

Commission of Inquiry

PARADISE DAM

PARADISE DAM COMMISSION OF INQUIRY

CONCURRENT EVIDENCE

AGENDA AND PROTOCOL

I Preamble

- A. The Commissioners of the Paradise Dam Commission of Inquiry are directed by paragraph 3(a) of the Terms of Reference to inquire into, among other things, the root cause of structural and stability issues identified in engineering and technical studies between 30 January 2013 and 30 November 2019.
- B. One such structural and stability issue is the sliding stability of the Paradise Dam (**the Dam**) as assessed by GHD Pty Ltd in GHD.005.0001 (**the GHD Stability Assessment**) and subsequently which suggest that the Dam does not meet the Guidelines of Australian National Committee on Large Dams (ANCOLD) (2013). More specifically, this issue involves, by reference to the Commission's revised 'Key Issues' dated 4 March 2020, as follows:

3.1 In terms of sliding stability:

- a. adequacy of the bond between the roller-compacted concrete (**RCC**) lifts;
- b. whether the consequences of using the particular 'lean' RCC mix adopted for the Dam limited the practicability of verifying shear strength parameters by *in situ* testing and, for that reason, necessitated greater reliance on quality management systems that recorded whether and to what extent specified construction methodologies and practices were adhered to than for mixes with higher cementitious content;
- ...
- d. the adequacy of testing and checking (and the standards against which such testing was undertaken) reliably to verify that the lift joints were of a quality likely to result in a dam about which there could be reasonable satisfaction of stability and structural integrity;
- f. whether the Dam, as designed, 'essentially achieves stability with current friction values alone' (see, for example, SUN.010.002.0047) ...;
- g. what standards are properly to be applied in assessing the Dam's sliding stability.

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- C. One of the principal components of the GHD Stability Assessment is that the roller-compacted concrete (RCC) lifts within the Dam are below the ‘Acceptance Criteria’ in Table 6.1 of the ANCOLD Guidelines.
- D. The question of whether these Acceptance Criteria are met is materially informed by assessments of the shear strength of those lifts and by an understanding of the characteristics of RCC, and especially ‘lean mix’ RCC.
- E. The Commission intends to call experts with specialised knowledge of RCC, and, in particular, the assessment of its shear strength of RCC, and the circumstances in which it may be engineering good practice to undertake such assessments as well about its properties.
- F. Pursuant to s 17 of the *Commissions of Inquiry Act 1950 (Qld)*, the Commission considers that the means by which the issues set out below ought be inquired into includes by the giving of concurrent evidence by witnesses with specialised knowledge.
- G. The expert witnesses proposed to be included in the concurrent evidence sessions are:

Session 1: RCC shear strength testing - 10 March 2020

- a. Dr Ernest Schrader (in person)
- b. Mr Timothy P Dolen (in person)
- c. Mr Stephen Tatro (by video or phone link)
- d. Dr Paul C Rizzo (by video or phone link)
- e. Mr James Willey (in person)

Session 2: Dam construction with RCC – 11 March 2020

- a. Dr Ernest Schrader (in person)
 - b. Mr Timothy P Dolen (in person)
- H. The issues set out below are framed to facilitate the orderly and expeditious inquiry into the question of the nature and cogency of the assessment of the Dam’s sliding stability undertaken by GHD as well as the root cause of the structural and stability issue.
 - I. The concurrent evidence session is to be conducted by Counsel Assisting so that the various experts, guided by the Commission, work to arrive (where possible) at a common resolution of the issues stated below.

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II Issues to be addressed at concurrent evidence session

Session 1: RCC shear strength testing

1. Identify the shear strength test results and assessments undertaken on samples from Paradise Dam which are not the subject of criticism as between the witnesses.
2. On that basis, what is the difference between witnesses as to the stability of the Dam, and what, precisely, is that difference?
3. Of the test results and assessments which *are* the subject of criticism, to what extent do those criticisms have merit in connection with samples being subjected to multi-stage testing, having regard to:
 - a. ASTM D5607, Uplift Pressures, Shear Strengths, and Tensile Strengths for Stability Analysis of Concrete Gravity Dams (EPRI 1992) and relevant guidance from the US Bureau of Reclamation;
 - b. the respective residual friction angles which were returned in the various stages of the testing undertaken;
 - c. the extent of displacement that the lift joints would undergo if the Dam were to fail in sliding.
4. With respect to the testing and assessment undertaken on samples of RCC from the Dam:
 - a. to what extent, if any, does the testing and assessment undertaken in 2006 and as reported in Commission Exhibits 59 and 60 and in the Report of Mr Montalvo dated 14 September 2006 assist in informing the sliding stability of the Dam;
 - b. what, if any, and to what degree, are the results of shear strength testing of samples undertaken in 2015 and in 2019 a reliable basis for an assessment of the Dam's sliding stability;
 - c. have a sufficient number of tests been undertaken to give shear strength parameters with reasonable certainty (for the purposes of the applying the Acceptance Criteria) so as to derive 'well-defined' shear strength parameters;
 - d. what degree of reliability can be attached to GHD's assessment of sliding stability so far as it is informed by the tests referred to in 4(a) and (b) above?

