



APPENDIX H5

## **ELCOM model development**



APPENDIX H5.1

## **Introduction and testimonial letters**

## **H5.1 INTRODUCTION AND TESTIMONIAL LETTERS**

### **H5.1.1 REFINEMENTS TO THE DRAFT EIS MODEL**

Hydrodynamic modelling was undertaken by BMT BWM Pty Ltd for the Draft EIS to support the impact assessment (refer Sections 16.2.4 and 16.4.3 and Appendix O11 of the Draft EIS). The Draft EIS modelling work deployed a three-tiered framework (near, mid and far field) capturing different spatial and temporal scales.

For the Supplementary EIS, BHP Billiton again commissioned BMT BWM Pty Ltd to upgrade the models used in Draft EIS with additional field-collected data and with improved modelling technologies. The result is an integrated three dimensional model that supersedes the separate mid field and far field models used in the previous work. In line with current best-practice, the upgraded model includes:

- improved validation of the model with an expanded suite of field data
- improved bathymetry at Point Lowly
- higher resolution meteorological and boundary forcing data
- a single, gulf-wide ELCOM model used to assess plume dispersion
- increased spatial resolution near Point Lowly (by a factor of up to 25).

Appendix H5.2 provides the details of the field data collection and configuration and validation of the new model.

The setup and calibration of the upgraded model has been independently peer-reviewed by two experts from internationally recognised marine engineering companies (HR Wallingford Ltd in the UK, and Cardno Lawson Treloar Pty Ltd in New South Wales, Australia), and by oceanographer Dr Rick Nunes-Vaz (an author of some of the definitive papers on Spencer Gulf oceanography). Letters of testimony from these reviewers are provided below.

Further details of the advances made since the Draft EIS model are provided in Appendix H5.3.

Additional analysis of current speeds near the seafloor, natural variability of salinity near Point Lowly (based on the field-collected data) are presented in Appendix H5.4.

Additional salinity and current data collected between March and September 2010 (with further data to be collected until at least March 2011) is presented in Appendix H5.5.

### **H5.1.2 COMPARISONS WITH MODELLING BY KAEMPF AND OTHERS (2009)**

A number of submissions have questioned the Draft EIS model outcomes, referring to modelling undertaken by Kaempf and others (2009). The modelling studies for the Draft and Supplementary EIS and by Kaempf and others (2009), and their interpretation, have therefore been compared in Appendix H5.3.

### **H5.1.3 REFERENCES**

Kaempf, J, Brokensha, C, & Bolton, T 2009, Hindcasts of the fate of desalination brine in large inverse estuaries: Spencer Gulf and Gulf St. Vincent, South Australia. *Desalination and Water Treatment*, 2, 325–333.

### **H5.1.4 TESTIMONIAL LETTERS**

See overleaf for letters.

Our Ref LJ2849/L2106 :sge

Contact P.D. Treloar



19 April 2010

Olympic Dam EIS Project  
c/- Arup Pty Ltd  
GPO Box 11052  
**ADELAIDE SA 5000**

Attention: Mr James Brook - Marine Biologist

Dear Sir,

**OLYMPIC DAM EIS PROJECT  
REVIEW OF REPORT: 'HYDRODYNAMIC AND WATER QUALITY MODELLING  
OF SPENCER GULF: MODEL VALIDATION REPORT'**

As part of this EIS project, Arup have requested that Cardno Lawson Treloar review the BMT WBM report 'Hydrodynamic and Water Quality Modelling of Spencer Gulf: Model Validation Report'. This work follows-on from previous WBM reports on this matter. It is noted that the modelling adopts the ELCOM model again, but is now a single 3D model that replaces the previous 'far field' and 'mid field' separate models with a single integrated model. Review comments were provided by Cardno Lawson Treloar on 19 November 2009.

WBM have considered Cardno Lawson Treloar's review comments and responded, with a revised version of the report provided to us on 17 March 2010.

Following our review of the March 2010 version of the BMT WBM revised report we advise that WBM have satisfied Cardno Lawson Treloar's comments/information requests.

I am satisfied that the model system has been validated well.

Yours faithfully,

*P.D. Treloar*  
**P.D. Treloar**  
*Manager - Coastal, Ocean & Estuarine Studies*  
**for Cardno Lawson Treloar**

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**HR Wallingford**

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Your ref 85450/RAW  
Our ref EBM 5763

23 April 2010

Dear David

**Olympic Dam Expansion Project  
Hydrodynamic Modelling – International Peer Review**

Thank you for asking us to review the recent additions to the hydrodynamic modelling reports.

We have now completed the review of the report 'Hydrodynamic and Water Quality Modelling of Spencer Gulf: Model Validation Report', document R.B17415.001.01\_Calibration\_Report.doc. Our review covers the October 2009 and March 2010 revisions together with a clarification letter from the authors of the report dated 15 March 2010.

We find that:

- The modelling has been comprehensive and adds to the understanding of the overall dynamics of the Spencer Gulf, as well as the immediate impact of the BHP project.
- The modellers have taken account of and responded to HR Wallingford's comments throughout.
- The models have been set up and verified in accordance with recognised good practice.
- We agree that the modelling system as described is suitable for moving forward to predictive 'production' runs.

Yours sincerely

B R Wild  
Project Manager  
HR Wallingford

**20 Gordon Terrace  
Rosslyn Park  
S.A. 5072  
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Mr David Wiltshire  
Social & Ecological Assessment Pty Ltd  
PO Box 3135, Unley  
South Australia 5063.

14<sup>th</sup> October 2010

Dear David

This letter updates my previous letter of 9<sup>th</sup> December 2008, and considers all additional efforts of the BMT WBM modelling team since that time, and since the release of the Draft EIS.

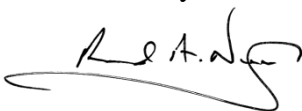
I had previously communicated my belief that modelling of the long-term, large-scale salt balance of Spencer Gulf was appropriate to the needs of the EIS, and the models (including the more recent single, multi-scale version that replaced the nested approach) can be expected to provide effective representation of gross annual and seasonal behaviours of the Gulf as a whole.

Following my comments in 2008, WBM conducted a number of instrument deployments in the region and added substantially to its field validation data. The locations and timings of instrument deployments were based on considerable consultation, and following their recovery there were several rounds of three-way discussion between ARUP, WBM and myself, on interpretation of the results. The modelling work, and its validation have clearly advanced greatly as a result of their additional effort during this time, and it is now apparent that both the magnitudes and variability of currents and other physical variables, particularly in the vicinity of Port Bonython, are appropriately reproduced in the model.

In generating its new report ("Spencer Gulf Modelling Assessments Final Report"), which I reviewed in September 2010, WBM has continued to demonstrate its commitment to addressing and resolving many additional questions, including my own. Its use of a computational fluid dynamics (CFD) model to strengthen understanding of initial diffuser dilutions is an example of its commitment to best practice. In this regard, I raised further questions about the validity of the brine injection methodology used to initialise CFD results into ELCOM. In response, WBM proceeded to test alternative injection methods which have shown that dilution statistics in the near vicinity of the diffusers do not contain significant artefacts of the injection method, generating confidence in the validity of its predictions.

I am happy to inform that, as far as my interactions and questions are concerned, BMT WBM has conducted itself entirely professionally and has shown commendable diligence in extending its modelling work to provide validation of its findings, thereby substantially resolving my concerns. Within the scope of my expertise I consider that the modelling results presented in the Supplementary EIS should be seen as fit-for-purpose with regard to assessing the oceanographic impacts of the proposed developments on Spencer Gulf.

Yours sincerely



Dr Richard Nunes-Vaz