Environmental Impact Statement

ADDENDUM

October 2006

Ensham Central Project




HANSEN CONSULTING

Ensham RESOURCES

ENSHAM CENTRAL PROJECT

ENVIRONMENTAL IMPACT STATEMENT ADDENDUM

Prepared by:

HANSEN CONSULTING
Level 4
20 Wharf Street
BRISBANE QLD 4000

24 October 2006

For:

ENSHAM RESOURCES PTY LTD
Level 18, AMP Place, 10 Eagle Street
BRISBANE QLD 4000

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This document contains amendments to the Ensham Central Project Environmental Impact Statement (EIS) in response to submissions received from the public exhibition of the EIS. The submissions were received from State and Local Government Departments, neighbouring landowners and an industry body. This document also includes amendments in response to a letter from the Commonwealth Department of Environment and Heritage (DEH), dated 18 August 2006.

This document accompanies the *Ensham Response to EIS Submissions* report. The amendments are presented in Table 1. The section of the EIS to be amended is listed first, followed by the proposed text for the EIS amendment. The amendments are formatted with omissions shown as text strikethroughs and additions underlined. The proposed amendments have been made in response to submissions received on the EIS and the final column of the table provides a cross references to the relevant sections of the *Ensham Response to Submissions* report for each amendment.

Table 1
EIS Amendments

Amended EIS Section	Amendment	Relevant Submission
Executive Summary – Groundwater (fourth paragraph, page 14).	As the privately owned bores in the vicinity of Ensham Mine are completed in different coal seams to the seam being mined by Ensham Mine, there is only a very small potential for any of these bores to be affected by mining. ~~There are two groundwater bores in active use in the vicinity of the Ensham Mine that could potentially be impacted by lowered groundwater levels.~~ The proponent will monitor these bores to determine whether any impacts occur due to mining. ~~and~~ In the event that monitoring confirms adverse impacts on bores due to mining, the proponent will provide an equivalent, alternative water supply to the affected landowner. ~~address any impacts in consultation with affected landowners.~~	• Department of Natural Resources, Mines and Water: Issue 9.11. • G.W. & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.
Section 1.1 – Background (third paragraph from the end of the page)	The project involves mining of approximately ~~62~~ 64 million tonnes of open cut …	Department of Natural Resources, Mines and Water: Issue 9.1.
Section 3.2.3 – Geology (insert after the first paragraph under the heading 'Resource Utilization' on page 3-5)	As indicated in Table 3-1A, the southern and northern blocks shaded in yellow on Figure 3-7 are not economic to mine by either open cut or underground mining methods. The coal seams in these two areas have undergone significant splitting and/or thinning. Typical seam thicknesses and ash content of the coal seams in the Northern and Southern blocks are shown in Table 3-1A. ***Insert Table 3-1A (included at the end of this document)*** The seam thinning has the effect of both reducing the amount of coal present and increasing the cost of mining those thinner seams. In addition, the depth of the seams in these areas is from 100 m in the south to 150 m in the north. The depth of seams, thickness and coal quality in these areas precludes economic mining using open cut methods. Seam thickness and coal quality also precludes mining in these areas by underground methods. This determination is based on long term mine planning, operations cost structure, product pricing assumptions and forward projections at the time of writing the EIS. It should be noted that the coal resources in these two areas are not planned be sterilised against possible future mining, rather not mined due to economic conditions. As indicated in Figure 3-6, the Aries seams are located above the underground working section. Within the underground mining area indicated in Figure 3-7, the Aries seams have thickness in the order of 0.5 m, varying up to a maximum of 0.75 m and thinning and splitting in places. These seams are therefore too thin to be mined by underground methods. The depth to these seams in the underground mining area is greater than 50 m resulting in a strip ratio of greater than 50 and making them also uneconomic for open cut mining. The ash content of these seams is also generally above	Department of Natural Resources, Mines and Water: Issue 9.3.

Amended EIS Section	Amendment	Relevant Submission
	20%, making potential saleability very limited. Optimum utilisation of the target A22C seam within the underground mining area will be achieved using the longwall mining method. Current longwall technology enables extraction of mining seam sections up to 4.5 m on a single pass. This is likely to be the upper limit of the longwall operation and hence will recover most of the targeted A22C seam. Due to seam splitting, the targeted A22C seam thickness varies from less than 3 m to over 5 m across the resource area. The total coal recovery in the underground mining area is a function of the seam section that is mined, how much coal is left in the coal pillars adjacent the extracted longwalls, pillars left for stability or barriers for isolation of extracted areas to avoid spontaneous combustion. Other areas can also be sterilised due to structures and other geological anomalies. It is planned to use longwall equipment that has the operating range that is most suitable to the varying seam thickness across the area to maximise the resource recovery aligned with good mining practices and safe operations.	
Section 3.2.4 Open Cut Mining (insert new paragraph after fifth paragraph on Page 3-7).	Open cut pit excavations adjacent to the Nogoa River will be designed with appropriate factors of safety to ensure that the river is not impacted by slope failures. Appendix N describes the geotechnical issues associated with the design of open cut pits adjacent to the Nogoa River.	Department of Natural Resources, Mines and Water: Issue 9.17.
Section 3.2.5 Underground Mining (second paragraph after the dot points on Page 3-8).	Add new paragraph after paragraph starting: "Underground mine product coal will be loaded onto trains for transport from the site via the existing Ensham Mine train loading facility which will be upgraded as necessary…." If the train loading facilities are upgraded, they will be designed and constructed to comply with *Queensland Rail Guidelines for New Loadout Facilities*, or the current relevant Queensland Rail Guidelines.	Queensland Transport: Issue 12.4.
Section 7.3.3 Elevated Overburden Emplacements (fourth dot point on page 7-3).	Planting of native trees and shrubs on the slopes is considered only after initial erosion control has been achieved by the establishment of pasture grasses. Where feasible, species native to the pre-clearing regional ecosystem will be used;	Environmental Protection Agency: Issue 5.3.
Section 7.3.3 Elevated Overburden Emplacements (seventh dot point on page 7-3).	Native trees and shrubs are planted on the plateau areas to establish native bushland for fauna habitat. Where feasible, species native to the pre-clearing regional ecosystem will be used; and	Environmental Protection Agency: Issue 5.3.
Section 7.3.5 Surface Subsidence Areas (first paragraph under the heading 'Subsidence Predictions' on Page 7-5).	Project underground longwall mining operations will result in surface subsidence. Preliminary surface subsidence predictions were provided by the proponent. These predictions were made using the Surface Deformation Prediction System (SDPS). Appendix M provides a detailed explanation of the prediction methodology. The SDPS …	• Environmental Protection Agency: Issue 5.7. • Environmental Protection Agency: Issue 5.8.

Amended EIS Section	Amendment	Relevant Submission
Section 7.3.5 Surface Subsidence Areas (first paragraph on Page 7-6).	Insert the following text at the end of the paragraph: Appendix M provides further detail on the issues associated with the construction of underground access roadways beneath the Nogoa River.	• Environmental Protection Agency: Issue 5.2. • Fitzroy Basin Food & Fibre Association: Issue 19.1.
Section 9.2.5 Future Combined Construction and Operations Traffic Volumes (first paragraph on page 9-6).	In Year 3 the peak combined construction and operation workforce of ~~838~~ 938 employees is present on site.	Emerald Shire Council: Issue 13.20.
Section 10.3.4 Groundwater Impacts on Private Bores (sixth paragraph on page 10-6).	There are seven private bores located in coal formations within a 15 km radius of the mine site which could potentially be impacted by the project. These private bores are located on Property No.'s 72, 73, 74, and 75 ~~and 115~~. Only one of these bores was in active use at the time of the bore survey in November 2005 (Bore 7 on Figure 10.2). ~~Of these bores, only three, on Property No.'s 73, 75 and 115, are equipped with pumps and in active use.~~ There is only a very small potential for any of these seven bores to be affected by mining for the following reasons: • The coal seam that will be mined at Ensham is about 240 m below ground level in the area of these bores, whereas the seven bores are all relatively shallow, with a maximum depth of 90 m. Therefore, although constructed in the coal measures, the bores are not drawing groundwater from the coal seam that will be dewatered during underground mining. • The bores are between about 4 km and 7 km from the open cut mine and therefore are not predicted to be impacted by open pit dewatering. To confirm the predictions of the modelling, it is proposed that water level and quality monitoring of these bores be undertaken prior to commencement of the project and at four monthly intervals thereafter. In the event that monitoring confirms adverse impacts on bores due to mining, the proponent will ~~address these in consultation with affected landowners.~~ provide an equivalent, alternative water supply to the affected landowner.	• Department of Natural Resources, Mines and Water: Issue 9.11. • G.W. & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.
Section 12.2.4 Mining Strategy (Add new paragraph after first paragraph on page 12-3).	This minimum buffer distance of 100 m is consistent with the three similar mining operations studied in detail during the development of the project mine plan (Section 12.2.3). The adequacy of a 100 m buffer has been demonstrated by the current Ensham mining operations, which have included mining for a length of more than 1 km, up to 100 m from the top of the high bank of the Nogoa River for the past five years. As described in Section 10.3.2, the Nogoa River is not hydraulically connected to the alluvial aquifer	• Environmental Protection Agency: Issue 5.1. • Environmental Protection Agency: Issue 5.2.

Amended EIS Section	Amendment	Relevant Submission
	due to the presence of a low permeability clay layer up to 2 m thick that lines the river channel. Experience from mining at Ensham Mine confirms that there is no inflow to the mine from the river via the alluvial aquifer and that the 100 m minimum offset distance is more than adequate to protect the clay seal in the river channel. Mining operations at Ensham Mine have also demonstrated that the 100 m buffer allows adequate control of runoff and sedimentation from floodplain mining areas. Further, in the case of the Ensham Central Project, the buffer ensures that there will be no significant clearing of riparian vegetation (only 0.4 ha of non-remnant riparian vegetation along the Nogoa River will be cleared).	
Section 12.7.2 Flood Level Impacts - Mine Flood Immunity - Operations Phase (second paragraph, page 12-12).	The levees will be designed and maintained in accordance with appropriate engineering standards and ~~NRMW and~~ NRFPB approval requirements.	Department of Natural Resources, Mines and Water: Issue 9.16.
Section 12.8.1 Existing Floodplain Infrastructure - Mine Flood Protection Levees (sixth paragraph, page 12-17).	The levees will be designed and maintained in accordance with appropriate engineering standards and ~~NRMW and~~ NRFPB approval requirements.	Department of Natural Resources, Mines and Water: Issue 9.16.
Attachment 12-1 Floodplain Mining Risk Assessment (line 'Flood waters enter open cut voids', page 3).	Design and construction in accordance with Nogoa River Floodplain Board ~~and NRMW~~ requirements.	Department of Natural Resources, Mines and Water: Issue 9.16.
Attachment to Section 12-1 Floodplain Mining Risk Assessment (Table 3, page 3). Insert new row at the end of the table.	**What Can Happen?** Mining drains water from Winton Creek **Impact** • Partial loss of ephemeral flows **How/Why?** • Creek and aquifer are connected through some unknown mechanism • Damage to the clay creek bed due to open cut mining or underground mine subsidence • Seal in creek bed damaged by blasting	Environmental Protection Agency: Issue 5.9.

Amended EIS Section	Amendment	Relevant Submission
	Proposed Controls • Hydrogeological investigations have confirmed that creeks traversing the floodplains are underlain by low permeability silts and clays • Minimum 100 m buffer between open cut mining and creek • Plastic clays in the creek bed are not prone to subsidence cracking and any creeks would seal due to swelling or filling with fine sediment • Experience from B-pit blasting has not shown evidence of damage to a similar seal in the river • Subsidence monitoring to confirm continued integrity of creek bed **CWC** 3 **C** 2 **L** D **R** Low (5) **EIS Section Reference** Volume 1 Section 10.3.2 Appendix C Sections 5.3, 5.4 and 13.2	
Section 13.7.6 Odour (first paragraph, page 13-8)	A detailed odour impact assessment study has been undertaken for the emissions from the underground mine ventilation shaft. A conservative approach has been taken to provide a robust basis for siting the underground mine ventilation shaft. The odour assessment has found that the EPA's guideline of 0.5 ou (for stack sources) or 2.5 ~~odour units~~ ~~(~~ou~~)~~ (for wake affected sources) will not be exceeded if the ventilation shaft is sited more than 1,500 m from the nearest residence. All neighbouring …	Environmental Protection Agency: Issue 5.14.

