carried out and recorded using the risk register database. The findings of this stage are presented in Section 3.1 – Assessment of Adequacy of the Critical and Major Controls.

2.2 Reduced Case Safety Risk Assessment

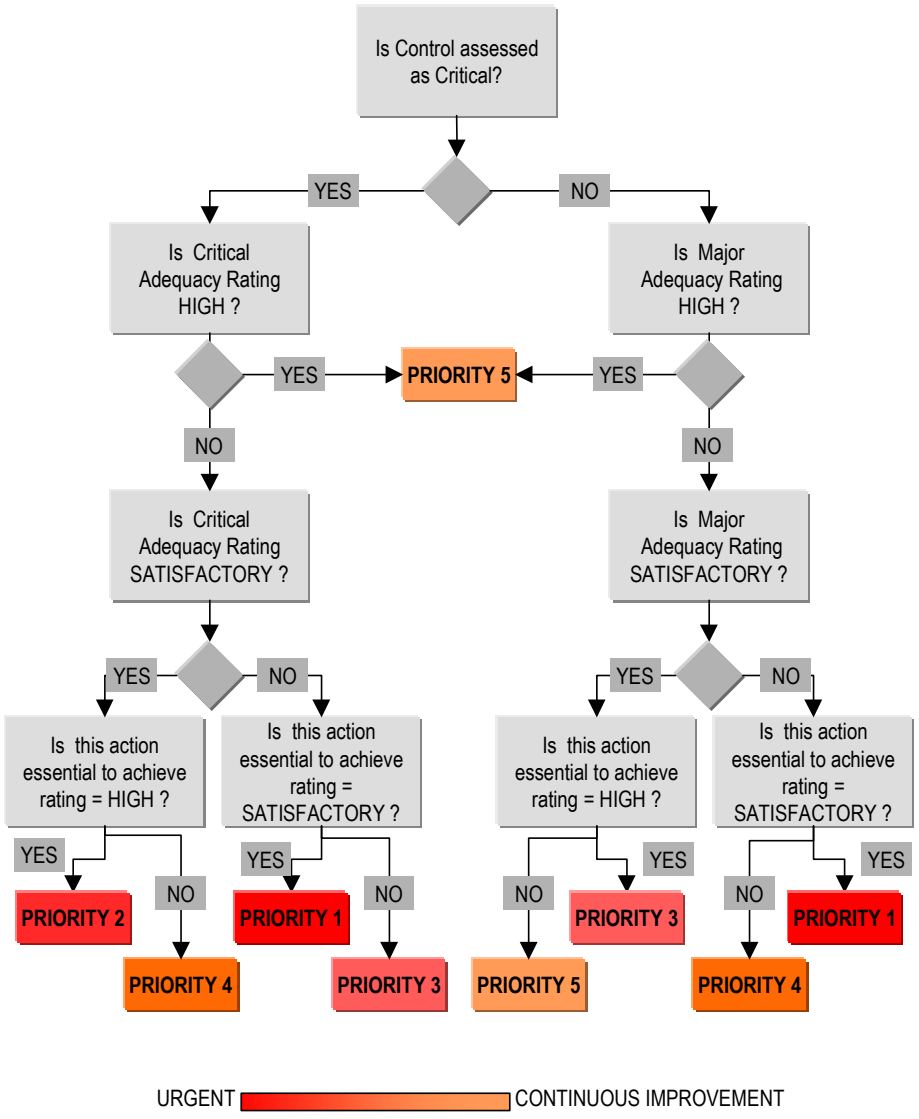
The potential actions identified in the CCAA aim to reduce the site risk by focussing on the largest risk contributors to the Base Case risk profile. Once these actions are identified and documented, the SQRA process is redone for each major hazard for which critical or major controls have been selected, to reflect the changes that would occur if we introduced the identified improvement ideas. This re-application of the SQRA process calculates the corresponding anticipated improvement in the site risk profile from the introduction of these actions. This data is presented in Section 3.2 – Reduced Case Safety Risk Assessment Results.

2.3 Action List for Additional / Improved Controls

One of the key outputs of the safety assessment process is the list of actions generated. To assist with the development of an implementation schedule, and to reflect the risk focus of this process, the actions are prioritised based on their potential effect on the control of the major hazard.

Each action is assigned a priority in accordance with the logic diagram shown in Figure 2-2.

Figure 2-2 - Safety assessment actions priority resolution



3.0 RESULTS

3.1 Assessment of Adequacy of the Critical and Major Controls

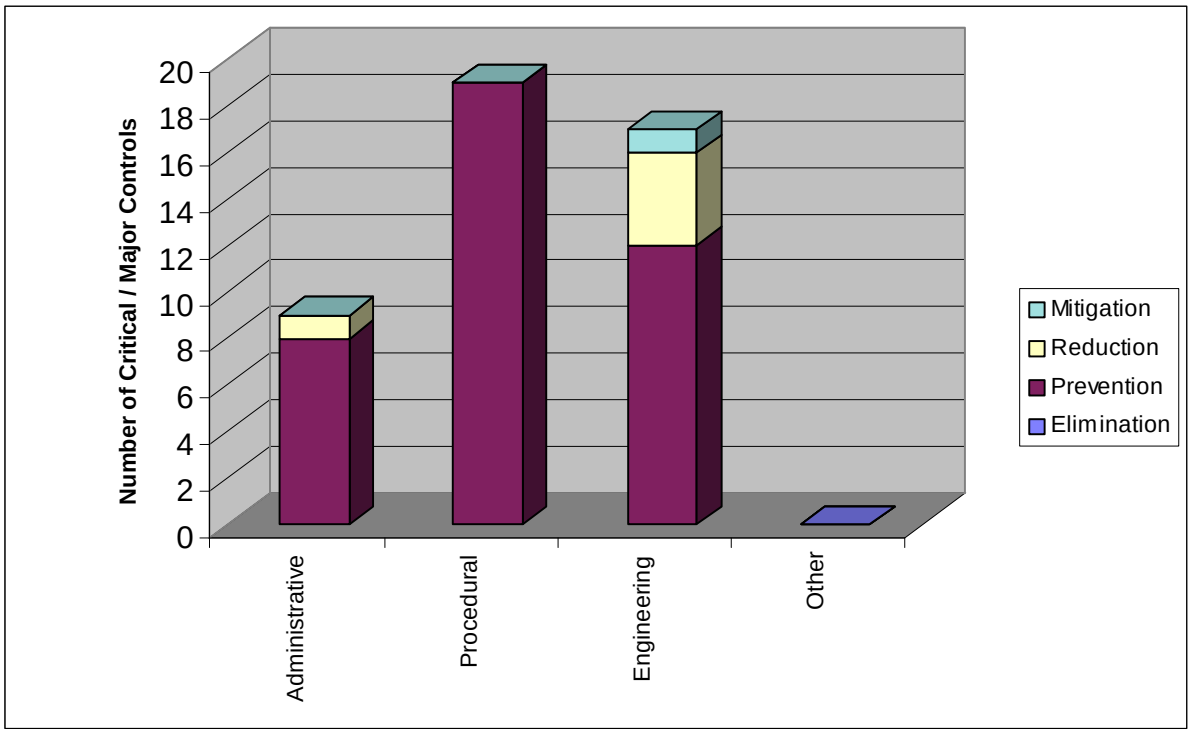
A total of 45 controls were assessed through the adequacy assessment processes, this included 15 Critical Controls and 30 Major Controls.

