EMAIL TRANSMISSION

ALLAN WATSON ASSOCIATES
Waste and Water Management Consultants

Sender: Ralph Holding
Email: r.holding@awassociates.net
Project No: 0150-xstc-002
Doc Ref: e001-a

71 Frasers Road
(PO Box 46)
ASHGROVE QLD 4060
Phone: 07 3366 6588
Fax: 07 3366 2413

13 April 2006

Yadav Sharma

cc Pat Bowen (MRM)

Dear Yadav,

RE: McARTHUR RIVER MINE TAILINGS STORAGE FACILITY CELL 2 STABILITY ASSESSMENT

As directed by McArthur River Mining (MRM), we herein provide the draft results of the stability assessment for the proposed Cell 2 development. Please note that the following is a brief summary of the stability analysis and will be fully documented as part of our final design report.

STRUCTURAL STABILITY CRITERIA

The Cell 2 embankment is to be designed with regard to foundation stability (i.e. control of vertical and lateral movement) and slope stability (i.e. to limit the risk of slope failure).

No target criteria for minimum vertical and lateral movement (settlements) have been adopted for this design. Experience indicates that, given the geological and geotechnical conditions of the site and the overall embankment construction concept, movements within the embankment should not be of significance subject to compliance with adequate foundation preparation and construction fill compaction standards.

Detailed slope stability analysis of the embankment forms a significant part of design. On the basis of general limit equilibrium (GLE), the following minimum factors of safety have been adopted, based on ANCOLD (1999) for the expected range of stability conditions for the dam embankments.

Condition	Minimum Factor of Safety
Long Term/Steady State	1.5
End of Construction	1.3
Seismic Condition	1.1

DESCRIPTION OF EMBANKMENT STABILITY MODEL

Slope stability analyses in relation to the embankment configuration were completed using the SLOPE/W computer package, which uses GLE theory to solve for the factor of safety of earth and rock slopes. The steady state condition as described below was assessed for the embankment using SLOPE/W:

Design Case	Description	Input Parameters
Steady state (long term) condition	Considers embankment stability under assumed worst case steady state seepage conditions.	Effective stress parameters (c', ϕ') with the phreatic surface represented as a piezometric line.
End of construction condition	Considers embankment stability immediately following completion of construction. Incorporates excess pore pressures developed within the embankment.	Effective stress parameters (c', ϕ') using estimated excess pore pressures developed during construction and post-construction periods.
Seismic condition	Considers embankment stability as per the steady state conditions, with seismic (earthquake or tremor induced) effects.	Effective stress parameters (c', ϕ') in addition to estimated seismic coefficient (to support pseudo-static analysis).

The analysis was coupled with the seepage model to develop the embankment seepage conditions. The cross section used for the analysis was taken through the portion of the embankment of greatest height.

ADOPTED DESIGN PARAMETERS

The following outlines and quantifies the design parameters adopted for the stability analysis:

(i) Embankment Height

The embankment height through the analysed cross section is some 12.0m (excluding foundation preparation thickness).

(ii) Material Parameters

Material parameters used in the stability analysis for embankment construction materials and foundation layers have been based on the results of the geotechnical investigation. The adopted design parameters are summarised on **Plate 1**.

(iii) Developed Pore Pressures Within the Embankment (Steady State Condition)

Output from the seepage modeling provides a profile of the developed phreatic surface within the embankment for the steady state seepage condition.

(iv) Developed Pore Pressures Within the Embankment (End of Construction)

The end-of-construction condition differs to the steady state condition to the extent that it considers the effect of excess pore pressures developed within the embankment fill through construction activity and increasing overburden as the embankment level is reached. The rate of dissipation of pore pressure within the fill controls this condition. Based on the characteristics of the

embankment fill material, particularly the inferred consolidation properties (related to permeability), the issue of excess pore pressure relates specifically to the clay fill. An excess pore pressure dissipation coefficient (r_u) for the earthen fill of 0.2 has therefore been adopted in design, which is considered to be conservative.