Amended EIS Section	Amendment	Relevant Submission
Section 13.9 Mitigation Measures (Table 13-6, insert line at the end of the table, page 13-10).	**Source:** Rail Loading **Control Procedures:** Any new or upgraded rail coal loading facilities will comply with *Queensland Rail Guidelines for New Loadout Facilities*, or the current relevant Queensland Rail Guidelines, including overload management systems, load profiling and freeboard measures to minimise coal spillage and dust dispersion during rail transit	Queensland Transport: Issue 12.3.
Section 16.5.2 Direct Impacts – Mitigation (last paragraph, page 16-9).	Finally, the following vegetation clearing procedures will be adopted for clearing of remnant vegetation associated with the project to minimise impacts on flora and fauna: 1. The area to be disturbed will be limited to the minimum area necessary. 2. The clearance area will be clearly delineated to ensure that no disturbance occurs outside the area. 3. Prior to clearing commencing, all trees to be removed will be subjected to a pre-clearing survey, conducted by the Ensham Environmental Officer. Specific tasks will include: – inspect trees for the presence of bats and other mammals; – inspect trees for nesting birds; and – inspect trees for den/roost/nest hollows. Any sites found will be documented, recorded on GPS and flagged. 4. If threatened species are detected nesting in the trees, an ecologist will be consulted to develop management plans or mitigation procedures for the species and to determine whether nests can be relocated. Management Plans for the relocation of any fauna species identified during pre-clearing inspection and protected under the EPBC Act will be submitted to the Commonwealth Department of the Environment and Heritage for approval prior to commencement of clearing that would disturb the species. The plan would contain measures on how to safely remove fauna prior to clearing where possible, the best method for capture and relocation during clearing and, for birds, what to do if eggs are located.	Amendment in response to letter from DEH dated 18 August 2006.
Figure 16.5	Figure has been amended to include the area of Regrowth/RE 3.1 (60/40) on the northern side of the Nogoa River riparian corridor in the Vegetation Management Plan.	Amendment in response to letter from DEH dated 18 August 2006.

Amended EIS Section	Amendment	Relevant Submission
Section 20.11.2 Fire Fighting (third paragraph, page 20-12).	The fire ~~fighting facilities~~ safety installations required by the Building Code of Australia will be assessed by the Queensland Fire and Rescue Service Community Safety Department. ~~are approved by the local Queensland Rural Fire Brigade service and~~ All fire fighting facilities and equipment are installed, serviced, maintained and inspected by an approved certified body. The existing systems will continue to be implemented and extended as necessary to serve the project.	Department of Emergency Services – Qld Fire and Rescue Service: Issue 4.4.
Section 21.6.4 Environmental Protection Objectives and Control Strategies (Table 21-1, insert line at the end of the table, page 21-7).	**Source:** Rail Loading **Control Procedures:** Any new or upgraded rail coal loading facilities will comply with *Queensland Rail Guidelines for New Loadout Facilities*, or the current relevant Queensland Rail Guidelines, including overload management systems, load profiling and freeboard measures to minimise coal spillage and dust dispersion during rail transit	Queensland Transport: Issue 12.3.
Section 21.7.3 Potential Impacts (third paragraph, page 21-10).	There are seven private bores located in coal formations within a 15 km radius of the mine site which could potentially be impacted by lowered groundwater levels due to mine dewatering. Only one of these bores was in active use at the time of the bore survey in November 2005 (Bore A on Figure 12-4). ~~Of these, only two are in active use.~~ These bores are completed in different coal seams to the seam being mined by Ensham Mine and it is therefore assessed that there is only a very small potential for any of these bores to be affected by mining. To confirm the predictions of the modelling, it is proposed that water level and quality monitoring of these bores be undertaken prior to commencement of the project and at four-monthly intervals thereafter so as to identify any impacts. In the event that monitoring demonstrates that bores have been adversely affected by mining, the proponent will provide an equivalent, alternative water supply to the affected landowner.	• Department of Natural Resources, Mines and Water: Issue 9.11. • G.W. & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.
Section 21.7.5 Proposed EA Conditions Schedule C – Water (insert after condition C6-4 on page 21-12).	(C6-5) The holder of the environmental authority will provide an equivalent, alternative water supply in the event of bores being demonstrated to have been adversely affected by mining operations, based on monitoring results.	• Department of Natural Resources, Mines and Water: Issue 9.11. • Emerald Shire Council: Issue 13.8. • G.W & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.

Amended EIS Section	Amendment	Relevant Submission
Section 21.8.5 Proposed EA Conditions Schedule C - Water (continued) (EA condition C4-1 on page 21-18)	Amend EA condition C4-1 as follows: (C4-1) ~~At least 28 days prior to commencement of the project~~ The holder of the environmental authority will develop a River Management Plan for the reach of the Nogoa River within Ensham land. The River Management Plan must be submitted to the Administering Authority for approval at least twenty eight (28) days prior to the commencement of the Ensham Central Project. The River Management Plan is deemed to be accepted if the administering authority has not rejected the River Management Plan within 28 days of its submission. The River Management Plan should address the following matters: a) Control of grazing in the river channel; b) Management of woody debris in the river channel; c) A program to monitor and remediate identified localised erosion areas; d) A program to monitor the river condition following any significant flow events and every two years.	Department of Natural Resources, Mines and Water: Issue 9.18.
Section 21.8.5 Proposed EA Conditions Schedule C – Water (Continued) (insert after condition C5-5 on page 21-18).	(C5-6) If practicable, levee construction works at the upstream and downstream ends of the anabranch will include the construction of earthworks to establish free drainage from the toe of the levee bank to the main channel of the river to eliminate ponding and the potential trapping of fish.	Department of Primary Industries and Fisheries: Issue 10.3.
Section 21.8.5 Proposed EA Conditions Schedule C – Water (Continued) (insert after condition C5-5 on page 21-18).	**Winton Creek Subsidence Monitoring Program** (C6-1) The Authority holder will establish a creek monitoring program for areas of Winton Creek that are to be subsided. The program will include monitoring of the creek pre- and post-subsidence to identify areas of instability and erosion initiated by subsidence. (C6-2) If the monitoring undertaken for condition C6-1 identifies any areas of instability or erosion initiated by subsidence, appropriate stabilisation and erosion control works will be designed and implemented.	• Department of Natural Resources, Mines and Water: Issue 9.8. • Department of Primary Industries and Fisheries: Issue 10.5.
Section 21.12.4 Environmental Protection Objectives and Control Strategies (fifth dot point on page 21-29).	• Planting of native trees and shrubs on the slopes is considered only after initial erosion control has been achieved by the establishment of pasture grasses. Where feasible, species native to the pre-clearing regional ecosystem will be used;	Environmental Protection Agency: Issue 5.3.

Amended EIS Section	Amendment	Relevant Submission
Section 21.12.4 Environmental Protection Objectives and Control Strategies (eighth dot point on page 21-29).	• Native trees and shrubs are planted on the plateau areas to establish native bushland for fauna habitat. Where feasible, species native to the pre-clearing regional ecosystem will be used; and	Environmental Protection Agency: Issue 5.3.
Section 21.12.5 Proposed EA Conditions Schedule F – Land (insert after condition F1-3 on page 21-34).	Add after (F1-3). (F1-4) Upon submission of the updated Rehabilitation Management Plan (condition F1-3), an amended EA will be issued addressing new rehabilitation landform criteria conditions.	Department of Natural Resources, Mines and Water: Issue 9.29.
Section 21.13.4 Environmental Protection Objectives and Control Strategies; Mitigation Measures; Vegetation Clearing (last paragraph, page 21-38).	Finally, the following vegetation clearing procedures will be adopted for clearing of remnant vegetation associated with the project to minimise impacts on flora and fauna: 1. The area to be disturbed will be limited to the minimum area necessary. 2. The clearance area will be clearly delineated to ensure that no disturbance occurs outside the area. 3. Prior to clearing commencing, all trees to be removed will be subjected to a pre-clearing survey, conducted by the Ensham Environmental Officer. Specific tasks will include: – inspect trees for the presence of bats and other mammals; – inspect trees for nesting birds; and – inspect trees for den/roost/nest hollows. Any sites found will be documented, recorded on GPS and flagged. 4. If threatened species are detected nesting in the trees, an ecologist will be consulted to develop management plans or mitigation procedures for the species and to determine whether nests can be relocated. Management Plans for the relocation of any fauna species identified during pre-clearing inspection and protected under the EPBC Act will be submitted to the Commonwealth Department of the Environment and Heritage for approval prior to commencement of clearing that would disturb the species. The plan would contain measures on how to safely remove fauna prior to clearing where possible, the best method for capture and relocation during clearing and, for birds, what to do if eggs are located.	Amendment in response to letter from DEH dated 18 August 2006.
Figure 21.7	Figure has been amended to include the area of Regrowth/RE 3.1 (60/40) on the northern side of the Nogoa River riparian corridor in the Nogoa River Vegetation Management Plan.	Amendment in response to letter from DEH dated 18 August 2006.

Amended EIS Section	Amendment	Relevant Submission
Appendix C, Table 15: Groundwater Bores within 15km Radius of Mine (row entitled 'Unregistered Bore No. 1' – third column, page 34).	~~Collapsed to 15m~~ Obstruction (old pump) at 15 m	G.W. & J.E. Little: Section 17.2.
Appendix C, Section 13.1 Impacts on Existing Bores and Wells (fourth paragraph, page 60).	Extraction of groundwater by mine dewatering will lower the elevation of the piezometric surface of the coal seam aquifer, and water table of the alluvial aquifer, that is, it will create a "cone of depression" around the mine. The numerical model simulated the development and extent of the "cone of depression" in the coal seam and it was found that the radius of impact of the mine, as determined by 1m drawdown contour on the piezometric surface is between about 9 km and 15 km. That is only those bores which draw water from the coal seam that is mined at Ensham, up to a radius of about 15 km of the mine, will be impacted by mine dewatering. Bores in alluvium and in other aquifers will not be impacted. ~~As discussed in Section 7.0, and shown on Table 15 and on Drawing No. 4, privately owned bores within a 15 km radius are mainly completed in other formations and most of the bores are at the extremity of the cone of depression. It is therefore assessed that the mine will not impact on any other groundwater users other than potentially a privately owned bore (RN38845), drilled in 1900, which is about 5 km from the mine and the status of which is unknown.~~ Table 15 and Drawing No. 4 show the location of privately owned bores in the vicinity of Ensham Mine. As discussed in Section 7.0, the majority of privately owned bores within a 15 km radius do not draw water from the coal measures in which the mine is located, and therefore will not be affected by Ensham mining operations. The only private bores that draw water from the coal measures in which the mine is located are seven bores located on property owned by G.W. and J.E. Little (Property No.'s 72, 73, 74,and 75). Only one of these bores was in active use at the time of the bore survey in November 2005 (Bore 7 on Drawing No. 4). There is only a very small potential for any of these seven bores to be affected by mining for the following reasons: • The coal seam that will be mined at Ensham is about 240 m below ground level in the area of these bores, whereas the seven bores are all relatively shallow, with a maximum depth of 90 m. Therefore, although constructed in the coal measures, the bores are not drawing groundwater from the coal seam that will be dewatered during underground mining. • The bores are between about 4 km and 7 km from the open cut mine and therefore are not predicted to be impacted by open pit dewatering.	• Department of Natural Resources, Mines and Water: Issue 9.11. • G.W. & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.

Amended EIS Section	Amendment	Relevant Submission
Drawing 4 – Appendix C	Figure has been amended to show all privately owned bores and the coal seam subcrop.	• Department of Natural Resources, Mines and Water: Issue 9.11. • G.W. & J.E. Little: Issue 17.1. • C.F. & M. L. Vandersee: Issue 18.2.
Appendix F, Section 3 Air Quality Regulations and Goals (first paragraph – after the dot points, page 4).	"…Both the annoyance threshold (concentration) guideline of 0.5 ou and 2.5 ou (1-hour average, 99.5th percentile) ~~is~~ may be of ~~most~~ relevance for this assessment of the Ensham underground mine ventilation shaft, depending on the final design of the ventilation shaft.	Environmental Protection Agency: Issue 5.14.
Appendix F, Section 6 Odour Assessment of the Ensham Central Project Ventilation Shaft (first paragraph, page 23).	The Ausplume dispersion model (Version 6) has been used to model odour emissions from the ventilation shaft and to predict ground-level concentrations of odour for comparison with the EPA's guidelines of 0.5 ou and 2.5 ou (99.5th percentile, 1-hour average). The ventilation shaft has been represented in the following two different ways in the dispersion model because a detailed design is currently not available: • A short ventilation shaft with no vertical emission velocity. This configuration is not likely to act like a stack discharge and will be affected by aerodynamic wakes. This configuration was modelled as a volume source and the recommended separation distance was calculated from the EPA's guideline of 2.5 ou; and • A taller ventilation shaft (2 metres above ground level) with low vertical emission velocity and no wake effects. This configuration was modelled as a stack source and the recommended separation distance was calculated from the EPA's guideline of 0.5 ou.	Environmental Protection Agency: Issue 5.14.
Appendix F, Section 6 Odour Assessment of the Ensham Central Project Ventilation Shaft (final paragraph of the section, page 23).	The modelling results from AUSPLUME predict odour concentrations to be below the EPA's odour guideline at distances greater than 1,500 metres from the vent location. Provided this distance is maintained, odour concentrations are not likely to exceed the EPA's guidelines of 0.5 ou (for stack sources) or 2.5 ou (for wake affected sources). All neighbouring residences are located further than 1,500 metres from the proposed underground mining operations and consequently the project is not predicted to give rise odour concentrations that would exceed the EPA's guidelines.	Environmental Protection Agency: Issue 5.14.