As a part of the CCAA the controls were categorised according to their type and position on the control hierarchy. Table 3-1 and Figure 3-1 show a breakdown of the controls according to these categories.

Table 3-1 – Distribution of Critical and Major Controls

Type	Elimination	Prevention	Reduction	Mitigation	Total
Administrative	0	8	1	0	9
Procedural	0	19	0	0	19
Engineering	0	12	4	1	17
Other	0	0	0	0	0
Total	0	39	5	1	45

Figure 3-1 - Distribution of Critical and Major Controls



These control distributions show that there was a good spread between the Procedural and Engineering controls reviewed as part of this process. It also shows that a vast majority of the controls selected were Preventative in nature.

The critical and major controls selected and their associated major hazards can be viewed in APPENDIX 2.

The results of this analysis were recorded in the database. Table 3-2 below summarises the results. A summary of each controls adequacy assessment can be generated from the database. A total of 51 improvement actions were identified and assessed to determine if they improved the adequacy of each control. As can be seen from Table 3-2, many of the actions were successful in increasing the adequacy of the controls.

Table 3-2 - Adequacy rating of controls

Adequacy Rating	Initial Adequacy		Final Adequacy	
	Critical	Major	Critical	Major
High	10	4	14	14
Satisfactory	5	24	1	16
Unsatisfactory	0	2	0	0

3.2 Reduced Case Results

This section of the report details the findings from the Reduced Case risk assessment process. Through comparison of the base case risk and reduced case results, the risk reduction achieved was calculated. The risk reduction, as estimated by the Risk Assessment Team, is summarised in Table 3-3.

As per the Base Case results, it must be acknowledged that this method of risk estimation is semi-quantitative and uses a “team-based” approach and as such relies on the collective understanding of the risk assessment team. The accuracy in estimating the potential risk reduction achieved can also be difficult as it relies on estimating the potential effectiveness of the proposed new control or improvement action. The strength of the SQRA approach is that it provides an assessment of the improvement actions relative to each other and as such enables a risk-based framework for safety improvement to be established. This framework enables risk priorities to be focussed and reductions efforts to be measured.

Table 3-3 - Comparisons of Base Case and Reduced Case Results

Rank	Hazard No.	Hazard Title	Base Case PLL	Reduced Case PLL	% Reduction
1	IPRH-NO1	Vehicle incident while accessing worksite	1.15E-02	1.02E-02	10.9%
2	IPRH-NO24	Heavy Mobile equipment interactions on mine roads	6.67E-03	6.00E-03	10.0%
3	IPRH-NO4	Dropped objects from major mining plant (onto personnel or equipment)	6.00E-03	5.49E-03	8.5%
4	IPRH-NO37	Failure whilst field jacking of major mining plant	4.40E-03	3.15E-03	28.5%
5	IPRH-NO5	Uncontrolled Movement of major mining plant.	1.65E-03	1.65E-03	0.0%
6	IPRH-NO38	Unplanned movement of equipment	1.37E-03	1.23E-03	10.0%
7	IPRH-NO42	Fall from or tipping of EWP	1.10E-03	1.10E-03	0.0%
8	IPRH-NO26	Batter failure	1.00E-03	8.51E-04	15.0%
9	IPRH-NO39	Confined/registered spaces	3.00E-04	3.00E-04	0.0%
10	IPRH-NO8	Explosion of electrical components on major mining plant	2.20E-04	2.20E-04	0.0%
11	IPRH-NO7	Major mining plant fire	1.00E-04	1.00E-04	0.0%
Total Estimated PLL			**3.43E-02**	**3.03E-02**	**11.57%**

As outlined in Table 3-3 the implementation of the improvement actions is estimated to reduce the PLL, for the controls assessed, from approximately 1 fatality every 29 years to 1 fatality every 33 years. This constitutes approximately 11.5% reduction in the risk profile of the hazards reviewed.

Please note this reduction only relates to the 11 MMHs assessed during this stage.

The estimated Base Case and Reduced Case profiles, for the MMH assessed, are also graphed in Figures 3-2 and 3-3.