(v) Seismic Effects

Based on ANCOLD (1998), the proposed guidelines for seismic stability assessment of embankments dams in Australia were adopted, with a pseudo-static analysis completed in conjunction with US Army Corps of Engineers recommendations. A conservative acceleration coefficient of 0.15 was assumed in this analysis

EMBANKMENT STABILITY ANALYSIS RESULTS

Based on the embankment configuration as described above, the following factors of safety were calculated:

Condition	Modelled Factor of Safety
Steady State Seepage Condition	1.8
End of Construction	1.3
Steady State Seepage Condition with Seismic Effects	1.2

The results of these analyses, compared with the target minimum factors of safety as provided for the conditions analysed indicate that the embankment configuration is appropriate.

Results of the stability analysis as indicated, in the form of model output, are shown on **Plate 1** through **3**.

If you have any further queries, please do not hesitate to contact the undersigned.

Yours faithfully
Allan Watson Associates Pty Ltd

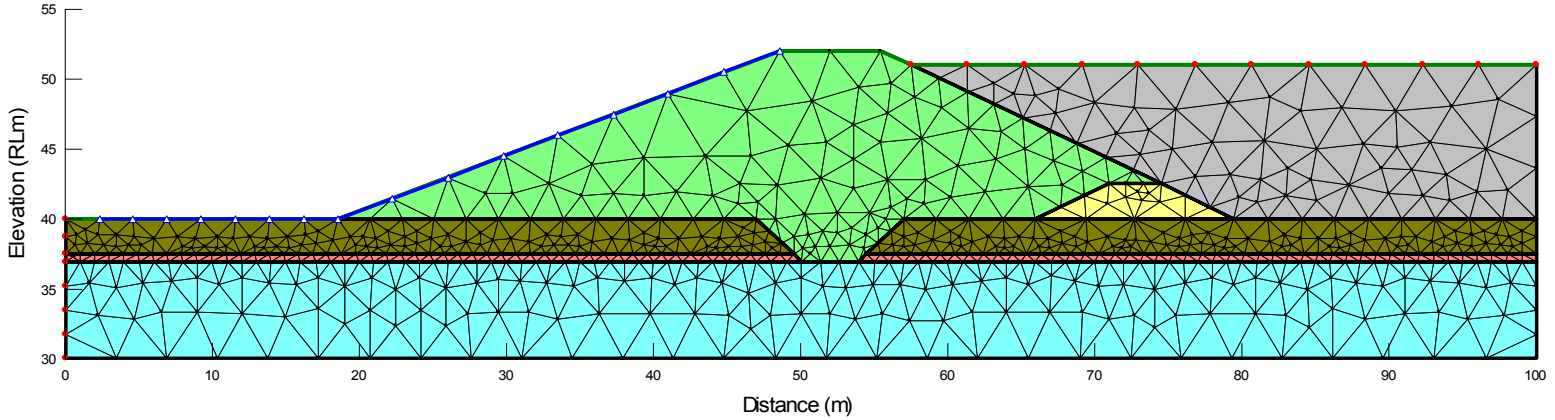
Ralph Holding
Senior Civil/Geotechnical Engineer
Encl. Plates 1, 2 and 3