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5. If a sufficient number of tests have not yet been undertaken to give shear strength parameters with reasonable certainty (within the meaning of the Acceptance Criteria) within the Dam:
 - a. what further such testing or assessment could practicably be undertaken to derive 'well-defined' shear strength parameters to inform an assessment of the Dam's sliding stability;
 - b. how ought that testing be undertaken and by whom?
6. Is it reasonably practicable, all things considered, or necessary, to undertake further shear strength tests and assessments?

Session 2: RCC qualities and assessment

1. The properties and comparative advantages and disadvantages of low (**LCRCC**), medium and high cementitious mix RCC in dam construction.
2. The consequences for dam construction when using LCRCC, including as to:
 - a. the dimensions of a dam and its lift joint surface areas;
 - b. whether reliance ought be placed, in terms of the dam's sliding stability, on friction alone;
 - c. the achievement of bonded lifts;
 - d. the means available to test for shear strength;
 - e. construction methods and methodologies;
 - f. the extent to which good engineering practice requires the use of bedding mix between lifts.
3. Whether the Lift Joint Quality Index:
 - a. is properly to be used to establish or calculate values for cohesion and friction;
 - b. if applied, is a substitute for shear strength testing, and if so, in what circumstances.

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III Protocol

1. Witnesses will be provided with:
 - a. a copy of this Agenda and Protocol;
 - b. a brief of relevant documents (including any report provided by a witness to the Commission to date).
2. Counsel Assisting will conduct the concurrent evidence session in accordance with this Agenda and Protocol and be responsible for ensuring the fairness of the session and that each witness has a reasonable opportunity to speak on each issue, and to express their agreement or disagreement (and reasons why) with other witnesses.
3. Questioning of the witnesses will be by Counsel Assisting, except as stated below. Counsel Assisting will ask questions of witnesses and direct the giving of evidence and the sequence of it in accordance with the agenda above.
4. Any Counsel for any party given leave to appear will, no later than 24 hours before the commencement of the concurrent evidence session, provide to Counsel Assisting, any points they wish to be raised to explore or expose issues stated in the agenda above.
5. Counsel Assisting will consider any points notified in accordance with 4. above, but will not be bound to pursue such points with witnesses.
6. To the extent a party has notified an issue in accordance with 4. above, and if Counsel Assisting does not pursue the issue with witnesses, or does so inadequately in the view of a party, that party may, through its Counsel, seek leave of the Chairperson to ask questions of witnesses.
7. The Chairperson may grant leave to a party to ask questions of witnesses whether or not the procedure in paragraphs 4-6 above has been followed.
8. Questioning of the witnesses shall be conducted sequentially in terms of the issues set out below, with any application for leave to be raised and decided at the conclusion of the questioning by Counsel Assisting upon each individual issue.
9. Nothing in this Protocol precludes or curtails the usual right of a Counsel for a party to object to a question put by Counsel Assisting in the course of evidence.
10. Counsel Assisting will decide the order in which witnesses speak on a particular issue but will, as much as reasonably possible, rotate or change the order in which witnesses speak on different issues.
11. Witnesses who are physically present or present by video link at the concurrent evidence session may indicate their wish to speak by raising their hand. Witnesses

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appearing by telephone who wish to speak during the concurrent evidence session can indicate their desire to speak by saying their last name.

12. The concurrent evidence session No 1 will be conducted, so far as is possible, to commence at 8.30am AEST on Tuesday, 10 March 2020 and to conclude no later than 2.30pm AEST.
13. The concurrent evidence session No 2 will be conducted, so far as is possible, to commence at 8.30am AEST on Wednesday, 11 March 2020 and to conclude no later than 2.30pm AEST.
14. The concurrent evidence session is exempt from the requirements of Practice Guideline No 2 paragraph 8(d) to (f).

Counsel Assisting

9 March 2020