Amended EIS Section	Amendment	Relevant Submission
Appendix I, Section 4.1.3 Survey Effort and Technique (After second paragraph, page 7).	New paragraph. The remainder of the remnant vegetation on site was surveyed using the random meander technique to confirm the regional ecosystems.	Environmental Protection Agency: Issue 5.17.
Appendix I Ecology Section 7.2.2 Mitigation (forth paragraph, page 42).	Finally, the following vegetation clearing procedures will be adopted for clearing of remnant vegetation associated with the project to minimise impacts on flora and fauna: 1. The area to be disturbed will be limited to the minimum area necessary. 2. The clearance area will be clearly delineated to ensure that no disturbance occurs outside the area. 3. Prior to clearing commencing, all trees to be removed will be subjected to a pre-clearing survey, conducted by the Ensham Environmental Officer. Specific tasks will include: – inspect trees for the presence of bats and other mammals; – inspect trees for nesting birds; and – inspect trees for den/roost/nest hollows. Any sites found will be documented, recorded on GPS and flagged. 4. If threatened species are detected nesting in the trees, an ecologist will be consulted to develop management plans or mitigation procedures for the species and to determine whether nests can be relocated. Management Plans for the relocation of any fauna species identified during pre-clearing inspection and protected under the EPBC Act will be submitted to the Commonwealth Department of the Environment and Heritage for approval prior to commencement of clearing that would disturb the species. The plan would contain measures on how to safely remove fauna prior to clearing where possible, the best method for capture and relocation during clearing and, for birds, what to do if eggs are located.	Amendment in response to letter from DEH dated 18 August 2006.
Figure 7.2 – Appendix I	Figure has been amended to include the area of Regrowth/RE 3.1 (60/40) on the northern side of the Nogoa River riparian corridor in the Nogoa River Vegetation Management Plan.	Amendment in response to letter from DEH dated 18 August 2006.

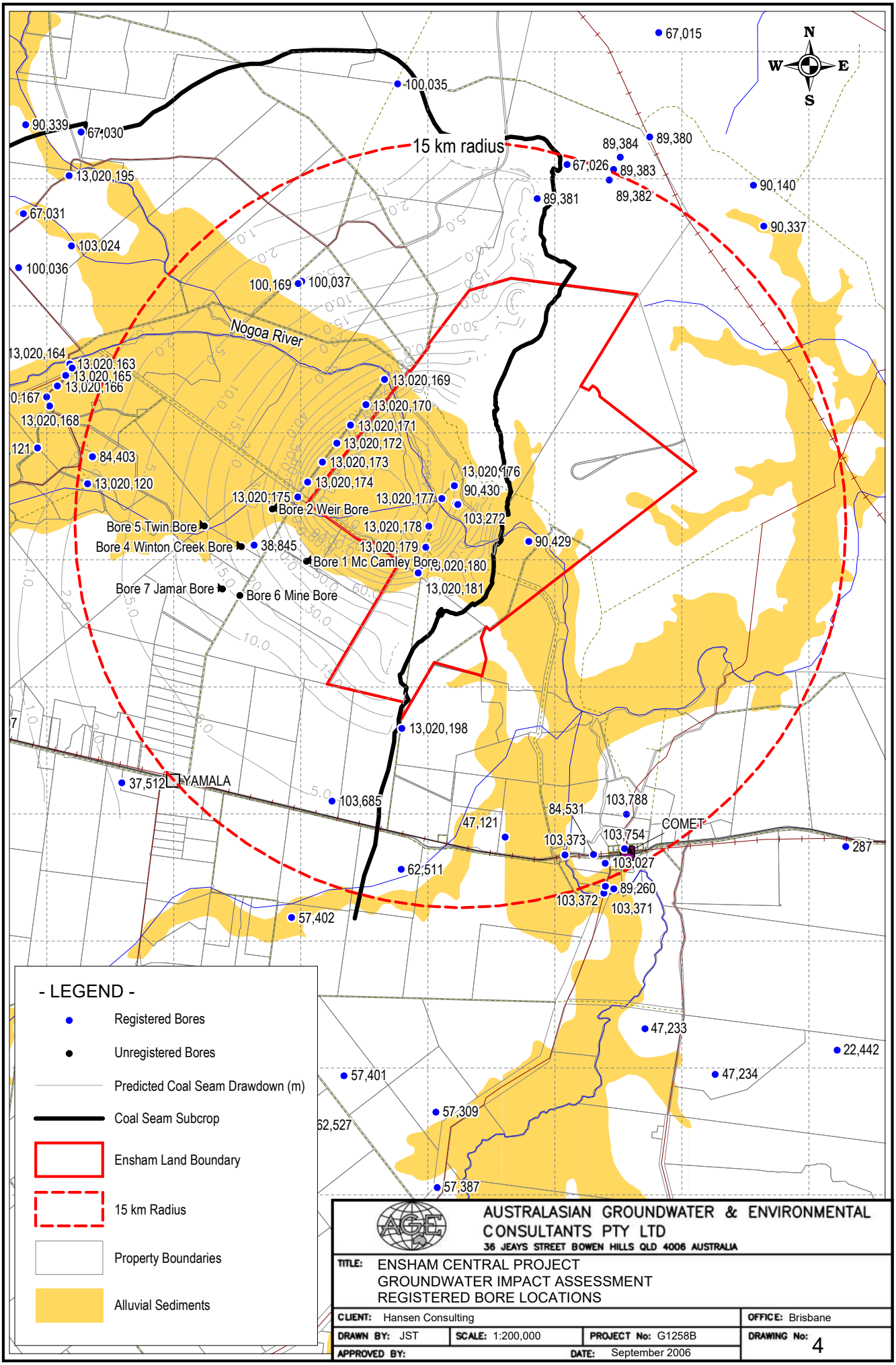
Amended EIS Section	Amendment	Relevant Submission
EIS Appendices.	Insert new Appendix M entitled "Briefing Note on Subsidence Issues"	• Environmental Protection Agency: Issue 5.2. • Environmental Protection Agency: Issue 5.7. • Environmental Protection Agency: Issue 5.8. • Fitzroy Basin Food & Fibre Association: Issue 19.1.
EIS Appendices.	Insert new Appendix N entitled "Geotechnical Issues Associated with Pit Design"	Department of Natural Resources, Mines and Water: Issue 9.17.
EIS Appendices.	Insert new Appendix O entitled "Existing Ensham Environmental Authority".	Department of Natural Resources, Mines and Water: Issue 9.27.

Table 3-1A
Coal Seam Thickness and Ash Content

Seam Name	Northern Block		Southern Block	
	Seam Thickness (m)	Ash Content (%)	Seam Thickness (m)	Ash Content (%)
Aries 11	0.3 – 0.4	> 30	0.3 – 0.4	18 – 20
Aries 12	< 0.2	> 30	0.2 – 0.3	18 – 20
Aries 211	< 0.6	18 – 20	< 0.2	24 – 32
Aries 212	0.3 – 0.8	18 – 20	< 0.2	24 – 34
Aries 22	0.4 – 1.8	> 24	1.0 – 1.2	14 – 16
Castor	0.4 – 1.2	16 – 24	2.2 – 2.4	14 – 16
Castor 22	< 0.2	16 – 24	0.2 – 0.4	16 – 24
Pollux 1	< 1.0	> 16	Non-existent	-
Pollux 2	< 1.0	> 16	Non-existent	-
Orion	< 0.2	22 – 24	Non-existent	-

FIGURES

Drawing 4 in EIS Appendix C



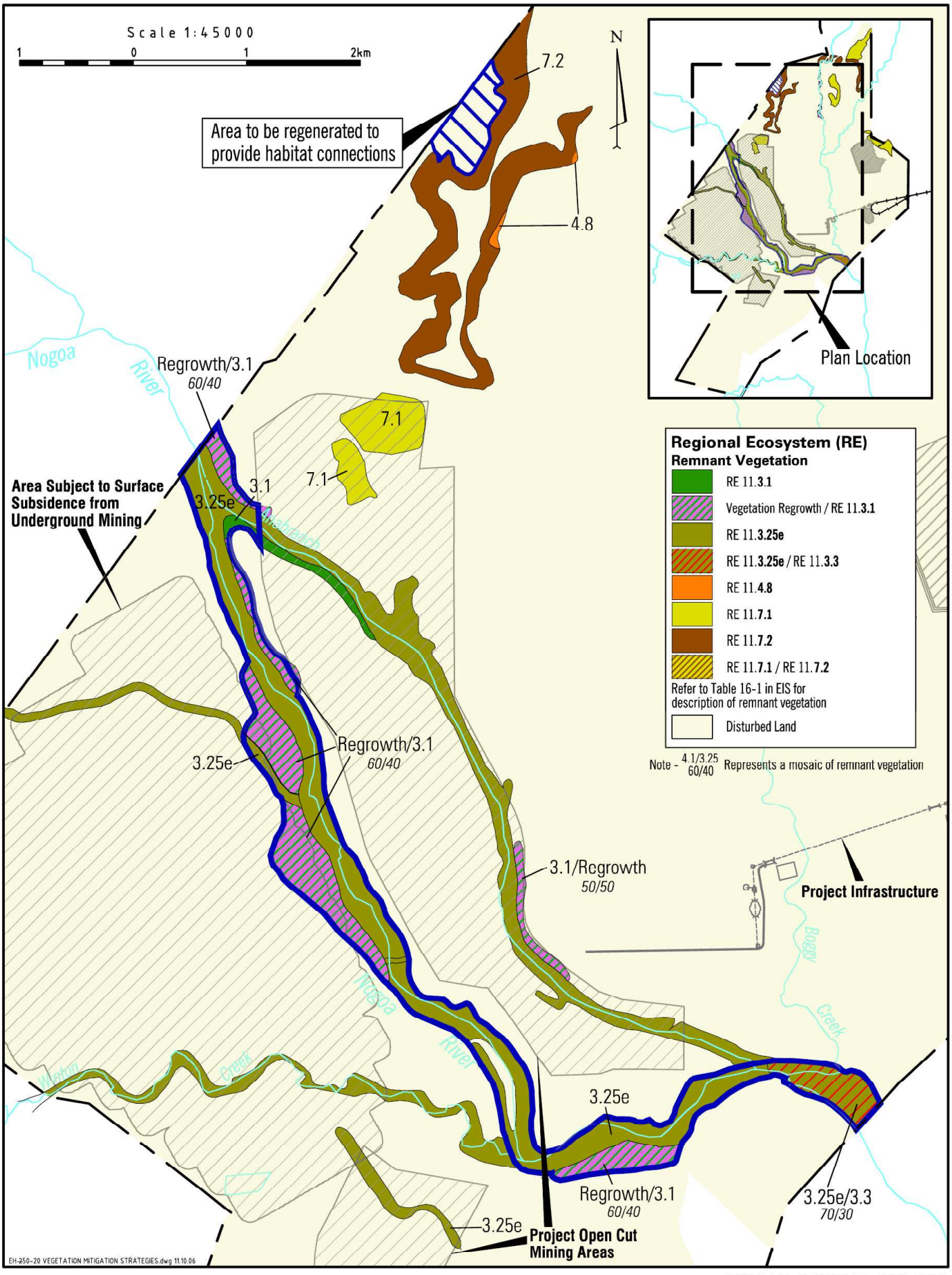
AUSTRALASIAN GROUNDWATER & ENVIRONMENTAL CONSULTANTS PTY LTD
36 JEAYS STREET BOWEN HILLS QLD 4006 AUSTRALIA

TITLE: ENSHAM CENTRAL PROJECT
GROUNDWATER IMPACT ASSESSMENT
REGISTERED BORE LOCATIONS

CLIENT: Hansen Consulting			OFFICE: Brisbane
DRAWN BY: JST	SCALE: 1:200,000	PROJECT No: G1258B	DRAWING No: 4
APPROVED BY:		DATE: September 2006	

Figures 16.5 & 21.7 in EIS Volume 1

Figure 7.2 of Appendix I



ENSHAM CENTRAL PROJECT

Mining Lease and Mining Lease Application Area
Project Disturbance Areas
Project Infrastructure
Nogoa River Vegetation Subject to Vegetation Management Plan

Vegetation Mitigation Strategies

Ensham RESOURCES HANSEN CONSULTING

Figure 16-5
Figure 21-7
Figure 7-2 (Appendix I)

APPENDICES

Appendix M

Briefing Note in Relation to Subsidence Issues

SEEDSMAN GEOTECHNICS PTY LTD
ACN 082 109 082

285 Cordeaux Road, Mt Kembla NSW 2526
Telephone 0417279556
Facsimile 0242712220

Friday, 22nd September 2006

REF: ENSHAM06NG-L1.doc

BRIEFING NOTE IN RELATION TO SUBSIDENCE ISSUES

Introduction

Following the release of the Ensham Environmental Impact Statement (EIS) for public comment, the EPA and the Fitzroy Basin Food & Fibre Association (FBFF) have raised a number of issues relating to subsidence. SGPL has been requested to provide a response to these issues.