PLATES

MODEL SUMMARY

ANALYSIS TYPE:	SEEPAGE
LOCATION:	STEADY STATE / LONGTERM

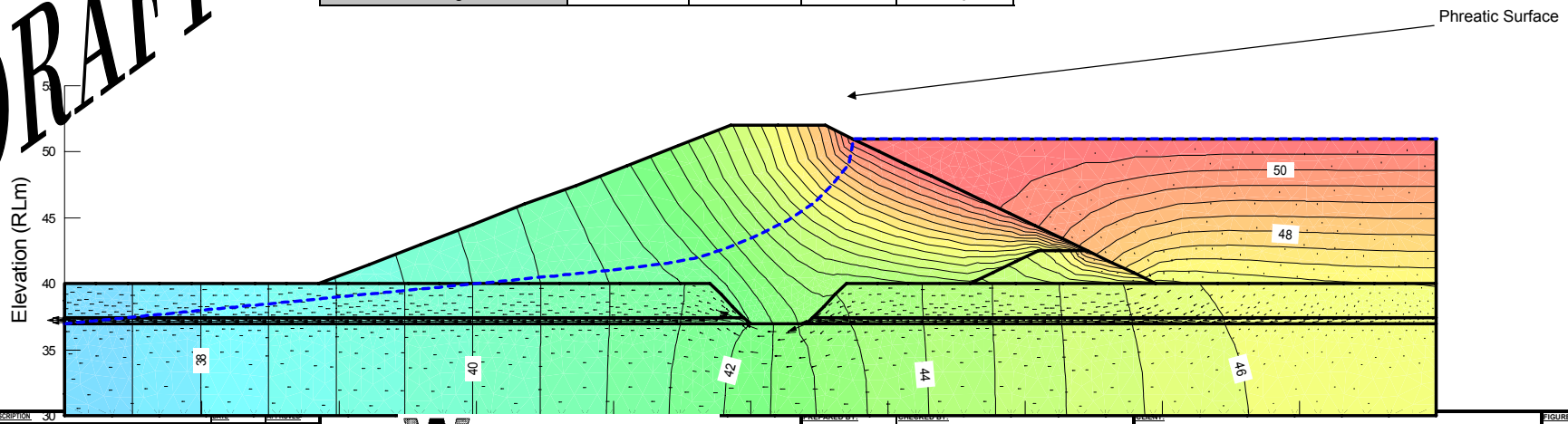
SEEPAGE ANALYSIS



Model Layer	Adopted Geotechnical Parameters			
	Unit Weight (kN/m3)	Effective Cohesion	Friction Angle	Permeability (m/s)
Embankment 1	17	15	32	$1x10^{-8}$
Embankment 1	20	12	25	$1x10^{-9}$
Sandy Gravelly Clay	18	5	30	$1x10^{-6}$
Sandy Gravelly Clay	18	5	30	$5x10^{-6}$
Bedrock	22	200	40	$1x10^{-6}$
Tailings	14	0	25	$1x10^{-7}$

Seepage analysis assumes (conservatively) fully saturated conditions within the tailings mass.

