



## Memorandum

To: Ministry for the Environment                      Date: 11 June 2014  
From: Richard Gorman                                      Our Ref: MFE13305  
Graham Rickard

Copy:

Subject: **Review of the UPDATED report "Astrolabe Reef Metocean Conditions: Wave, ocean current and wind statistics "**

### Executive summary

An updated report on meteorological and oceanographic conditions at Astrolabe Reef prepared by MetOcean Solutions Limited has been reviewed by NIWA. Differences, and comments on the differences with respect to the originally reviewed report are presented here.

On page iii, a new figure, Figure 2.17, is included.

On page v, two new tables are listed which *should* read Table 2.6 and Table 2.7.

On page 5, Figure 2.2 has been updated with the plot.

On page 14, there are some changes to the paragraphs on the "3d model baroclinic validation". The second paragraph in the section has been updated to,

Time series plots showing the measured and hindcast non-tidal surface velocities for Pukehina and Astrolabe Reef are given in Figures 2.11 and 2.12, respectively. Corresponding measures of fit are presented in Table 2.6. Measured velocity profile data are presented in Figures 2.13 and 2.14.

The reference to the new Table 2.6 is included.

The third paragraph has been updated to,

In general, the model effectively captures the main flow patterns, including the timing and magnitude of major reversals and the structure of flow through the water column at both the Pukehina and Astrolabe measurement sites. However higher frequency variability is less well captured and is reflected in the low correlation coefficients. Velocity profile comparisons between the measured and modelled data at the Astrolabe ADCP site suggest that the near-field effects of the reef are only partially captured by the model due to the resolution of the Bay of Plenty baroclinic model grid.

The extra sentence “However...” is consistent with comments in our review of the model solutions.

The following paragraph is a completely new update, providing some quantification of the likely errors associated with the dispersion modelling via Figure 2.17 and the integrated values in Table 2.7, viz:

In the context of dispersion modelling, which is carried out in a statistical monte-carlo approach, it is the distribution of integrated current displacements which are of primary interest. To quantify the errors associated with modelled advection, progressive vector displacements are calculated over the measured and modelled time series. A series of progressive vectors are calculated at daily intervals for both modelled and measured data, an example of which is shown in Figure 2.17. The mean difference in net displacement between model and measured progressive vectors with respect to time are presented in Table 2.7. These values provide a measure of likely errors in dispersion modelling due to advection by the baroclinic currents.

The analysis is consistent with comments in our original review regarding the goodness-of-fit between the in-situ measurements and the model (namely the biases in the flows, and the differences in variability). As noted in our original review, it is difficult to quantify how good one would expect a point measurement to be reproduced by a model of this nature. And indeed Figure 2.17 shows that more often than not the model captures the U component of the flow in magnitude and direction, but tends to get the sign of the V component incorrect, reflected in the good bias and correlation for U at RENA in Table 2.6, but poor correlation for V.

On page 15, Tables 2.6 and 2.7 have been inserted. In Table 2.6 the units for BIAS and RMSE would need to be speeds, presumably m/s are intended...?

On page 21, Figure 2.17 has been inserted (again at the rather general low resolution of many of the figures in the reports)

We find nothing in the updated report to change our original review that found that the methods used in preparing the climate statistics for wind, waves, currents and sea temperatures were in general suitable, and the results presented were appropriate for the

stated purpose, with no significant gaps identified. The validation results against available data were generally sufficient to give confidence in the validity of the results.

A handwritten signature in black ink, appearing to read 'G. Rickard', with a long horizontal flourish extending to the right.

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