Three issues have been raised relating to subsidence and are summarised as follows:

1. The long term stability of the main access roadways directly under the Nogoa River.
2. A description of the methodology used to generate the subsidence predictions.
3. Adequacy of the subsidence predictions.

Roadways Under the Nogoa River

This issue relates to the construction of underground access roadways directly under the Nogoa River, as discussed in Sections 3.2.5 and 7.3.5 of the EIS and shown in Figures 3.10 and 3.11. Both the EPA and the FBFF raised this issue, with concerns over the long term stability of the roadways. In particular the FBFF described the issue as:

- There is a risk of roadways causing surface subsidence:
- Subsidence may damage the clay seal in the bed and banks of the Nogoa River:
- Damage to the clay seal would cause leakage from the river into the alluvial aquifer; and
- This may lead to significant water losses from the river system and may have negative effects on the aquifer.

The driveage of underground main access roadways, commonly referred to as “Mains”, is standard practice at Australian longwall coal mines. These roadways are required to be serviceable for the life of the mine and are designed accordingly. Several coal mines in NSW have excavated Mains roadways under water bodies such as Lake Macquarie near Newcastle and in the Wollongong area under the water catchment dams.

Addressing this concern requires consideration of both the stability of the workings and also the induced surface deformations; and stability requires both pillar and roadway stability of the Mains development.

The Ensham mine plan in **Figure 1** shows the Mains pillars of coal as 30m wide (solids). No length dimensions have been determined at this early stage of mine planning. Typically Mains development pillars are between 50m and 100m long in the Australian coal industry.

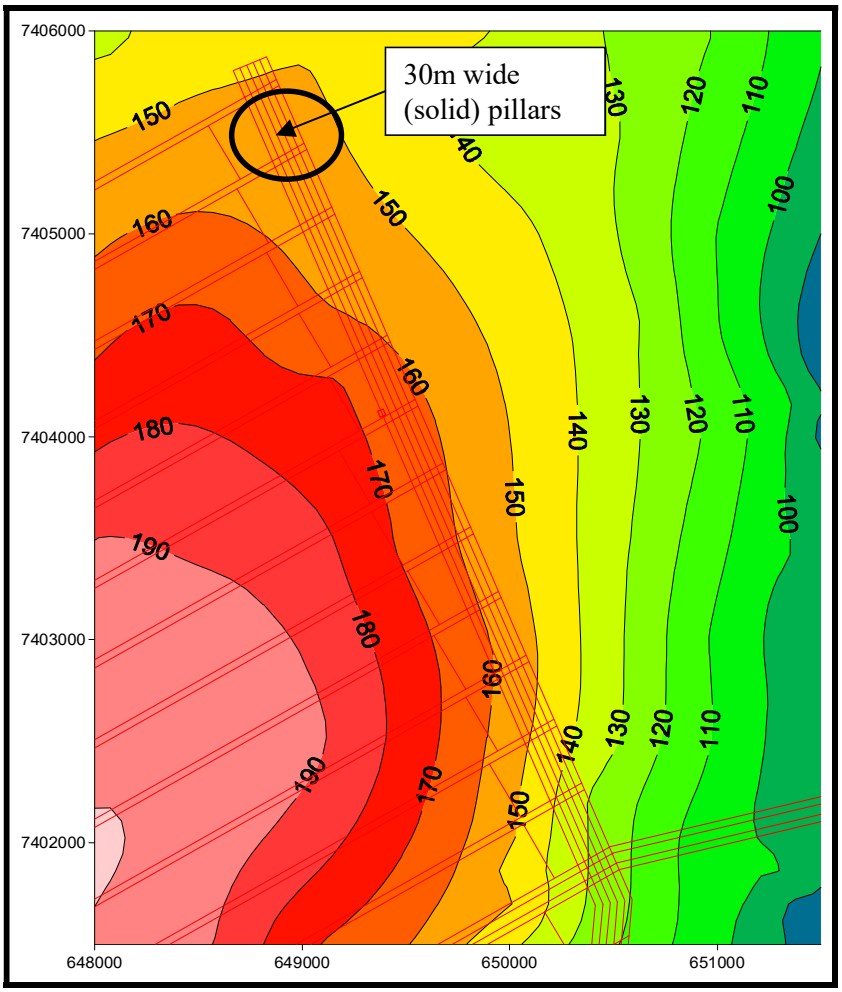


Figure 1 Mine Layout with Depth of Cover Contours

To analyse the long-term stability of the pillars of coal between the roadways the University of NSW pillar design methodology for rectangular pillars (Linear Strength Formula) has been used. **Figure 1** indicates that the Mains roadways under the Nogoa are at between 120m and 165m depth of cover. It is intended to develop the roadways at 6m wide and 3.5m high. The analysis has been carried out for both 50m and 100m long pillars. Forming 30m x 100m wide Mains pillars, with 6m roadways equates to 21% extraction i.e. 79% of the coal under the Nogoa is left in the ground. For 30m x 50m pillars the extraction ratio increases to 26% (74% left in situ).

In pillar design the requirement for long-term stability can be addressed by specifying high factors of safety – in NSW the convention is for a factor of safety of 2.57, based on the above methodology. The factor of safety is selected to represent a probability of failure of better than 1 in 1,000,000.

The Factors of Safety for the 30m x 50m and 30m x 100m Mains pillars vary between 3.6 to 4.9 and 3.8 to 5.2 respectively (**Figure 2**). These are very high Factors of Safety.

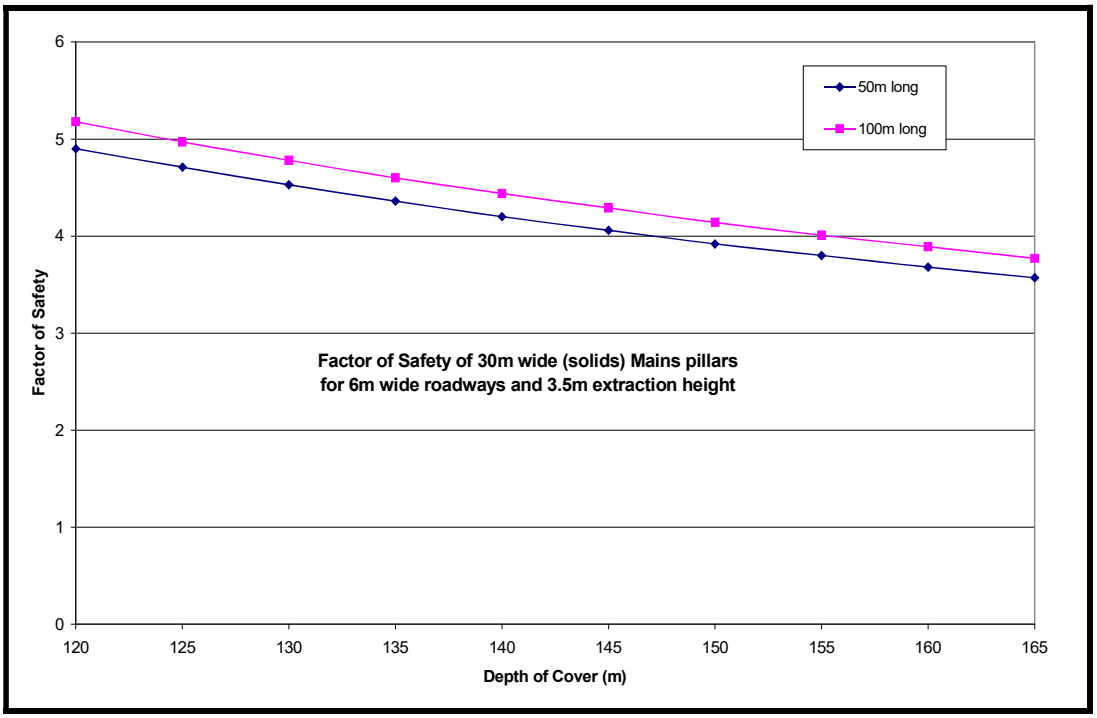


Figure 2 Factors of Safety for 30m Wide (Solids) Mains Pillars

In addition to overall pillar stability, the risk of roadway (intersection) collapse such that potholes develop at the surface is assessed as being negligible, as the depths are in excess of 10 times the intersection span. It is reported in the literature that potholes generally reach the surface at depths <50m[1,2]. As shown in **Figure 1** the Mains development is at greater depths, between 120m and 165m.

It is also noted that long term flooding of the roadways when the mine closes will increase stability and reduce surface subsidence.

The surface deformation above the Mains can be estimated analytically by calculating the amount of pillar, roof and floor compression. This analysis has used pillar, roof and floor moduli values of 1500, 5250 and 3900MPa respectively. The roof and floor values have been estimated from the average strengths in **Figure 3**, of 25-35MPa and 20-25MPa respectively, using a Modulus to UCS ratio of 175. The coal modulus is typical of coal seams elsewhere in the Bowen Basin.

[1] Mahar, J.W. and Marino, G.G., 1982. Building response and mitigation measures for building damage in Illinois. Proceedings of Workshop on Surface Subsidence due to Underground Mining, Morgantown, West Virginia University, pp. 238-252.

[2] Whittaker, B.N. and Reddish, D.J., 1989. Subsidence: Occurrence, prediction and control, Elsivier, Amsterdam, 528p.

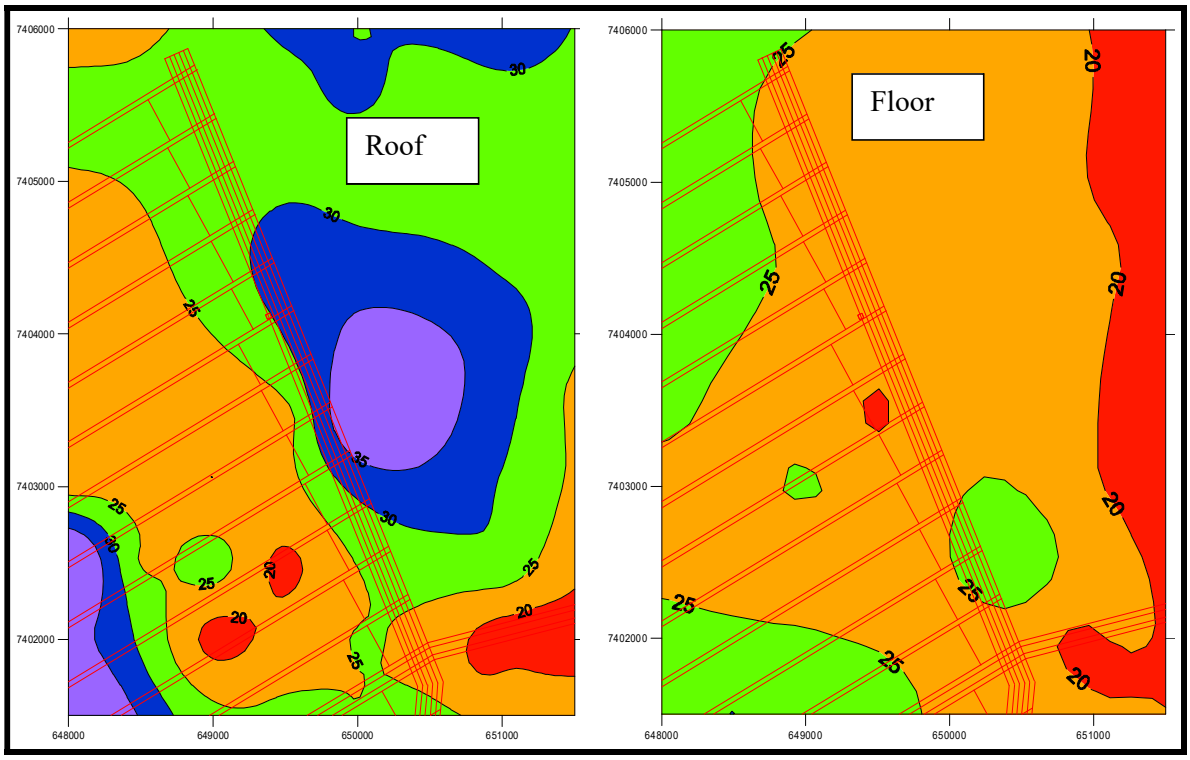


Figure 3 Immediate Roof and Floor Strength in MPa

Using Elastic theory to analyse the Mains pillar/roof/floor system indicates surface settlement would be <10mm (**Figure 4**). Such low magnitudes of surface settlement would have negligible affect on the clay seal below the Nogoa River.