DRAFT



REV	DESCRIPTION	DATE	APPROVED

ALLAN WATSON ASSOCIATES
Waste and Water Management Consultants
ACN 081 272 407

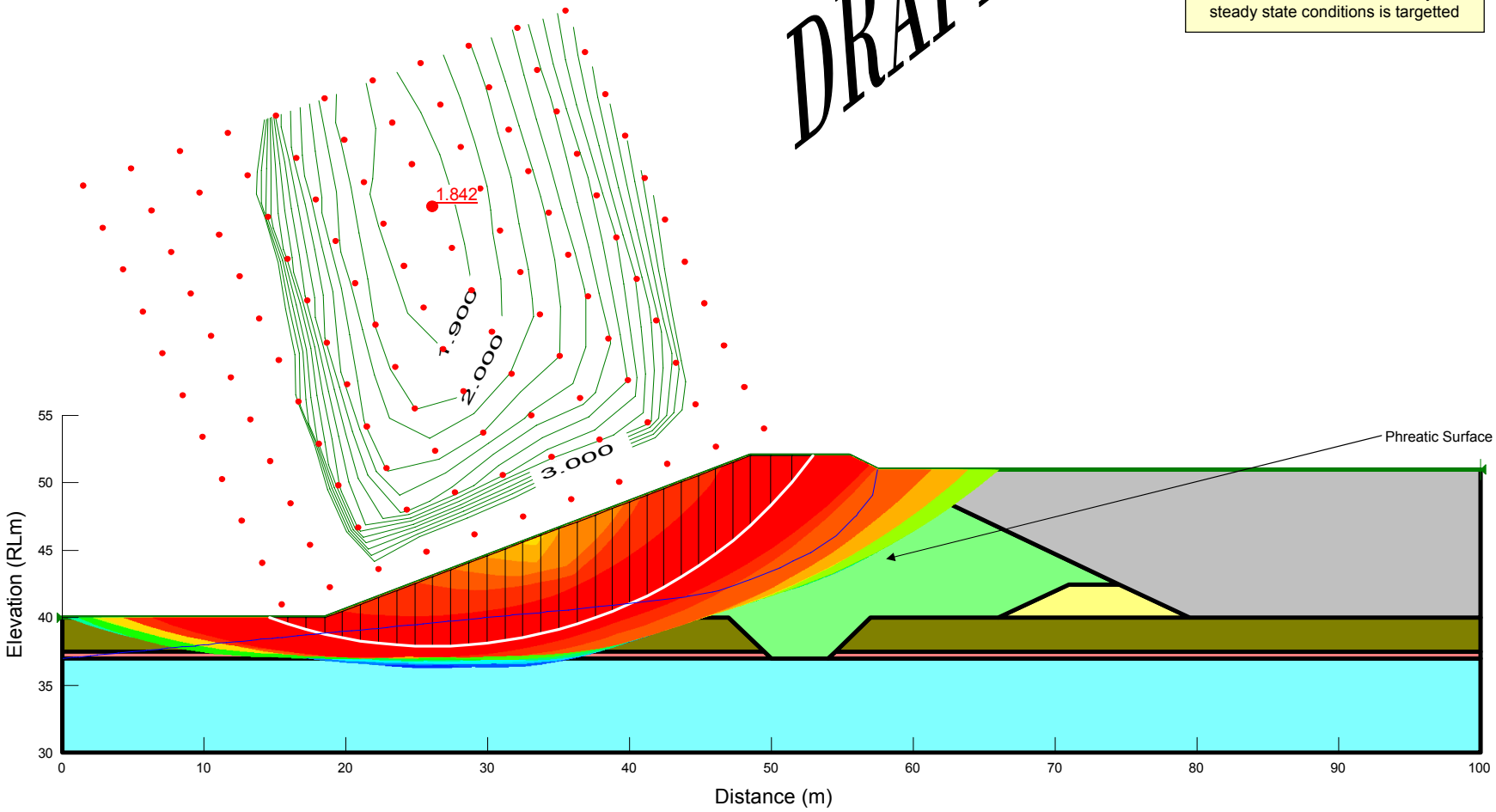
PREPARED BY:	DWT
CHECKED BY:	RJH
PROJECT NO:	0150-xst-002
FILE/SOURCE:	D:\2005 Jobs\0150-xst\002\plates\Plates_XSEC.xls
CLIENT:	McARTHUR RIVER MINE PTY LTD
PROJECT:	McARTHUR RIVER MINE TAILINGS STORAGE FACILITY - CELL 2 CONSTRCUTION
TITLE:	Steady State Long Term Condition
FIGURE NO:	Plate 01
REV:	A
DATE:	May-06