**Figure 3-2 - IPRH Major Mining Hazard –
Base Case and Reduced Case Risk Profile Comparison**

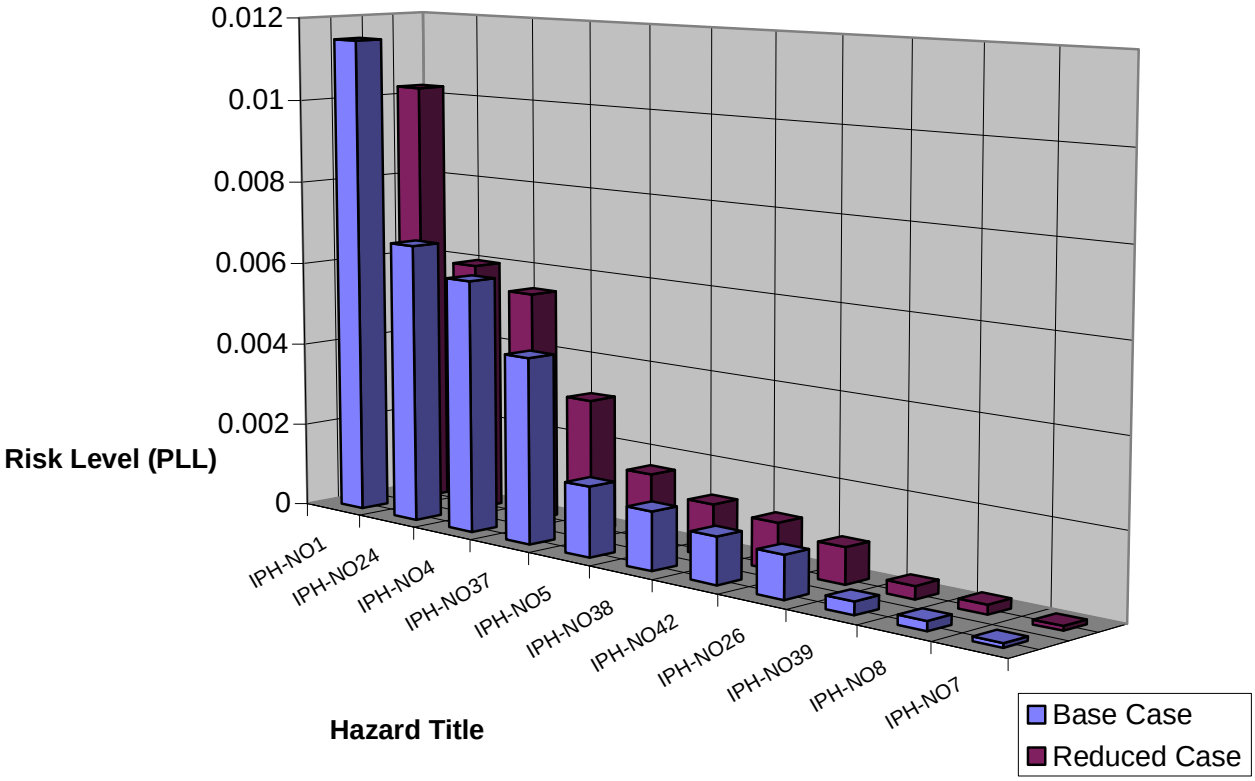
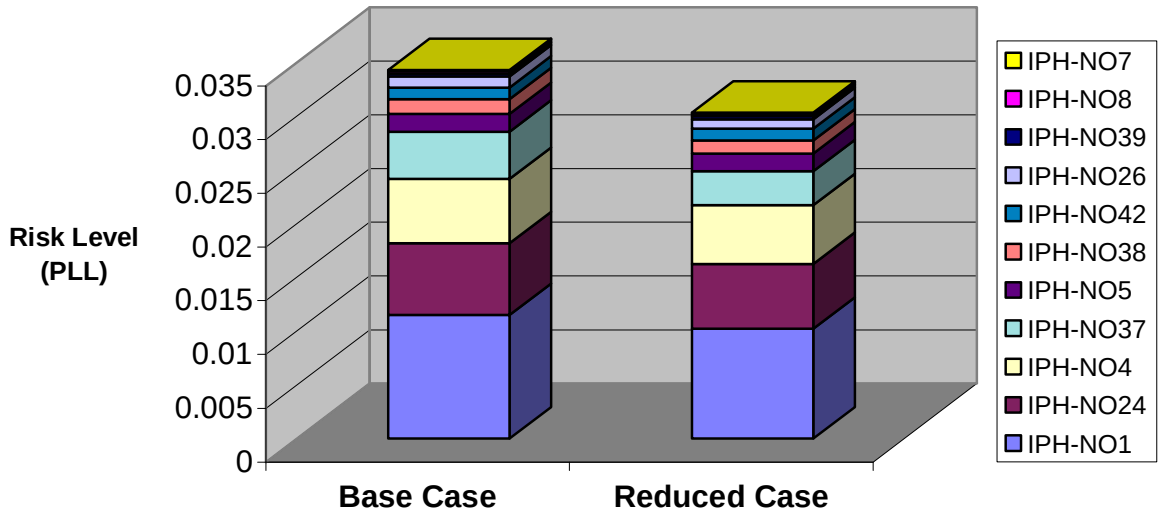


**Figure 3-3 - IPRH Major Mining Hazard –
Base Case and Reduced Case Risk Distribution Comparison**



3.2.1 Reduced Case Assumptions

The workshop team assumptions and data used to derive the Reduced Case PLL values are outlined in the following Table 3.4

Table 3-4 – Reduced Case Assumptions

Hazard No Description	Assumptions
IPRH-NO1 Vehicle Incident while accessing worksite.	Installing windrows as required by the digging plan would reduce off edge incidents to 1/50 years (down from 1/30). Actions to improve workers driving appropriately for the conditions was felt to result in a 5% decrease in frequency of occurrence of all 3 incident types (ie rollovers, impact / collision & off edge incidents). Closure or barricading of roads that are below standard or that have inadequate guide posts and reflectors would have little immediate effect, but would result in a 10% reduction in rollovers and off edge incidents in the long run. In addition to these reductions, the actions that aim to address behavioural issues at site (eg implementation of safework observations, take 5 program) was felt to lead to a 5% reduction in incident frequencies for all 3 types of incidents considered. The remainder of the actions considered were not felt to reduce the incident frequency markedly. Particular mention was made that engineering speed controls were not considered feasible as a method of risk reduction for this hazard, as the speed problem is behavioural and is therefore very difficult to counter with engineering solutions.
IPRH-NO4 Dropped objects from major mining plant (onto personnel / equipment)	Ensuring completion and installation of new conveyor systems to design criteria / specification was felt to have a marked effect, reducing the frequency with which lumps fall from the conveyors / transfers by 50% from 1 per year to 0.5 per year. However due to the increased height of the new conveyors, the chance of fatality should lumps fall from the conveyor was increased from 5% to 10%. In addition, barricading the area under major mining plant during cleaning / maintenance was felt to reduce the chance of a fallen component impacting personnel from 1 in 100 to 1 in 200. The introduction of a new type of coupling (non-rotating coupling - VOITH) on the conveyors was felt to reduce the risk from pieces of plant by 2% for each new coupling. These couplings are intended to replace the existing couplings as they fail. This is therefore a time dependant decrease in risk and hard to quantify. Only a 2% risk reduction was claimed, as the replacement process will most likely be quite gradual.
IPRH-NO5 Unplanned movement of major mining plant	No specific risk reductions were considered to occur as a result of the actions identified for this hazard.