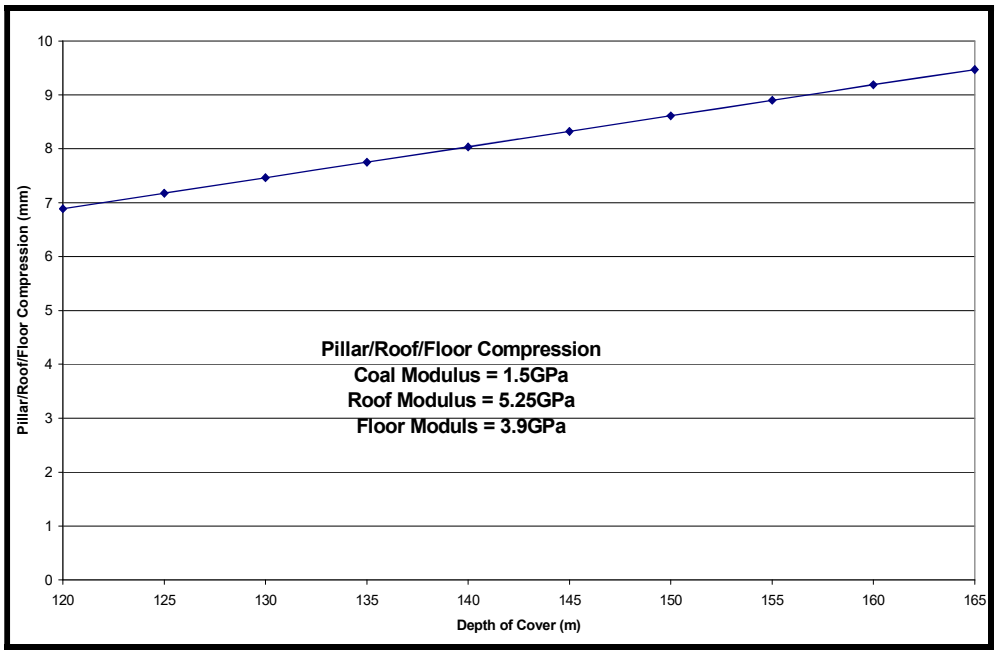


Figure 4 Pillar/Roof/Floor Compression

SDPS Methodology

The EPA has requested a description of the methodology used to generate the subsidence predictions.

In the EPA response, reference is made to the Subsidence Management Plans used in NSW as an indication of the type of information required. To satisfy the EPA request the following information is provided in the NSW SMP format. It should be highlighted that these NSW management plans are prepared at the mining stage not the EIS level of investigation.

1. Method(s) employed to estimate subsidence resulting from the proposed underground coal mining

The Surface Deformation Prediction System (SDPS) has been used to estimate the subsidence resulting from underground mining. SDPS is an influence function method that assumes the shape of a subsided surface can be modelled with a Gaussian (bell shaped) curve that is "centred" on the point of inflexion of a subsidence profile. The method can be used for Greenfield sites or after calibration to existing survey data and mine geometry. SDPS has been used at 6 operating longwall mines in the Bowen Basin and NSW and the calibrations have shown that the assumption of a Gaussian curve is valid. SGPL has also published case studies in the application of influence functions to visualise surface subsidence[3].

2. Discussion of all factors that may affect the development of subsidence over the subsidence areas

The factors considered relevant at Ensham include panel layouts (pillar and panel widths), maximum vertical subsidence, angle of influence, depth of cover and strain coefficient. These are discussed in more detail under point 3.

3. Relevance of all input data, including results of any previous relevant subsidence monitoring, which has been utilised or considered to develop the predictions

It should be highlighted that no underground mining has been carried out in the Ensham lease area and data from nearby collieries has been relied on. These assumptions are documented below, for each of the following inputs to the SDPS method.

Extracted Thickness (T)
An extracted thickness of 4m was used as an average for the underground longwall area. Increases or decreases in the extracted thickness will primarily affect the magnitude of subsidence, provided the longwall panel width remains unchanged. It should be highlighted that the same remedial measures and mitigation as documented in the EIS would be required at the different extraction thicknesses.

[3] Byrnes, R (2003) Case Studies in the Application of Influence Function in Visualise Surface Subsidence. COAL 2003 – 4th Underground Coal Operators' Conference. Pp. 89-100.

Subsidence factor (ratio of S_{max}/T)
The subsidence factor is the ratio of the maximum subsidence and extracted thickness (S_{max}/T). Based on mining experiences at nearby collieries in the Bowen Basin, a value of 65% was used.

Panel Layouts (corrected by the panel adjustment factor). SDPS considers each extraction panel not by the mining edge but by the projection of the points of inflexion. For wide extraction panels, the position of the inflexion points is a linear proportion of the depth of cover. Based on our experience with the method in both the Bowen Basin and NSW, a ratio of 0.20 was used.

Angle of Influence
The angle of influence is the parameter that controls the maximum tilt that is developed at the point of inflexion. The nature of the influence function is such that the angle of influence is related to the maximum tilt, the depth of cover and the maximum subsidence:

$$\text{Angle of influence} = \tan^{-1}(\text{max tilt} * \text{depth/maximum vertical subsidence})$$

Without site-specific data a value of 75^{o} was used based on data from elsewhere in the Bowen Basin.

Depth of cover
The depth of cover data was generated from the geological database. New geological borehole information will not significantly change the depth of cover contours.

Strain Coefficient
This value is directly related to the magnitude of the calculated strains and curvatures. It can be empirically estimated by the average ratio of measured strain and curvature over a set of surface points. In the absence of local Ensham data, experience from local collieries extracting longwalls was used to obtain a value of 0.21.

4. Identification of all assumptions used, especially those, which may significantly affect the outcome of the subsidence predictions, and discussion of their relevance.

SDPS is particularly valuable in visualising the subsidence deformations. For supercritical extraction i.e. the width of the panel:depth of cover is >1.2, the deviations from maximum predictions are negligible. The base of the subsidence bowl may be slightly smaller or bigger.

However, it is stressed that SDPS can only predict the overall or systematic deformations. All subsidence surveys reveal small scale variations from the smooth profile predicted by this method – these deformations can be related to localised movements of the blocky rock, that is a feature of all coal mine overburdens.

This is not likely for Ensham because of the amount of soil/alluvial cover (typically 8-20m thick) that blankets the rock. These deviations can be important for surface improvements but not for agricultural land.

5. Reliability of the subsidence predictions and the level of uncertainties involved, in particular, any potential deviations from the predictions due to factors such as topographic, geological or geotechnical conditions or variations.

At the current state of knowledge it is not considered that there will be significant deviations from the current predictions due to topographic, geological or geotechnical variations. As is good engineering practice we do recommend a review of the predictions once more geological/geotechnical data is available.

Adequacy of the Subsidence Prediction

In Section 7.3.5 of the EIS, the surface subsidence predictions are described as preliminary. Preliminary in the sense that mine plan is preliminary. The EPA requires more definitive subsidence prediction information, including more detailed discussion to support the predictions. The main issue is will the new drilling information significantly change the predictions.

It is suggested that the response in the previous section provides more definitive information to allow an assessment of the subsidence predictions. The planned longwall layout extraction is considered supercritical, as a result small variations in seam thickness and depth of cover together with the identification of faults will not significantly modify the subsidence profile. From our knowledge of the Rangal Coal measures, we do not expect any significant deviations from the geological/geotechnical model. The same remedial and mitigation methods will still be required as documented in the EIS. The only material difference would be if the Width of panel/Depth of cover were to be significantly reduced.

Yours truly,

N.G. Gordon.

Nick Gordon

Appendix N

Geotechnical Issues Associated with Pit Design

Pells Sullivan Meynink Pty Ltd

Engineering Consultants
Rock-Soil-Water
Offices at Sydney, Brisbane and Terrigal ABN 15 061 447 621

G3, 56 Delhi Road
North Ryde NSW 2113
Sydney Australia
T 61-2 9812 5000
F 61-2 9812 5001
E mailbox@psmsyd.com.au
W psmsyd.com.au

Our Ref: PSM687.L18
Date: 23 October 2006

Hansen Consulting
GPO Box 3285
BRISBANE QLD 4001

ATTENTION: LAURA KNOWLES

Dear Madam,

RE: MINING NEAR NOGOA FLOODPLAIN ENSHAM

This letter has been prepared at the request of Hansen Consulting to assist with the EIS for proposed mining beneath the Nogoa Floodplain by Ensham Resources Proprietary Limited (Ensham).

1. INTRODUCTION

It is understood that the Department of Natural Resources, Mines and Water has raised concerns in relation to the stability and design parameters for open cut pit excavation walls and associated levee banks close to the river channel.

This letter presents the following:

- The geological setting, geotechnical setting and mining practices proposed at Ensham for mining in the floodplain.
- The recommended approach for design of the Ensham pit walls in the floodplain.
- Recommendations for levee bund design.
- A general discussion that attempts to place into perspective the combination of geological, geotechnical and mining setting which contributed to the failure at Curragh North; together with a comparison to Ensham.

2. PROPOSED FLOODPLAIN MINING AT ENSHAM

2.1. Extent of Mining

Figure 1 presents the proposed mining beneath the floodplain at Ensham. The mining is essentially an extension of mining in B block, south of the Nogoa River, and extension of mining in C block, north of the Nogoa River.

It is understood the limit of mining is 100m from the top of the high bank of the river, although the proposed distance is typically much greater.

2.2. Mining Setting

At Ensham, the proposed pit walls near the Nogoa river comprise predominantly highwalls with some end walls.

In the highwall the bedding dips into the wall, providing very favourable stability conditions. Whilst in the end walls the bedding is essentially flat (i.e. there is no component of dip into the open void), which is also favourable for stability.

Figure 2 presents the above concepts schematically. Typically the risk for large scale block sliding occurring on any weak layers within the sequence is very low for end wall and high wall situations such as at Ensham.

2.3. Geological & Geotechnical Setting

There are several geotechnical aspects that require consideration of pit wall designs at Ensham.

Alluvial materials blanket the Permian sedimentary sequence and form the floodplain. These alluvials require a flatter design and a berm immediately below to control any minor sloughing of the face. This berm is also to control minor seeps which occur at the base of the alluvials.

A minor aquifer occurs within the alluvials. It is understood this aquifer is saline. Furthermore, it is understood that a natural clay layer occurs at the base of the river and therefore disconnects the river from the alluvial aquifer. This is confirmed by aquifer remaining saline and the fact that seepages where they occur in pit walls are saline.

The Permian sediments above the coal at Ensham largely comprise sandstone and siltstones with no “weak layers” evident in any exposures observed by this firm.

Faulting is present in both B and C pits at Ensham. However, the faults are normal faults; that means they are sub-vertical and very widely spaced, often up to kilometres. There is “drag-folding” associated with the faults. However, the drag folding is limited to the immediate vicinity of faults and to a width of only several metres. Bedding between faults remains essentially planar and undisturbed with no shearing of beds. Figure 3 presents key aspects of this style of faulting.

In summary the combination of geological, geotechnical and mining settings at Ensham are largely very favourable and this is borne out by the mainly steep end wall and highwalls that have been achieved with no history to date of large scale instability.

Notwithstanding the above, the designs at Ensham require the utilisation of appropriate design methodologies and these are discussed below.

3. APPROPRIATE DESIGN METHODOLOGY – ENSHAM

3.1. Approach

An appropriate design methodology for Ensham for mining near the river would comprise:

- Selection of slope angles within alluvials,
- Selection of slope angles for Permian rocks,
- Selection of overall angles,
- Consideration of groundwater and
- Consideration of the possible influence of faulting on final walls.

3.2. Alluvial Materials

For the alluvial materials a key aspect is the strength of these materials and back-analysis of any instability in these materials should be utilised to confirm appropriate strengths, i.e. accepting a Factor of Safety (FOS) of 1.0. Based on the above strengths, a design within the alluvial materials utilising a FOS of 1.5 would provide an appropriate design.