MODEL SUMMARY

ANALYSIS TYPE:	COUPLED STABILITY SEEPAGE
LOCATION:	ULTIMATE (FINAL STAGE) EMBANKMENT
ADOPTED CONDITIONS:	STEADY STATE / LONGTERM

Output from stability analysis comprises a Factor of Safety (FOS) map of potential slip surfaces for FOS values between 1.8 (red) and 4.0 (blue). Note that a minimum factor of safety for steady state conditions is targetted

STABILITY ANALYSIS



REV	DESCRIPTION	DATE	APPROVED

Allan Watson Associates
Waste and Water Management Consultants
ACN 081 272 407

PREPARED BY: DWI	CHECKED BY: RJH
PROJECT NO: 0150-xst-002	
FILE/SOURCE: D:\2005 Jobs\0150-xstl\002\plates\Plates_XSEC.xls	
CLIENT: McARTHUR RIVER MINE PTY LTD	
PROJECT: McARTHUR RIVER MINE TAILINGS STORAGE FACILITY - CELL 2 CONSTRCUTION	
TITLE: Steady State Long Term Condition	
FIGURE NO: Plate 02	
REV: A	DATE: May-06

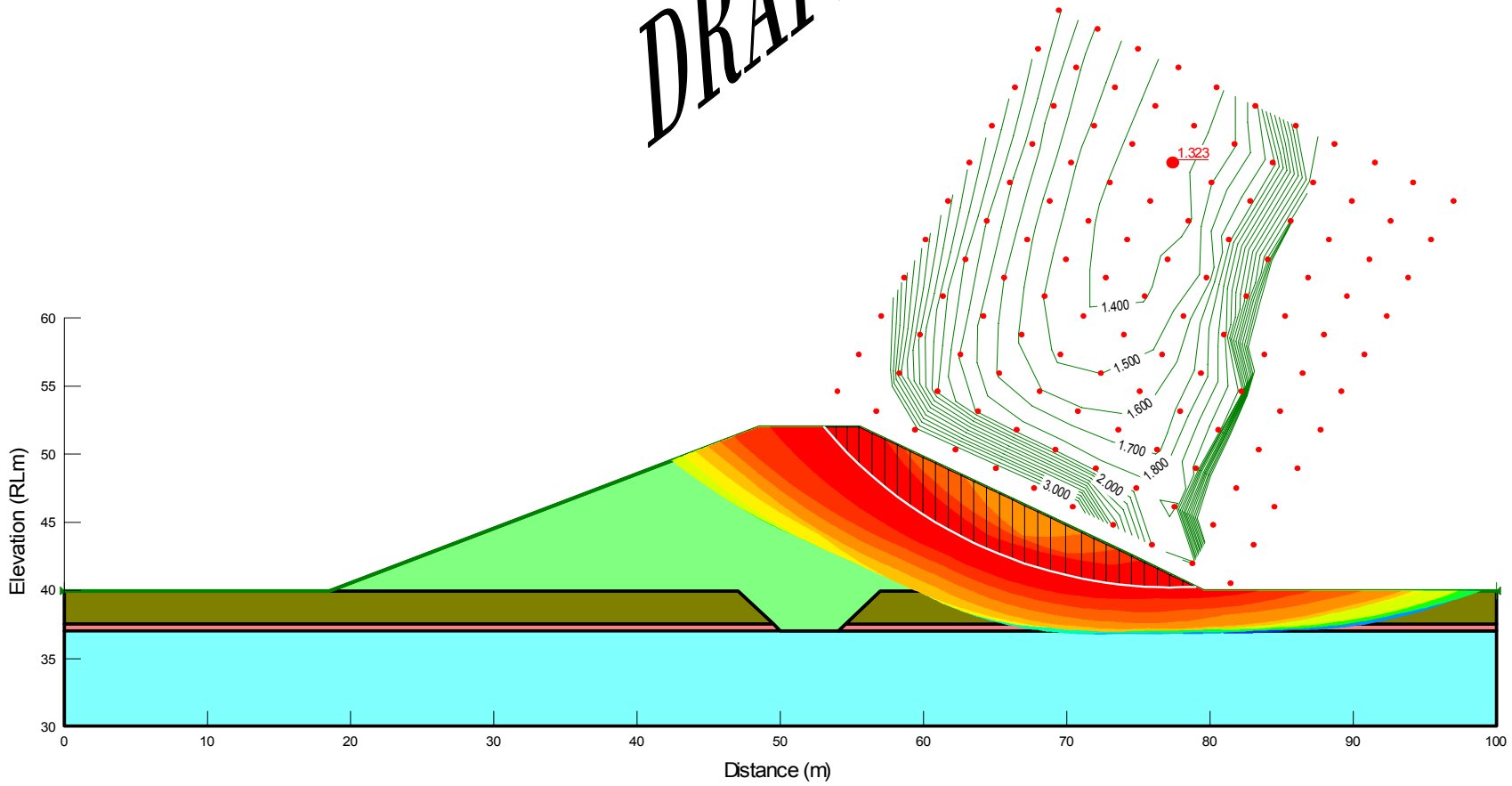
MODEL SUMMARY

ANALYSIS TYPE:	STABILITY
LOCATION:	ULTIMATE (FINAL STAGE) EMBANKMENT
ADOPTED CONDITIONS:	END OF CONSTRCUTION

DRAFT

Output from stability analysis comprises a Factor of Safety (FOS) map of potential slip surfaces for FOS values between 1.3 (red) and 3.4 (blue).

STABILITY ANALYSIS - UPSTREAM EMBANKMENT



REV	DESCRIPTION	DATE	APPROVED

Allan Watson Associates
Waste and Water Management Consultants
ACN 081 272 407

PREPARED BY: DWI	CHECKED BY: RJH	CLIENT: McARTHUR RIVER MINE PTY LTD	FIGURE NO: Plate 03
PROJECT NO: 0150-xst-002		PROJECT: McARTHUR RIVER MINE TAILINGS STORAGE FACILITY - CELL 2 CONSTRCUTION	
FILE/SOURCE: D:\2005 Jobs\0150-xstl\002\plates\Plates_XSEC.xls		TITLE: End of Construction Condition	REV: A / DATE: May-06