Hazard No Description	Assumptions
IPRH-NO7 Major mining plant fire	No specific risk reductions were considered to occur as a result of the actions identified for this hazard.
IPRH-NO8 Explosion of electrical components on major mining plant	The installation of explosion vents was felt to have been included in the SQRA 1 risk assessment. As a result, no further risk reduction has been claimed here.
IPRH- NO24 Mobile equipment interactions on mine roads	Actions to improve workers driving appropriately for the conditions was felt to result in a 5% decrease in frequency of occurrence of both incident types (ie rear end and head on collisions). In addition to this reduction, the actions that aim to address behavioural issues at site (eg implementation of safework observations, take 5 program) was felt to lead to a further 5% reduction in incident frequencies, again for both types of incidents considered.
IPRH-NO26 Batter failure	The real risk from this hazard results from the side batter. The front batter is not as critical. It was felt that all of the actions identified for this hazard would contribute to ensuring that the operators can continue to avoid batter failure and would result in a 15% reduction in the incident frequency.
IPRH-NO37 Field jacking of major mining plant	The combined effect of all of the actions identified for this hazard was felt to be enough to justify reducing the initiating incident frequency from 1 incident in 5 years to 1 incident in 7 years. This reduction was from increased awareness of the maintenance personnel and resulting improved practices and procedures.
IPRH- NO38 Unplanned movement of equipment	The actions identified for this hazard that targeted improvements in procedural actions (eg training, JSA etc) were felt to result in a 10% reduction in risk across all 3 areas considered (ie remote unplanned start-up of equipment, unsecured equipment and parked equipment runaway).
IPRH-NO39 Confined spaces	The actions identified for this hazard were not felt to result in any quantifiable risk reduction. Due to the current arrangements / controls and the infrequency of exposure to confined spaces at the mine, the risk was felt to be reasonable.
IPRH-NO42 Fall from or tipping of EWP	Although the contributors to the risk from this hazard were felt to change as a result of the actions identified for this hazard, the overall risk was thought to remain relatively static. The rationale behind this decision was that whilst the risk from the use of elevated work platforms (EWPs) will increase due to the increased usage of them with the new conveyors, the EWPs are a safer means of accessing conveyors than is currently used. This means that whilst the EWPs will be used more, they are safer than the current practices being used. These two considerations were felt to counterbalance each other, resulting in no effective change in the risk from this hazard.

3.3 MMH Safety Action Plan

The SQRA process generated 51 actions that aim to improve the adequacy of the control of MMHs and thus decrease the risk at the site. These actions form the MMH Safety Action Plan and this is one of the main outputs of the SQRA process. It represents the culmination of the SQRA process and presents the context in which the Reduced Case risk assessment was completed. It therefore acts as a list of what needs to be done to reach the reduced risk level.

To assist with the implementation of the actions and to reflect the risk focus of this process, the actions are prioritised. They are each assigned a priority that reflects the degree that each measure relates to managing or reducing the risk from its associated major hazard scenario (ie. 1 to 5, with 1 being the highest priority and 5 the lowest). This process follows the methodology outlined in section 2.3. In addition to this prioritisation, a schedule of target dates for implementation of the actions is to be developed by IPRH. It was considered that this task is best completed following the SQRA process once the final list of actions are completed. The full list of action items, their priority rankings and responsibilities for implementation contained in APPENDIX 3.

4.0 Safety Assessment Review Process

This assessment process has reviewed the current mining operations and planned expansion to the West Field area. However, like any system, this assessment needs to be continually built upon to maximise its benefits to IPRH. Furthermore, it is important that the assessment process is reviewed and updated to keep pace with any significant findings or changes that may affect the mines risk profile.

The review process may result in the deletion of obsolete major mining hazards, inclusion of newly identified major mining hazards, or revision of existing hazards that have changed. Addition of new hazards or review of existing ones should include the revised hazard information being taken through the SQRA process and the risk level revised.

In addition, as the actions identified in the Safety Action Plan are carried out, the mine risk profile will change. As such, it is important that the SQRA process be periodically reapplied to measure the risk reduction that such changes achieve. Similarly the risk and control adequacy process should be reapplied if the control measures are identified to be inadequate, new information is obtained or significant changes to the event structure or management are planned.

These review processes provides an opportunity to systematically review each hazard scenario and confirm the adequacy of the controls, or identify any areas in which additional improvement actions or new control measures can be implemented. Ensuring the update and review processes are completed, and subsequent actions are implemented, is the critical step in driving risk reduction and continual improvement.

APPENDICES

APPENDIX 1

Control Adequacy Assessment Criteria

CRITICAL CONTROL ADEQUACY ASSESSMENT

1. TYPES of CONTROLS

ADMINISTRATIVE typically site-wide procedures. eg JSA, Inductions, PTW, CSEP.

PROCEDURES established and specific procedures and instructions. eg Snr Operator duties, vessel inspection PM's, WI's, checklists.

ENGINEERING hard: alarms, shut-offs, relief valves, deluge systems
Soft: industry etc Standards, specifications, limits of operations.

OTHER other.

2. HIERARCHY of CONTROLS:

Elimination:
avoiding the dangerous situation altogether often by:
- replacement of a "dangerous" material with a "safe" material;
- changing the process so that the "dangerous" part is not needed
- using a corrosion-resistant metal
- using a plant item or structure that has a very low failure rate

Prevention:
stopping the "dangerous" situation arising by having (examples);
- design / building to appropriate standards and/or codes
- regular maintenance programs
- *suitable fail-safe modes (eg closed on loss of power / air)*
- suitable work procedures / instructions / training
- minimising the number of people having to be in the area

Reduction:
(often hard to distinguish between Prevention and Reduction)
methods to reduce the amount of material escaping or limiting the impact of an incident by using:
- detection devices at likely release points that shut off a line to reduce the amount of escaped material
- suitable control systems to avoid the escape situation
- scrubbing systems on vents
- workforce training

Mitigation:
dealing with the situation after an incident has occurred or because the process cannot be dealt with at a higher level:
- bunding, ventilation / dilution systems
- emergency response plans
- physical barriers, shelters, PPE
- cathodic protection

3. DEPENDABILITY of CONTROLS:

Dependability (from a non-human point of view)

Functional
- does it meet the INTENDED PURPOSE adequately?
- can it provide the PROTECTION expected?
- are there any ASSUMPTIONS to let it be considered?

Reliable taken here to mean,
- can the control give data which can be TRUSTED?
- *can the control ACT EVERY TIME it is called upon to give the protection it was designed to give?*
- is the control a SOURCE OF NUISANCE ALARMS and therefore likely to be ignored?

Independent
- does this control RELY ON OTHER THINGS to continue to work?
- if something else fails, will it TAKE THIS CONTROL OUT with it?