3.3. Permian Sediments

An alternative approach is required for the Permian Rocks.

Based on the rock mass quality an empirical method could be utilised to provide estimates of rock mass shear strengths. These assessments should use a conservative approach and allow for large scale blasting effects. Based on these rock mass shear strengths, analysis of the current slopes should be carried out to confirm the FOS achieved in relation to actual performance.

Analysis for design of the Permian rocks should then be carried out utilising a FOS of 1.5 for the final design.

3.4. Overall Slopes

A check on the overall slope would be required to ensure an overall FOS of 1.5 for the combined slope of alluvial materials and Permian rocks.

The design would also need to consider appropriate selection and placement of berm widths.

3.5. Groundwater

A key aspect in all of the above analyses would be the appropriate groundwater assumptions. These assumptions need to take into account:

- Observed groundwater levels in alluvials and Permian rocks; and
- Observations of seepage from existing highwalls and end walls at Ensham.

A conservative approach would be to assume connectivity between the alluvial and Permian rocks and with groundwater levels in accord with observed seepage horizons in current mining exposures.

3.6. Faulting

A key aspect that will need to take into account in the final designs at Ensham would be the occurrence of faults in the highwall and end walls.

This aspect will need careful consideration of the geometry of the fault in relation to the final wall and any necessary requirements for localised changes in design. Owing to variability in the strike of the faults, this detailed design should be addressed as the highwall or endwall approaches its final configuration so as to ensure an appropriate design for the final walls.

4. LEVEE DESIGN

An important aspect of mining in the floodplain is ensuring an appropriate design of the levee. Key considerations comprise:

- Material selection for the levee,
- Material placement,
- Slope angles,
- Scour protection on floodplain slope and
- Consideration for rapid flooding and rapid lowering of water which could affect levee stability.

5. CURRAGH NORTH

5.1. Data Sources

Review of the failure which occurred at Curragh North has been based on information provided within a Queensland Government Environmental Protection Agency (QEPA) Powerpoint presentation, titled "North Curragh Mine-Levee Incident of 22nd May 2006". This was supplemented by historic knowledge and experience with the conditions at Curragh.

5.2. Mining Setting

The mining setting at Curragh North played a critical role in the failure. The failure occurred within the low wall, a location where bedding dips out of the slope, Figure 4.

This setting is typically the highest risk scenario in open cut coal mining as there is a potential for sliding to occur upon any weak layers that dip into the mined out void, Figure 2.

5.3. Geological & Geotechnical Aspects

There are several geological and geotechnical aspects that indicated there was a high risk of low wall instability at Curragh North.

In particular thrust faulting is present at Curragh North and the implications of this style of faulting are, Figure 3:

- Thrust faulting will induce sheared "weak layers" within the sediments and provide "ramp-shears"; and
- The "ramp-shears" form surfaces which greatly facilitate potential for block sliding. This aspect is evident at Curragh North where block movements and cracking were evident at numerous locations between the mining void and river.

Review of the geotechnical aspects suggest the failure was as a result of a combination of factors and in order of their importance these are, Figure 5:

- Presence of thrust faulting in the low wall and which dips out of the low wall.
- Bedding which dips out of the wall. Although bedding dips are typically 4° in the low wall, the bedding has been "dragged" and steepened by thrust faulting.
- Presence of slickensided surfaces within a mudstone layer above the coal acting as a weak layer to allow sliding.
- Presence of tuff layer below coal. The tuff was placed during a volcanic event within the sedimentary deposition. Such volcanic rocks are more prone to

weathering and degradation and are frequently associated with weak layers within sedimentary sequences.

- Water pressures in low wall providing uplift and destabilising stability.

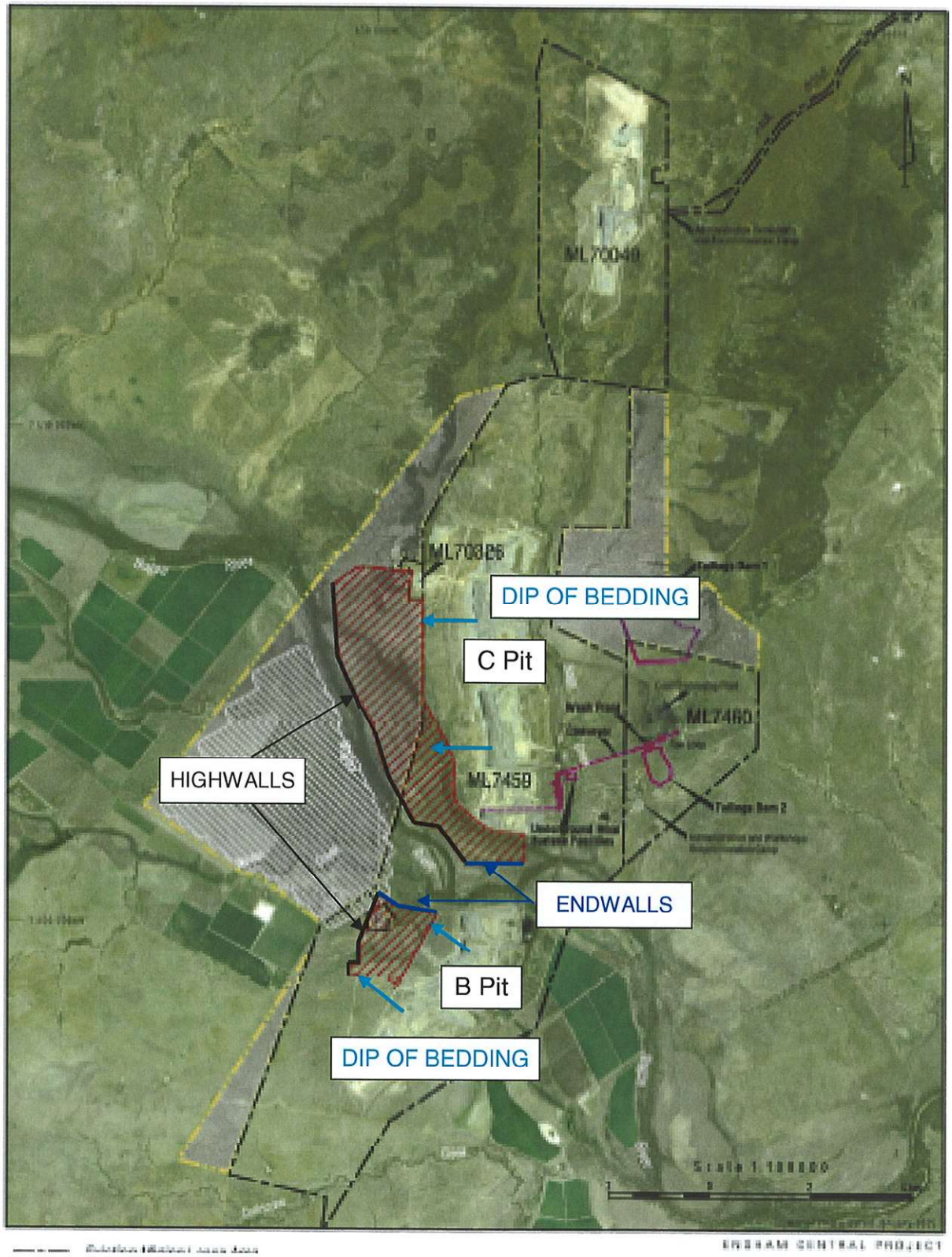
The combination of all the above aspects has played a part in the failure. Moreover, they provide key indicators to allow an assessment of the potential risks for alternative geological, geotechnical and mining settings.

Of note none of the above factors are present at Ensham within the floodplain area planned for mining.

For and on behalf of
PELLS SULLIVAN MEYNINK PTY LTD

A. DURAN

Encl: Figure 1 – Proposed Mining at Ensham in Floodplain
Figure 2 – Typical Risks Associated with Wall in Relation to Bedding Dip
Figure 3 – Impact of Faulting Styles on Disturbance with Sediments
Figure 4 – Curragh North Low Wall
Figure 5 – Geotechnical Factors at Curragh North Contributing to Failure

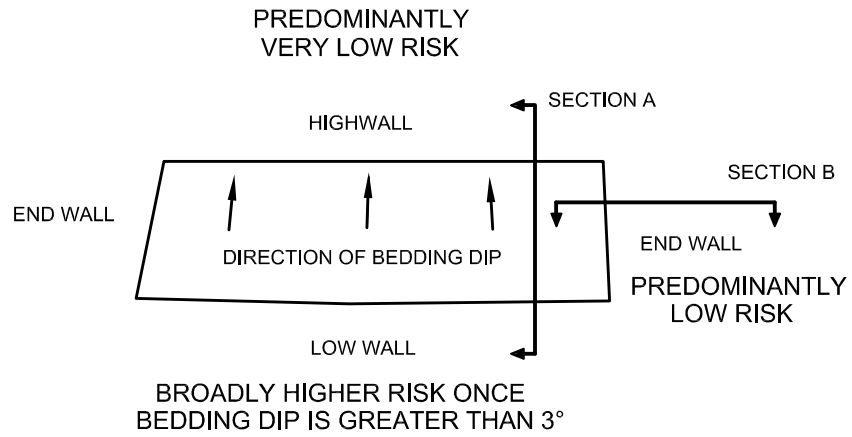


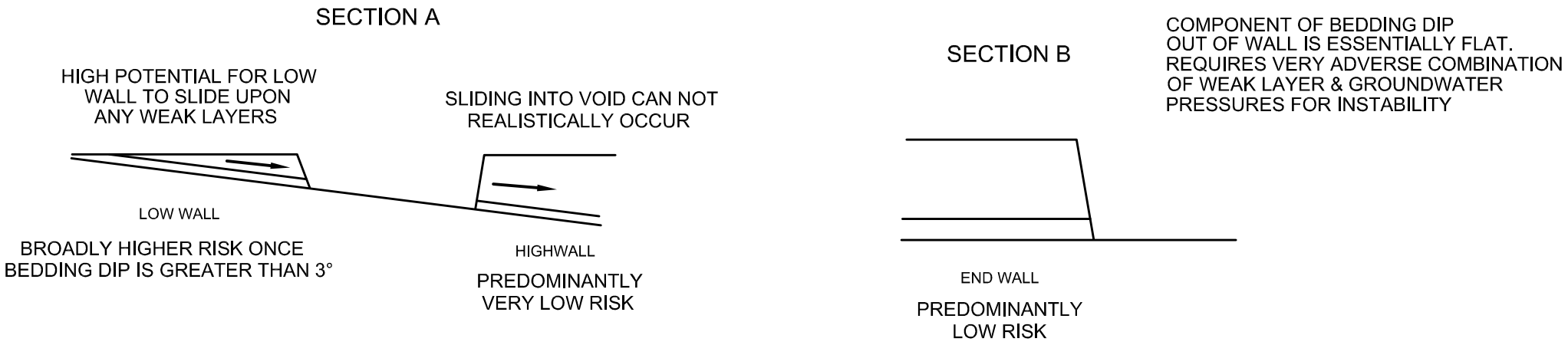
Hansen Consulting
Ensham Mining in Floodplain

PROPOSED MINING AT ENSHAM IN FLOODPLAIN

Pells Sullivan Meynink Pty Ltd

PSM687.L18	Figure 1





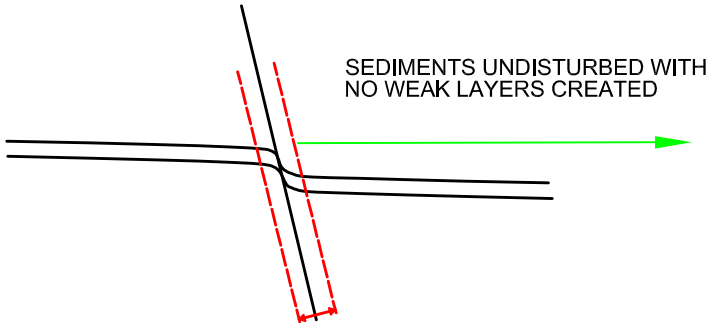
Pells Sullivan Meynink Pty Ltd

Hansen Consulting
Ensham Mining in Floodplain

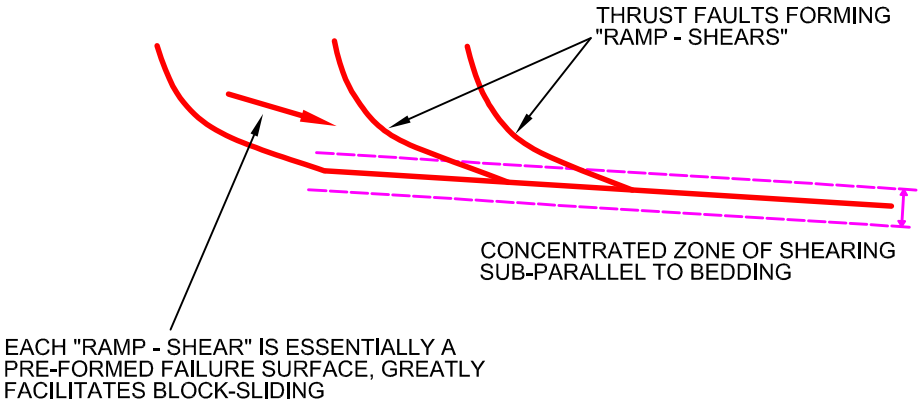
TYPICAL RISKS ASSOCIATED WITH WALL
IN RELATION TO BEDDING DIP

PSM 687.L18 | Figure 2

NORMAL FAULTING
(ENSHAM)



