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12 May 2008

David Luketina
Water Corporation
Dear David,

Review of Report PEN469-003-G

Overall the conclusions reached in the report about the rate of predicted spreading and dispersal of the expected saline plume are consistent and in agreement with what my experience, my intuition and a series of checks that I have carried out. I am totally confident that, provided the energy used to power the desalination plant is from a renewable source, the site and feasibility of the venture are sound. The report establishes feasibility, but has a number of technical omissions that need to be considered before a detailed design can be conducted. Broadly speaking here are the main points of concern:

1) Diffuser Design and Near Field Dilution

The authors adopted an overly simplified approach. This dilution calculation is based on a simple Froude Number scaling, omitting the ocean current and the background turbulence levels. Recently, Marti et al (2008) have shown how background turbulence increases the mixing and second, the freely available CORMIX model allows assessment of the influence ocean currents, albeit again in a simplified way only. A simple integration of the jet equations would allow correction for all these effects.

The analysis presented here is very routine. Neglect of ocean currents and background turbulence levels leads to an under prediction of the expected dilution and are therefore conservative assumptions. However, during periods of extended calm, as assumed in the report, the water column may be expected to stratify and this could have an appreciable impact on the degree of mixing in the near field, although the extent needs to be carefully checked, as would the number of days such calm conditions actually prevail.

I am comfortable that feasibility has been established for impact assessment, but I would certainly not recommend that detail design proceeds without including a more detailed technical analysis.

2) Extent of the Salinity Underflow

Judging from what was learned from the field measurements undertaken in the Cockburn Sound plant, I am comfortable that the horizontal extent of the underflow would be in the vicinity of about 500m. However, the use of an eddy diffusion

coefficient model to verify this, as was done in the report, establishes feasibility for the purposes of impact assessment, but if a detailed understanding of the far field dispersion is required, a more technically appropriate analysis should be conducted.

3) Horizontal Far Field Dispersion

The model results were achieved with a model that disperses the brine with an horizontal diffusion model using an eddy coefficient. By adjusting the dispersion coefficient, the authors matched the results from the dye tests carried out in the area. However, again, the physical processes that determine this net horizontal dispersion are most likely very different to what are represented by such a diffusion model. Hence, while I agree with overall magnitude of the predictions for the conditions tested, there is the possibility that during calm conditions, with winds weak enough to retain the stratification, yet strong enough to induce some shear, that a very different dispersion pattern result could result from the discussed seasonal variations. It is unlikely to show weaker dispersion, but this needs to be checked, for the detailed design phase of the project implementation

A handwritten signature in black ink, appearing to read 'Jörg Imberger', written in a cursive style.

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