Survivable
- will the control measure STILL REASONABLY BE AVAILABLE after or during the major incident being avoided?

Compatible
does the control INTERACT WITH OTHER PARTS of the plant / system without losing its own protection features and / or causing another control to have its function affected?

Available
what happens when the (eg) pressure gauge is being CALIBRATED – does the plant have to be shut down? does this mean calibration can only be done during a plant shut?· how much DOWN-TIME does this control need to keep its reliability (that is, its accuracy and level of trust) high?

Dependability (from a human point of view)

Functional
- can the employee act within an APPROPRIATE TIME frame?
- can the employee USE THE CONTROL appropriately?

Reliable
- are our operators TRAINED ADEQUATELY to deal with the complexity of the control? (see also Compatible)
- can the CORRECT DECISION be made under a stressful situation?
- Independent
- is the person to carry out the control DOUBLE-BOOKED to perform another function in a different role?
- does the skill / knowledge base lie with ONLY A FEW individuals?

Survivable
- can the control remain effective even if the OPERATOR IS OUT OF ACTION?

Compatible
- are our operators TRAINED ADEQUATELY to deal with the complexity of the control? (see also Reliable)

Available
- is the area PERMANENTLY MANNED?

4. MONITORING of CONTROLS:

MONITORING is recognised as the most difficult part to demonstrate.

Identifiable
- what KEY PARAMETERS need to be monitored?
- HOW OFTEN are these checks required?

KPI's covers a wide range of checks including –
- FUNCTIONALITY (eg does the emergency stop button actually close / stop what it should?)
- Calibration
- SETTINGS (eg pressure relief settings)
- SERVICE LIFE (eg actual pressure relief valve values before and after service)
- EXCURSIONS from allowable operating range
- OPERATOR SKILLS and understanding
- NDT MONITORING (eg corrosion, thickness, cracking
- RESPONSE SPEED (of items, personnel and to incidents)· failure rate and / or down time· incident / release / event COUNTS

Reporting
- are the appropriate persons aware of their requirement to PERFORM the monitoring?
- is there a system enabling the results of monitoring to be KEPT AND ACCESSED?

Correcting
- is it clear who INITIATES corrective action based on findings from the monitoring program?
- is it clear who CARRIES OUT the corrective actions?
- includes REVIEWING KPI suitability

5. OPERATOR INTERFACE with CONTROLS:

Involvement
Understanding
Training
OH&S Rep
- this is generally a SITE-WIDE ISSUE mostly tied up with getting to where we are now (eg fault tree development, employee consultation,

- unless there is a SPECIAL, UNIQUE OR UNUSUAL requirement, this section can be assumed to be site-wide issues (eg storeperson training regarding chlorine service equipment)

6. PRACTICALITY of CONTROLS:

Typically a control measure is at least proven OR be designed and operated to an applicable standard.

Proven
- is the control WELL ACCEPTED in doing what we intend it to do?
- is the control WELL RECOGNISED and accepted?
- has the control been in SUCCESSFUL USE over a period of time either at our MHF or other sites?
- is the FAIL-SAFE MODE easily identified?

Applicable Std
- is it an Industry Standard or AS, BS, ASTM, IP etc?
- WHY is the chosen standard the most suitable?
- has COMPLIANCE been kept up to date?
- is the standard CONSISTENT with other standards on the same part of the plant?
- is documentation available to PROVE COMPLIANCE?
- have CHANGES/REPAIRS been made to maintain compliance to the standard?

Cost
- is there a control available that gives BETTER PROTECTION yet costs the same or less?

Other Options
- all other things being equal, for the same cost, consider the control made to a RECOGNISED, PROVEN standard

7. CURRENT RATING:

RATINGS for the individual demonstration sections are quite subjective. A rating is a measure of Confidence in the control measure under review to meet each particular adequacy criteria being tested.

Poor seek an Action to upgrade status
Fair seek an Action to upgrade status
Adequate minimum status to remain Critical Control (see Weighting)
High preferred minimum Critical Control status

8. ACTIONS:

In some cases, the level of adequacy assessed on a critical or major control (see INITIAL / FINAL RATING below) will be less than required. To be acceptable, critical controls are required to have a high rating, and major controls a satisfactory one.

Where a critical or major control falls short of these required levels of adequacy, corrective actions should be identified that will address the controls shortcomings. These identified controls will later be used as part of an implementation plan to ensure the adequacy of all critical and major controls.

9. INITIAL / FINAL RATING:

The INITIAL / FINAL RATINGS are conducted for each control being assessed. These ratings are intended to provide an overall indication of the adequacy of each control based on the ratings given for each of the adequacy criteria.

The initial rating is taken to mean the Overall Rating PRIOR TO the implementation of any identified actions. Actions may enable the Current Rating to be upgraded. If this is the case, the upgraded rating is recorded as the final rating (rating post-implementation of actions).

Replace - choose a different control to be the Critical Control
De-rate - unless an Action enables upgrading, see Replace
Satisfactory - minimum status for a Major Control
High - preferred status for a Critical Control

APPENDIX 2

Major Mining Hazards and Critical / Major Controls

Table 1 - Critical and Major Controls Identified

Hazard and Id No.	Control	Type (Critical or Major)
IPRH-NO1 Vehicle Incident while accessing worksite.	Drive to conditions	Critical
	Road maintenance program	Critical
	Supervision	Critical
	Access control through control centre / shift manager	Major
	Competent personnel	Major
	Guide posts and reflectors	Major
	Pre start checks and recording	Major
	Preventative maintenance program.	Major
	Remarking of road lines	Major
	Shiftly fault inspections (reporting)	Major
	Signage	Major
IPRH-NO37 Failure whilst Field jacking of major mining plant	Ballast (excavation and backfill)	Critical
	Ground Assessment Procedure	Major
	Competent maintenance personnel	Major
	SOPs	Major
	Surface drainage Plan	Major
IPRH-NO4 Dropped objects from major mining plant (onto personnel / equipment)	Competent personnel	Critical
	Designed conveyor systems (chute size, gradient)	Critical
	Preventative maintenance program	Critical
	Sequencing and breaking design	Critical
	Sequencing of conveyors	Major
	Cleaning daily or on request (hose down / shovel clean)	Major
	Competent design engineers	Major
	Design to prevent spillage	Major
	Experienced workforce	Major
	Shiftly fault inspections(reporting)	Major
	Design Standard	Major
IPRH-NO7 Major mining plant fire	Cleaning daily or on request (hose down / shovel clean)	Major
	Shiftly inspection	Major
	Permit System (Hot Work)	Major
IPRH- NO38 Unplanned movement of equipment	Competent maintenance personnel	Major
	Routine inspection	Major
	JSA	Major
IPRH- NO24 Heavy Mobile equipment interactions on mine roads	Drive to conditions	Major
	Competent personnel	Major
	Contractor management process (fatigue management, selection process)	Major
	Preventative maintenance program.	Major
	Shiftly fault inspections (reporting)	Major
	Supervision	Major