THRUST FAULTING
(CURRAGH NORTH)



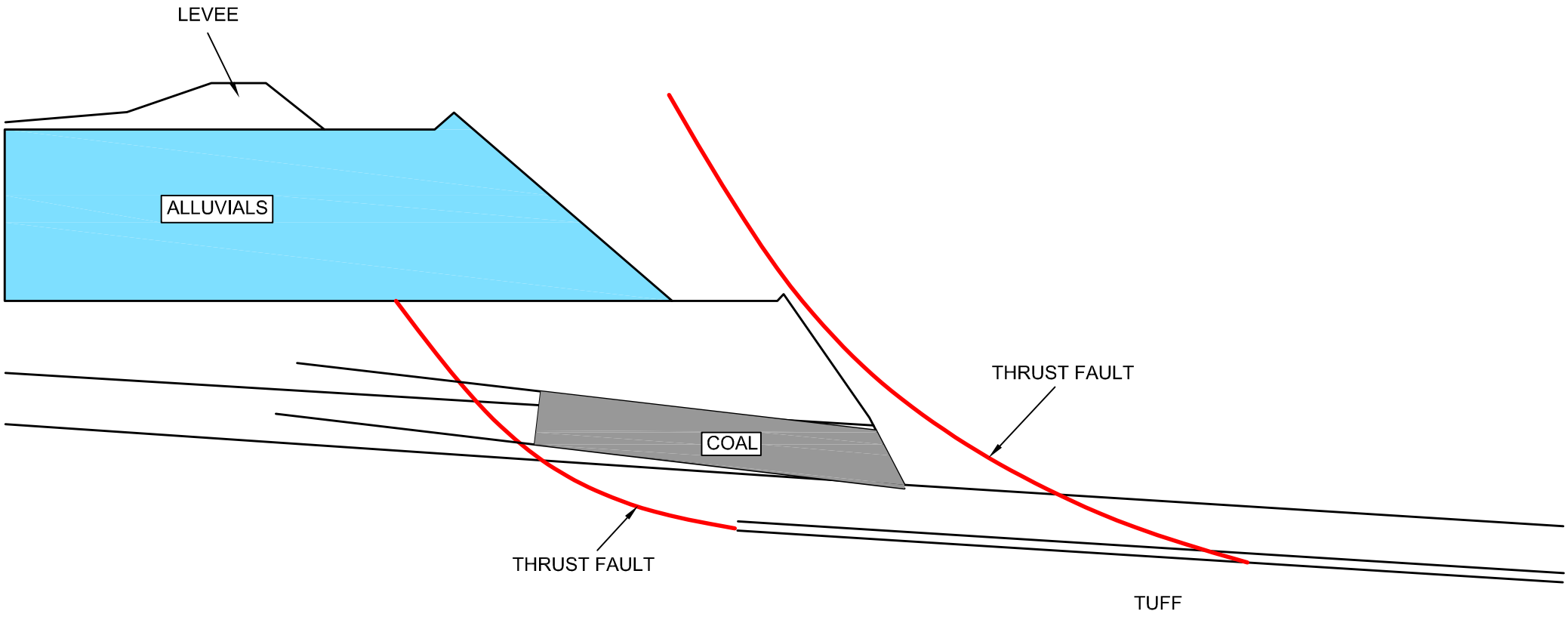
PSM

Pells Sullivan Meynink Pty Ltd

Hansen Consulting
Ensham Mining in Floodplain

IMPACT OF FAULTING STYLES ON
DISTURBANCE WITHIN SEDIMENTS

PSM 687.L18	Figure 3

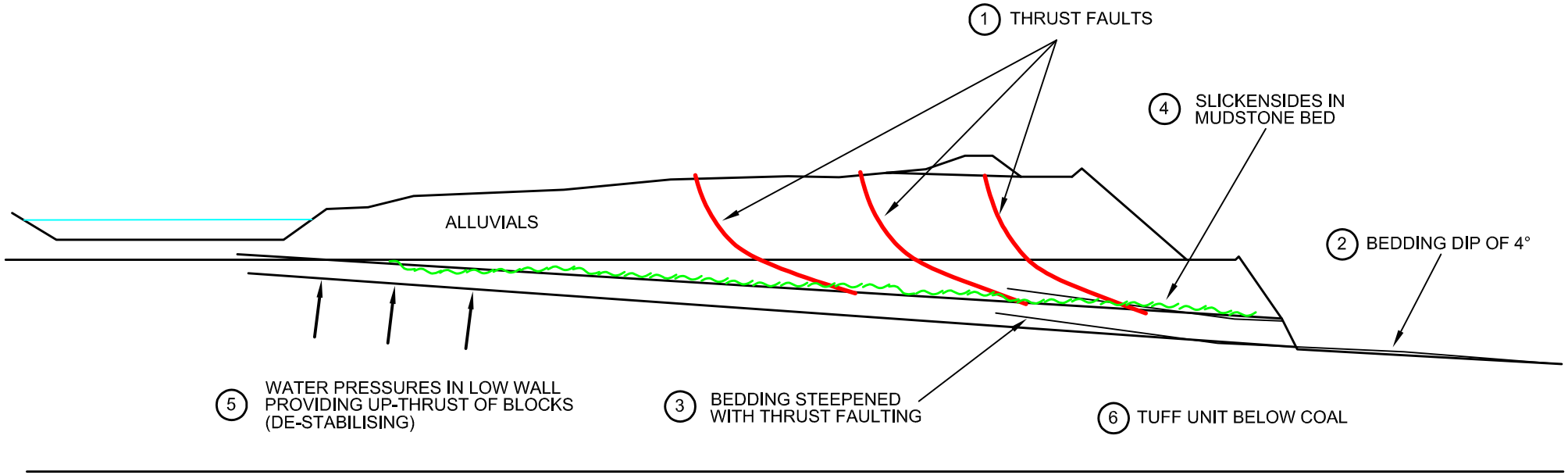


Pells Sullivan Meynink Pty Ltd

Hansen Consulting
Ensham Mining in Floodplain

CURRAGH NORTH LOW WALL

PSM 687.L18 | Figure 4



Pells Sullivan Meynink Pty Ltd

Hansen Consulting
Ensham Mining in Floodplain

GEOTECHNICAL FACTORS AT CURRAGH NORTH CONTRIBUTING TO FAILURE

PSM 687.L18 | Figure 5

Appendix O

Existing Ensham Environmental Authority

ENVIRONMENTAL PROTECTION ACT 1994

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Environmental Authority No. MIM 800086202 (mining activities)

Section 292 *Environmental Protection Act 1994*

This environmental authority is granted under the Environmental Protection Act 1994 *and includes conditions to minimise environmental harm caused, or likely to be caused, by the authorised mining activities. An environmental authority (mining activities) may be for mining activities authorised (under the* Mineral Resources Act 1989*) to occur under one of the following mining tenements: a prospecting permit; mining claim; exploration permit; mineral development licence; or mining lease. In general, a mining activity means: prospecting, exploring, mining; or processing minerals; remediation; rehabilitation; and includes facilitation and supporting activities and any action taken to prevent environmental harm.*

Under the provisions of the *Environmental Protection Act 1994* this environmental authority is issued to:

IDEMITSU QUEENSLAND PTYLTD
BLIGH COAL LIMITED
EPDC (AUSTRALIA) PTY LTD
LG INTERNATIONAL (AUSTRALIA) PTY LTD

C/ - Ensham Resources Pty Ltd
Level 20, AMP Place
10 eagle St
GPO Box 814
Brisbane QLD 4001

in respect of carrying out activities as part of the following mining project:

Type of environmental authority (mining activities)	Authorised mining tenements	Location
Mining Lease	ML 7459 ML 7460 ML 70049 ML 70326 SA 2 (lot 31 P864573)	Ensham Coal Mine 40km East of Emerald

The mining activities are authorized to the extent defined in Schedule 6 of the *Environmental Protection Regulation Act 1994.*

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

This environmental authority is subject to the conditions set out in the attached schedules.
The anniversary date of this environmental authority is 30 May
This environmental authority takes effect from. 13 October 2004

M Wells — Signed

13/10/04 — Date

Melissa Wells
District Manager
Central West District, Central Region
Delegate of Administering Authority
Environmental Protection Act 1994

This **environmental authority** incorporates the following schedules:

- Schedule A - General
- Schedule B - Air
- Schedule C - Water
- Schedule D - Noise and Vibration
- Schedule E - Waste
- Schedule F - Land
- Schedule G - Community
- Appendix 1 - Definitions
- Appendix 1 - Maps / Plans

Schedule A - General

Financial assurance

(A1-1) Provide a financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.

(A1-2) The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

Maintenance of measures, plant and equipment

(A2-1) The environmental authority holder must ensure:

- that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; and
- that such measures, plant and equipment are maintained in a proper condition; and
- that such measures, plant and equipment are operated in a proper manner.

Monitoring

(A3-1) Record, compile and keep for a minimum of five years all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.

(A3-2) Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

Storage and handling of flammable and combustible liquids

(A4-1) Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with Section 5.9 of AS 1940 - Storage and Handling of Flammable and Combustible Liquids of 1993.

Definitions

(A5-1) Words and phrases used throughout this EA are defined in Attachment 1 – Definitions. Where a definition for a term used in this EA is sought and the term is not defined within this EA, the definitions in the Environmental Protection Act 1994, its Regulations and Environmental Protection Policies must be used.

END OF CONDITIONS FOR SCHEDULE A

Schedule B - Air

Dust nuisance

(B1-1) All reasonable and practicable measures must be taken to minimise the release of dust or particulate matter or both resulting from the mining activities that causes or is likely to cause an environmental nuisance, at any sensitive place.

(B1-2) When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

(B1-3) If the environmental authority holder can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of (B1-1):

a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991 or another method of monitoring/assessment as determined to be appropriate due to the nature of the nuisance decided in consultation with the administering authority; and

b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometer (PM10) suspended in the atmosphere of 150 micrograms per cubic meter over a 24 hour averaging time, at a sensitive place downwind of the operation land, when monitored in accordance with:

- Particulate matter- determination of suspended particulate PM10 high volume sampler with size selective inlet – Gravimetric method, when monitored in accordance with AS 3580.9.6 Methods for sampling and analysis of ambient air – determination of suspended particulate matter – PM (sub) 10 high volume sampler with size-selective inlet – Gravimetric method of 1990; or
- Any alternative method of sampling PM10 which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority.

END OF CONDITIONS FOR SCHEDULE B

Schedule C - Water

Release to waters

(C1-1) Receiving waters affected by the release of process water or storm water contaminated by the mining activities or both must be monitored at the locations and frequencies defined in Schedule C - Table 1

Schedule C - Table 1 (Water monitoring locations and frequency)

Monitoring point	*Latitude (GDA 94)*	*Longitude (GDA 94)*	*Sampling Point*	*Monitoring frequency*
Release point	Any location within the mixing zones defined in condition C1-3 and C1-4		Release point at outlet	Daily during water release
Within mixing zone upstream of release point	As per C1-3 & C1-4		Mixing zone 1	Daily during water release
Within mixing zone downstream of release point	As per C1-3 & C1-4		Mixing zone 2	Daily during water release
Downstream Lease Boundary (Nogoa River)	654470	7400670	Compliance point 1	Daily before, during & after water release
Upstream Lease Boundary (Nogoa River)	Dept NRM&E station		Compliance point 2	Daily

NOTE: This does not apply to dams containing hazardous waste and is not a release point

(C1-2) Receiving waters at compliance point 1affected by the release of process water or storm water contaminated by the mining activities or both must comply with the contaminant limits defined in Schedule C - Table 2.