Hazard and Id No.	Control	Type (Critical or Major)
IPRH-NO39 Confined spaces	Confined space procedure CS Training Labelling of confined space	Critical Major Major
IPRH-IW28 Incident with 220KV towers including construction activities	Competent sub-contractors Contractor management process (fatigue management, selection process) Approved construction SMP	Critical Major Major
IPRH-NO29 Batter failure	Digging procedures Face mapping of OB Surcharge removal Surface drainage Plan Crack orientation for dig plan Shift face inspections	Critical Critical Critical Critical Major Major
IPRH-NO5 Uncontrolled Movement of major mining plant	Electronic feedback (survey control) Experienced workforce	Critical Major
IPRH- IW32 Public vehicle incident during road alterations	Enforcement of Vic Roads requirements Construction contractor QA system compliance with Vic Roads requirements	Critical Major
IPRH-NO8 Explosion of electrical components on major mining plant	HV Routine Maintenance (Insulator Cleaning, inspection and servicing) SOP (Isolation / set up sequence) Ticketed electricians to AS Explosion vents (compliance to AS3000)	Major Major Major Major
IPRH-NO42 Fall from or tipping of EWP	JSA Ticketed operators	Major Major

APPENDIX 3

Major Mining Hazards – Safety Action Plans

(Prioritised & per Hazard)

Prioritised Action List

Priority 1 Actions

	Actions	Control	Responsibility	Due Date
0	Review mine entry signage and identify whether it is fit for purpose (upgrade to "authorised personnel only" ?)	160	Safety Manager	
0	Ensure completion and installation of new conveyor systems to design criteria / specification (this will result in no spills / no blocked chutes)	20	Mine Engineering	
0	Barricading of areaa under major mining plant during cleaning / maintenance	20	Maintenance Manager	

Priority 2 Actions

	Actions	Control	Responsibility	Due Date
0	Refresher course / training in jacking setup and procedures	11	Maintenance Manager	
0	Review the use of tag out system for light vehicles, to prevent use of unroadworthy vehicles	130	Operations Manager	
0	Investigate / audit the potential for barricading below standard roads to prevent them being used. It may be possible to identify the roads that may be used and then upgrade these roads and remove the rest.	138	Mine Engineering	
0	Annual audit of barricading for non-active roads	138	Mine Engineering	
0	Continue to monitor surface drainage in mine to identify potential problem areas	175	Mine Engineering	
0	Safe work observation (eg. speed observation sign etc)	28	Safety Manager	
0	Take 5 process	28	Safety Manager	
0	Safety Action Report	28	Safety Manager	
0	Include confined space entry rules / requirements for relevant mine personnel in next training session	30	Training coordinator	
0	Implement non-rotating coupling (VOITH) on conveyors as existing couplings are replaced	43	Maintenance Manager	
0	Ensure completion and installation of new conveyor systems to design criteria / specification	43	Mine Engineering	
0	Safe Action Report	56	Safety Manager	
0	Take 5 process	56	Safety Manager	
0	Safe work observation (eg. speed observation sign etc)	56	Safety Manager	

Priority 3 Actions

	Actions	Control	Responsibility	Due Date
0	Periodic refresher courses on batter stability for operators	154	Operations Manager	
0	Ensure that maintenance procedures are accurate and specific to particular plant equipment	168	Maintenance Manager	
0	Investigate (with engineering department) the need for a dedicated person responsible for procedure development and coordinating job plans	168	Maintenance Manager	
0	Ensure that maintenance personnel receive adequate training for operation of new elevated work platforms	181	Training coordinator	
0	Further investigation into provision of fixed work platforms for maintenance activities at height (around new conveyors - westfields)	181	Maintenance Manager	
0	Ensure that training / number of people trained takes into account the increased need for use of elevated work platforms with new conveyors (westfield)	181	Training coordinator	
0	Security review of mine to be completed	2	Operations Manager	
0	Review warning signage at mine entry points that prevents unauthorised people from entering	2	Safety Manager	
0	Continue program of installing explosion vents into all relocated conveyors (westfield)	220	Maintenance Manager	
0	Carry out risk assessment on old equipment to determine if it is necessary to install explosion vents	220	Maintenance Manager	
0	Training for maintenance personnel in use of computer tools (eg passport / paradigm)	243	IT Manager	
0	IT to liaise with maintenance with respect to increasing ease of access to paradigm / intranet information (eg shortcuts to relevant information, procedures)	243	IT Manager	
0	Refresher information for maintenance personnel with respect to ground pressures for jacking of major mining plant	243	Maintenance Manager	
0	Install windrows as required as per digging plan (standing order with RTL)	32	Operations Manager	
0	Include confined space entry rules / requirements for relevant mine personnel in next training session	36	Training coordinator	
0	Continue to implement take 5 process to clarify when JSA is required	94	Safety Manager	
0	Establish an audit procedure that ensures that JSA's are being completed rigorously	94	Maintenance Planner	
0	Annual action to confirm presence of warning signage at all restricted / confined spaces	95	Safety Manager	

Priority 4 Actions

	Actions	Control	Responsibility	Due Date
0	Consider developing a refresher booklet / handout covering road rules / usage for use in inductions and refresher initiatives	56	Safety Manager	

Prioritised Action List

Priority 4 Actions

	Actions	Control	Responsibility	Due Date
0	Consider additional training for all supervisors for improving shift handover (eg to enable better information transfer) - eg potential to include abnormal weather and road conditions	56	Operations Manager	

Priority 5 Actions

	Actions	Control	Responsibility	Due Date
0	Complete installation of new design drive system (hopper pinch drive system) for hopper travelling system	142	Maintenance Manager	
0	Ensure that maintenance personnel are familiarised with requirements of new major plant purchases	142	Maintenance Manager	
0	Electrical safety management scheme should be extended to the mine (from the station)	180	Senior Electrical Engin	
0	Implement automatic lubrication systems on relevant plant	246	Maintenance Manager	
0	Investigate (with engineering department) the need for a dedicated person responsible for procedure development and coordinating job plans	25	Maintenance Manager	
0	Targeted training for maintenance personnel to ensure that they are competent / familiar with new tasks related to new equipment (eg conveyors)	25	Maintenance Manager	
0	Formalise debriefing process after major maintenance tasks (eg to drive procedural improvement / identify competency problems)	25	Maintenance Manager	
0	Problems with chutes to be addressed by task force / study group for reviewing chute design (on new equipment)	43	Mine Engineering	
0	Complete implementation of electronic upgrade on dredges (eg cameras, automated digging function)	48	Maintenance Manager	
0	Continued rollout of operator training in use of electronic upgrades to dredges	48	Operations Manager	
0	Investigate installing tilt device in dredges	62	Operations Manager	
0	Improve information dissemination on ground conditions to mine operators (electronic)	62	Operations Manager	
0	Road closure for roads with inadequate guide posts and reflectors	83	Operations Manager	
0	Trialling of new guide posts (in high wear areas)	83	Operations Manager	

Hazard Actions

Hazard **IPRH-NO24 Heavy Mobile equipment interactions on mine roads**

Major Control **28 Competent personnel** *PLL Affected by Control* 9.13E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Safety Action Report	2	Safety Manager	
0 Safe work observation (eg. speed observation sign etc)	2	Safety Manager	
0 Take 5 process	2	Safety Manager	

Major Control **56 Drive to conditions** *PLL Affected by Control* 2.96E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Safe work observation (eg. speed observation sign etc)	2	Safety Manager	
0 Safe Action Report	2	Safety Manager	
0 Consider developing a refresher booklet / handout covering road rules / usage for use in inductions and refresher initiatives	4	Safety Manager	
0 Consider additional training for all supervisors for improving shift handover (eg to enable better information transfer) - eg potential to include abnormal weather and road conditions	4	Operations Manager	
0 Take 5 process	2	Safety Manager	

Critical Control **130 Preventative maintenance program (light and heavy mobile vehicles)** *PLL Affected by Control* 3.47E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Review the use of tag out system for light vehicles, to prevent use of unroadworthy vehicles	2	Operations Manager	

Hazard **IPRH-NO26 Batter failure**

Critical Control **48 Digging procedures** *PLL Affected by Control* 3.50E-04

Actions	*Priority*	*Responsibility*	*Due Date*
0 Complete implementation of electronic upgrade on dredges (eg cameras, automated digging function)	5	Maintenance Manager	
0 Continued rollout of operator training in use of electronic upgrades to dredges	5	Operations Manager	

Major Control **154 Shift face inspections** *PLL Affected by Control* 3.50E-04

Actions	*Priority*	*Responsibility*	*Due Date*
0 Periodic refresher courses on batter stability for operators	3	Operations Manager	

Critical Control **175 Surface drainage Plan** *PLL Affected by Control* 2.87E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Continue to monitor surface drainage in mine to identify potential problem areas	2	Mine Engineering	

Hazard **IPRH-NO37 Failure whilst field jacking of major mining plant**

Critical Control **11 Ballast (excavation and backfill)** *PLL Affected by Control* 2.64E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Refresher course / training in jacking setup and procedures	2	Maintenance Manager	

Major Control **25 Competent maintenance personnel** *PLL Affected by Control* 2.00E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Targeted training for maintenance personnel to ensure that they are competent / familiar with new tasks related to new equipment (eg conveyors)	5	Maintenance Manager	
0 Investigate (with engineering department) the need for a dedicated person responsible for procedure development and coordinating job plans	5	Maintenance Manager	
0 Formalise debriefing process after major maintenance tasks (eg to drive procedural improvement / identify competency problems)	5	Maintenance Manager	

Major Control **168 Maintenance procedures** *PLL Affected by Control* 1.32E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Investigate (with engineering department) the need for a dedicated person responsible for procedure development and coordinating job plans	3	Maintenance Manager	
0 Ensure that maintenance procedures are accurate and specific to particular plant equipment	3	Maintenance Manager	

Major Control **175 Surface drainage Plan** *PLL Affected by Control* 2.87E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Continue to monitor surface drainage in mine to identify potential problem areas	2	Mine Engineering	

Hazard Actions

Hazard **IPRH-NO37 Failure whilst field jacking of major mining plant**

Major Control **243 Ground Assessment Procedure** *PLL Affected by Control* 2.64E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Training for maintenance personnel in use of computer tools (eg passport / paradigm)	3	IT Manager	
0	IT to liaise with maintenance with respect to increasing ease of access to paradigm / intranet information (eg shortcuts to relevant information, procedures)	3	IT Manager	
0	Refresher information for maintenance personnel with respect to ground pressures for jacking of major mining plant	3	Maintenance Manager	

Hazard **IPRH-NO38 Unplanned movement of equipment**

Major Control **25 Competent maintenance personnel** *PLL Affected by Control* 2.00E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Formalise debriefing process after major maintenance tasks (eg to drive procedural improvement / identify competency problems)	5	Maintenance Manager	
0	Investigate (with engineering department) the need for a dedicated person responsible for procedure development and coordinating job plans	5	Maintenance Manager	
0	Targeted training for maintenance personnel to ensure that they are competent / familiar with new tasks related to new equipment (eg conveyors)	5	Maintenance Manager	

Major Control **94 JSA** *PLL Affected by Control* 1.40E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Establish an audit procedure that ensures that JSA's are being completed rigorously	3	Maintenance Planner	
0	Continue to implement take 5 process to clarify when JSA is required	3	Safety Manager	

Major Control **142 Routine inspection** *PLL Affected by Control* 6.15E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Complete installation of new design drive system (hopper pinch drive system) for hopper travelling system	5	Maintenance Manager	
0	Ensure that maintenance personnel are familiarised with requirements of new major plant purchases	5	Maintenance Manager	

Hazard **IPRH-NO39 Confined/registered spaces**

Critical Control **30 Confined space procedure** *PLL Affected by Control* 2.40E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Include confined space entry rules / requirements for relevant mine personnel in next training session	2	Training coordinator	

Major Control **36 Confined Space Training** *PLL Affected by Control* 2.40E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Include confined space entry rules / requirements for relevant mine personnel in next training session	3	Training coordinator	

Major Control **95 Warning signage at all restricted / confined spaces** *PLL Affected by Control* 2.40E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Annual action to confirm presence of warning signage at all restricted / confined spaces	3	Safety Manager	