Schedule C - Table 2 (Receiving water contaminant limits)

Parameter	Units	Minimum	Maximum
pH		6.5	8.5
EC	µS / cm Micro semens per centimetre	215	1000
TSS	mg/L	10	1150

NOTE: This does not apply to dams containing hazardous waste. Background is considered to be hydrographical data taken from DNRM&E gauging station, Duckponds.

(C1-3) The Nogoa River mixing zone is considered to be from the Ensham mine Haul road crossing downstream to the eastern boundary of mining lease ML7459.

(C1-4) The Boggy Creek mixing zone is considered to be the northern limit of mining lease ML70049 to the confluence of the Nogoa River.

(C1-5) Water release to Boggy Creek shall be only during periods of natural flow events. The duration of a natural creek flow event shall not be extended as a consequence of the mine water release.

(C1-6) The Authority holder within 20 working days of a water release provide a report to the administering authority detailing:

a) The reason for the release;
b) The location of the release;
c) All water quality monitoring results;
d) All other monitoring results;
e) Any general observations;
f) All calculations;
g) Any other matters pertinent to the water release event.

Sediment contaminant levels

(C2-1) All reasonable and practicable erosion protection measures and sediment control measures must be implemented and maintained to minimise erosion and the movement of sediment. Inscluding:

a) All clean waters, from undisturbed areas, kept separate from dirty waters from disturbed areas;
b) Water from disturbed catchments diverted into a the mine water management system and sedimentation dams;
c) Sedimentation dams designed to contain a 6 hour 10 year average recurrence interval rainfall;
d) Sediment shall be excavated from sediment dams as required to maintain design capacity.

Sewage effluent

(C3-1) Sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in schedule C table 3.

Schedule C - Table 3 (Sewage effluent quality standards)

Quality	Release Limit	Units	Limit Type	Monitoring Frequency
5 Day BOD	20	mg/l	max	On release
pH	6 - 8		range	On release
Free Chlorine residuals	1.0	Mg/l	max	On release
Faecal coliforms (based on the average of a min of 5 samples)	1 000	Colonies per 100ml	max	On release

Groundwater

(C4-1) Groundwater affected by mining activities must be monitored at the locations and frequencies defined in schedule C table 4.

(C4-2) Subject to condition C4-1 groundwater levels must be monitored and groundwater draw down fluctuations in excess of 2m per year, not resulting from the pumping of licensed bores, must be notified within 14 days to the administering authority following completion of monitoring.

Schedule C - Table 4 (Groundwater monitoring locations)

Monitoring Point	Latitude (AMD)	Longitude (AMG)	Sampling Point	Frequency
Alluvium groundwater (upstream)	651140	7402054	GW2	Quarterly (depth)
Alluvium groundwater (downstream)	654627	7399513	GW1	Quarterly (depth)

(C4-3) The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the Environmental Protection Agency's Water Quality Sampling Manual.

END OF CONDITIONS FOR SCHEDULE C

Schedule D - Noise and vibration

Noise nuisance

(D1-1) Subject to Conditions (D1-2) and (D1-3) noise from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.

(D1-2) When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following.

(D1-3) The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

END OF CONDITIONS FOR SCHEDULE D

Schedule E - Waste

(E1-1) Tyres stored awaiting disposal or transport for take-back and, recycling, or waste-to-energy options – should be stockpiled in volumes less than 3m in height and 200sq.m in area and at least 10m from any other tyre storage area.

(E1-2) All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10m radius of the scrap tyre storage area.

(E1-3) Disposal of scrap tyres resulting from the mining activities in spoil emplacement is acceptable provided:

a) all other stages (options) in the waste hierarchy have been considered;
b) tyres are placed as deep in the spoil as reasonably practicable.

(E1-4) Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

END OF CONDITIONS FOR SCHEDULE E

Schedule F - Land

Rehabilitation landform criteria

(F1-1) Progressive rehabilitation must commence when areas become available within the operational land.

(F1-2) Complete an investigation into rehabilitation of the disturbed areas and submit a report to the administering authority proposing success criteria and landform design criteria by December 2005 The rehabilitation success criteria must be detailed in the Plan of Operations.

(F1-3) A Rehabilitation Management Plan for all mining areas must be developed by December 2005 and submitted to the administering authority for approval. The Rehabilitation Management Plan must:

a) map existing areas of rehabilitation;
b) detail rehabilitation methods applied to areas in F1-3 (a);
c) identify success factors from areas in F1-3 (a);
d) detail future rehabilitation actions to be completed on areas in F1-3 (a);
e) identify three (3) analogue and three (3) rehabilitation sites to be used to develop rehabilitation success criteria;
f) detail landform design criteria;
g) detail future planned rehabilitation methods for disturbed areas;
h) detail planned native vegetation rehabilitation areas and corridors;
i) detail rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance;
j) detail end of mine landform design plan;
k) detail spoil characteristics, soil analysis, soil separation for use on rehabilitation;
l) detail potential problem and how they will be addresses;

(F1-4) Upon submission of the Rehabilitation Management Plan (condition F1-3) an amended EA will be issued redressing new rehabilitation landform criteria conditions relative to the results identified.

Final Voids

(F2-1) All reasonable and practicable measures shall be taken to minimise or prevent serious environmental harm being caused by the void other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority

(F2-2) If final voids are to be left, an investigation into void options must be prepared and a report submitted to the administering authority. The investigation must at a minimum include the following:

a) A study of options available for minimising final void area and volume; and
b) A void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long term; and
c) A pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events; and
d) A hydrological study into the long-term risk of the Nogoa River, Boggy Creek / final void interaction, including erosion of the levee and extreme hydrological events, and the consequences of such interaction to the long-term stability of the final voids; and
e) A study of void capability to support native flora and fauna; and

f) A proposal/s for end of mine void rehabilitation success criteria and final void areas and volumes

These studies will be undertaken during the life of the mine, and will include detailed research and modelling. All studies must be complete prior to 5 years before end of open cut mining.

Topsoil Management

(F3-1) Topsoil resources, that are suitable for use in rehabilitation, must be salvaged ahead of mining disturbance, (or additional spoil placement) for strategic use in rehabilitation of the mine/spoil dump area. This topsoil removal and relocation must be documented in a Topsoil Stockpile Register.

Infrastructure

(F4-1) All infrastructure, constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner / holder.

Note: this is not applicable where the landowner / holder is the environmental authority holder.

END OF CONDITIONS FOR SCHEDULE F

Schedule G - Community

Complaint response

(G1-1) All complaints received must be recorded including details of complainant, reasons for the complaint, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

END OF CONDITIONS FOR SCHEDULE G

Definitions

"acceptance criteria" means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The acceptance criteria indicate the success of the rehabilitation outcome or remediation of areas which have been significantly been disturbed by the mining activities. Acceptance criteria may include information regarding:

- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire;
- vegetation water use and effects on ground water levels and catchment yields.

"airblast overpressure" means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dB).

"ambient (or total) noise" at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

"competent person" means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.

"authority" means environmental authority (mining activities) under the *Environmental Protection Act 1994.*

"blasting" means the use of explosive materials to fracture-

(a) rock, coal and other minerals for later recovery; or
(b) structural components or other items to facilitate removal from a site or for reuse.

"commercial place" means a work place used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees accommodation or public roads.

"dam" means a containment or proposed containment whether permanent or temporary, which is designed to contain, divert or control flowable substances. However this does not include a fabricated or manufactured tank or container designed to a recognised standard.

"environmental authority holder" means the holder of this environmental authority.

"hazardous waste" means any substance, whether liquid, solid or gaseous, derived by or resulting from, the processing of minerals that tends to destroy life or impair or endanger health.

"$L_{A\ 10,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, *(adjusted for tonal character and impulsiveness of the sound)* exceeded for 10% of any 10-minute measurement period, using Fast response.

"$L_{A\ 1,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, *(adjusted for tonal character and impulsiveness of the sound)* exceeded for 1% of any 10-minute measurement period, using Fast response

"$L_{A,\ max\ adj,\ T}$" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over any 10 minute period, using Fast response.

"land" in the "land schedule" of this document means land excluding waters and the atmosphere.

"land capability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land suitability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land use" term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

"mandatory reporting level" means the volume below the spillway crest, equivalent to the lower of the AEP, 72 hour storm or the AEP wave allowance (AEP is the annual exceedence probability).

"mineral" means a substance which normally occurs naturally as part of the earth's crust or is dissolved or suspended in water within or upon the earth's crust and includes a substance which may be extracted from such a substance, and includes—

(a) clay if mined for use for its ceramic properties, kaolin and bentonite;
(b) foundry sand;
(c) hydrocarbons and other substances or matter occurring in association with shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or for the purpose of enhancing the safety of current or future mining operations for coal or the extraction or production of mineral oil there from;
(d) limestone if mined for use for its chemical properties;
(e) marble;
(f) mineral oil or gas extracted or produced from shale or coal by in situ processes;
(g) peat;
(h) salt including brine;
(i) shale from which mineral oil may be extracted or produced;
(j) silica, including silica sand, if mined for use for its chemical properties;
(k) rock mined in block or slab form for building or monumental purposes;

but does not include—

(l) living matter;
(m) petroleum within the meaning of the Petroleum Act 1923;
(n) soil, sand, gravel or rock (other than rock mined in block or slab form for building or monumental purposes) to be used or to be supplied for use as such, whether intact or in broken form;
(o) water.

"noxious" means harmful or injurious to health or physical well being, other than trivial harm.

"non-standard" means a mining operation that if in the opinion of the administering authority does not have a low risk of serious environmental harm and the activities can not comply with the criteria for standard mining activities prescribed in schedule 1A of the *Environmental Protection Regulation 1998.* The standard mining activity trigger criteria are as follows;

- the mining activities do not or will not cause more than 10 ha of land to be significantly disturbed at any one time;
- the mining activities do not or will not cause more than 5 ha of land to be significantly disturbed at any one time;
  (a) in a riverine area;
  (b) because of mine workings;
- the mining activities are not or will not be carried out in, or within 2 km of a category A *Environmentally Sensitive Area*;
- the mining activities are not or will not be carried out in, or within 1 km of a category B environmentally sensitive area;
- the mining activities do not include a level 1 environmentally relevant activity
- no more than 20 persons are carrying out or will, at any one time, carry out the mining activities;

"offensive" means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

"peak particle velocity (ppv)" means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mms^{-1}).

"protected area" means - a protected area under the *Nature Conservation Act 1992*; or

- a marine park under the *Marine Parks Act 1992*; or

- a World Heritage Area.

"progressive rehabilitation" means rehabilitation (defined below) undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

"reference site" (or analogue site) may reflect the original location, adjacent area or another area where rehabilitation success has been completed for a similar biodiversity. Details of the reference site may be as photographs, computer generated images and vegetation models etc.

"rehabilitation" the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

"representative" means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

"residual void" means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

"self sustaining" means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

"sensitive place" means;

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- an educational institution; or
- a medical center or hospital; or
- a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- a public park or gardens.

"significant disturbance" – includes land

(a) if it is contaminated land; or

(b) it has been disturbed and human intervention is needed to rehabilitate it.

i. to a state required under the relevant environmental authority; or

ii. if the environmental authority does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance.

Some examples of disturbed land include:

- areas where soil has been compacted, removed, covered, exposed or stockpiled;
- areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (vegetation & topsoil)
- areas where land use suitability or capability has been diminished;
- areas within a watercourse, waterway, wetland or lake where mining activities occur;
- areas submerged by tailings or hazardous contaminant storage and dam walls in all cases;
- areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after mining activities have ceased; or
- areas where land has been contaminated and a suitability statement has not been issued.

However, the following areas are not included:

- areas off lease (e.g. roads or tracks which provide access to the mining lease);
- areas previously significantly disturbed which have achieved the rehabilitation outcomes;
- by agreement with the EPA, areas previously significantly disturbed which have not achieved the

rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);

- areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner. The agreement to leave permanent infrastructure must be recorded in the Landowner Agreement and lodged with the EPA;
- disturbances that pre-existed the grant of the tenure unless those areas are disturbed during the term of the tenure.

"spillway" means passage or outlet from the dam through which surplus water flows.

"stable" means geotechnical stability of the rehabilitated landform where instability related to the excessive settlement and subsidence caused by consolidation / settlement of the wastes deposited, and sliding / slumping instability has ceased.

"trivial harm" means environmental harm which is not material or serious environmental harm and will not cause actual or potential loss or damage to property of an amount of, or amounts totalling more than $5,000.

"watercourse" - Means a river, creek or stream in which water flows permanently or intermittently in a visibly defined channel (natural, artificial or artificially improved) with:

(a) continuous bed and banks;
(b) an extended period of flow for some months after rain ceases, and
(c) an adequacy of flow that sustains basic ecological processes and maintains biodiversity.

"waters" includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea) or any part-thereof.