Hazard **IPRH-NO4 Dropped objects from major mining plant (onto personnel or equipment)**

Major Control **20 Cleaning daily or on request (hose down / shovel clean)** *PLL Affected by Control* 2.80E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Ensure completion and installation of new conveyor systems to design criteria / specification (this will result in no spills / no blocked chutes)	1	Mine Engineering	
0	Barricading of areaa under major mining plant during cleaning / maintenance	1	Maintenance Manager	

Major Control **28 Competent personnel** *PLL Affected by Control* 9.13E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Take 5 process	2	Safety Manager	
0	Safety Action Report	2	Safety Manager	
0	Safe work observation (eg. speed observation sign etc)	2	Safety Manager	

Hazard Actions

Hazard **IPRH-NO4 Dropped objects from major mining plant (onto personnel or equipment)**

Critical Control **43 Designed conveyor systems (chute size, gradient)** *PLL Affected by Control* 3.00E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Implement non-rotating coupling (VOITH) on conveyors as existing couplings are replaced	2	Maintenance Manager	
0	Ensure completion and installation of new conveyor systems to design criteria / specification	2	Mine Engineering	
0	Problems with chutes to be addressed by task force / study group for reviewing chute design (on new equipment)	5	Mine Engineering	

Critical Control **246 Preventative maintenance program (major mining plant)** *PLL Affected by Control* 3.60E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Implement automatic lubrication systems on relevant plant	5	Maintenance Manager	
0	Implement automatic lubrication systems on relevant plant	5	Maintenance Manager	

Hazard **IPRH-NO42 Fall from or tipping of EWP**

Major Control **94 JSA** *PLL Affected by Control* 1.40E-03

Actions		*Priority*	*Responsibility*	*Due Date*
0	Continue to implement take 5 process to clarify when JSA is required	3	Safety Manager	
0	Establish an audit procedure that ensures that JSA's are being completed rigorously	3	Maintenance Planner	

Major Control **181 Ticketed operators (EWP)** *PLL Affected by Control* 7.15E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Further investigation into provision of fixed work platforms for maintenance activities at height (around new conveyors - westfields)	3	Maintenance Manager	
0	Ensure that maintenance personnel receive adequate training for operation of new elevated work platforms	3	Training coordinator	
0	Ensure that training / number of people trained takes into account the increased need for use of elevated work platforms with new conveyors (westfield)	3	Training coordinator	

Hazard **IPRH-NO5 Uncontrolled Movement of major mining plant.**

Major Control **62 Electronic feedback (survey control)** *PLL Affected by Control* 7.42E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Improve information dissemination on ground conditions to mine operators (electronic)	5	Operations Manager	
0	Investigate installing tilt device in dredges	5	Operations Manager	

Hazard **IPRH-NO7 Major mining plant fire**

Major Control **20 Cleaning daily or on request (hose down / shovel clean)** *PLL Affected by Control* 2.80E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Ensure completion and installation of new conveyor systems to design criteria / specification (this will result in no spills / no blocked chutes)	1	Mine Engineering	
0	Barricading of areaa under major mining plant during cleaning / maintenance	1	Maintenance Manager	

Hazard **IPRH-NO8 Explosion of electrical components on major mining plant**

Major Control **180 Ticketed / competent electricians** *PLL Affected by Control* 1.32E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Electrical safety management scheme should be extended to the mine (from the station)	5	Senior Electrical Engin	

Major Control **220 Explosion vents (compliance to AS3000)** *PLL Affected by Control* 0.00E+00

Actions		*Priority*	*Responsibility*	*Due Date*
0	Carry out risk assessment on old equipment to determine if it is necessary to install explosion vents	3	Maintenance Manager	
0	Continue program of installing explosion vents into all relocated conveyors (westfield)	3	Maintenance Manager	

Hazard **IRPH-NO1 Vehicle incident while accessing worksite**

Major Control **2 Access control through control centre / shift manager** *PLL Affected by Control* 5.74E-04

Actions		*Priority*	*Responsibility*	*Due Date*
0	Review warning signage at mine entry points that prevents unauthorised people from entering	3	Safety Manager	
0	Security review of mine to be completed	3	Operations Manager	

Hazard Actions

Hazard **IRPH-NO1 Vehicle incident while accessing worksite**

Critical Control **28 Competent personnel** *PLL Affected by Control* 9.13E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Safe work observation (eg. speed observation sign etc)	2	Safety Manager	
0 Safety Action Report	2	Safety Manager	
0 Take 5 process	2	Safety Manager	

Major Control **32 Construction of windrows** *PLL Affected by Control* 2.30E-04

Actions	*Priority*	*Responsibility*	*Due Date*
0 Install windrows as required as per digging plan (standing order with RTL)	3	Operations Manager	

Critical Control **56 Drive to conditions** *PLL Affected by Control* 2.96E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Consider developing a refresher booklet / handout covering road rules / usage for use in inductions and refresher initiatives	4	Safety Manager	
0 Safe Action Report	2	Safety Manager	
0 Safe work observation (eg. speed observation sign etc)	2	Safety Manager	
0 Take 5 process	2	Safety Manager	
0 Consider additional training for all supervisors for improving shift handover (eg to enable better information transfer) - eg potential to include abnormal weather and road conditions	4	Operations Manager	

Major Control **83 Guide posts and reflectors** *PLL Affected by Control* 2.30E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Road closure for roads with inadequate guide posts and reflectors	5	Operations Manager	
0 Trialling of new guide posts (in high wear areas)	5	Operations Manager	

Major Control **130 Preventative maintenance program (light and heavy mobile vehicles)** *PLL Affected by Control* 3.47E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Review the use of tag out system for light vehicles, to prevent use of unroadworthy vehicles	2	Operations Manager	

Critical Control **138 Road maintenance program** *PLL Affected by Control* 1.15E-03

Actions	*Priority*	*Responsibility*	*Due Date*
0 Annual audit of barricading for non-active roads	2	Mine Engineering	
0 Investigate / audit the potential for barricading below standard roads to prevent them being used. It may be possible to identify the roads that may be used and then upgrade these roads and remove the rest.	2	Mine Engineering	

Major Control **160 Signage** *PLL Affected by Control* 5.74E-04

Actions	*Priority*	*Responsibility*	*Due Date*
0 Review mine entry signage and identify whether it is fit for purpose (upgrade to "authorised personnel only" ?)	1	Safety Manager	