

**BEFORE THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA**

UNDER	The Resource Management Act 1991 (RMA)
IN THE MATTER	Appeals under clause 14(1) of the First Schedule of the Act in relation to the Proposed Southland Water and Land Plan
BETWEEN	MERIDIAN ENERGY LIMITED Appellant
AND	SOUTHLAND REGIONAL COUNCIL Respondent

MEMORANDUM OF COUNSEL FOR MERIDIAN ENERGY LIMITED

23 August 2019

Judicial Officer: Judge Borthwick

Counsel acting:

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Appellants

AND SOUTHLAND REGIONAL COUNCIL

Respondent

MAY IT PLEASE THE COURT

- 1 By Minute dated 5 August 2019 the Court directed¹ the parties, having conferred with their science advisors, to file and serve memoranda identifying data, facts and information relevant to the development of indicators of the ecological health of Southland's waterbodies.
- 2 Meridian Energy Limited has conferred with its science advisor Dr James.
- 3 Attached to this memorandum is a list of material suggested by Dr James and which I submit is relevant to the development of the interim indicators of health.
- 4 I have discussed this list with Alliance Group Limited and advise that this list incorporates the material it would suggest.



Stephen Christensen

Counsel for Meridian Energy Limited

23 August 2019

¹ Minute of the Court dated 5 August 2019 at [15](b)

List of relevant data, facts and information relevant to the development of indicators of ecological health

Data and facts

- Key data is available from Land and Water Aotearoa (LAWA), Environment Southland (ES) and NIWA's National River Water Quality Monitoring Network (NRWQMN).
- Key data required as a minimum from the above sources (i.e. LAWA, ES and NRWQMN) include:
 - Temperature (daily max), dissolved oxygen (7 day mean summer minimum, 1 day summer min)
 - Water clarity
 - Nutrients (nitrate-N (median and 95thile), ammoniacal-N (annual median and max), total nitrogen (annual median), dissolved reactive phosphorus (annual median and 95thile), total phosphorus (annual median))
 - Sediment cover (rivers (max)), sedimentation (estuaries)
- Key biological indicators of ecosystem health that should be considered:
 - Trophic level index (lakes)
 - Phytoplankton biomass (lakes - annual median and max)
 - Cyanobacteria (lakes and lake fed rivers – 80thile for biovolume)
 - Periphyton biomass (rivers, exceedances of 8% and 17% of samples over at least 3 years – as per NPSFM) and cover.
 - Macrophyte - Lake Submerged Plant Indicators (SPI) and cover (lakes), macrophyte index (estuaries)
 - Macroinvertebrate MCI and QMCI
 - Microbes eg *E.coli* (% exceedances of different concentrations as per NPSFM)
 - Some indicator of fish diversity
- State and trends for water quality, periphyton and macroinvertebrates for ES SOE river and in some cases lake sites should be updated from the evidence presented in the Topic A hearing. In Topic A evidence in relation to some attribute states and compliance with standards was presented for 2010-2014 (MCI), 1997-2014 (trends in MCI), 2014-2017 (periphyton). Trends from LAWA data were also presented covering two different time periods (2008-2017 and 2012-2017). Some of these data and trend analyses need updating and additional parameters that are measured need

to be included in the data provided. A single file with all data for all sites in Southland would be helpful for all participants so that they can choose time periods and statistics to be used.

- LAWA data for medians over the last 5 years (as at Dec 2018 and Jan 2019) and 10-year trends was presented by Kate McArthur in evidence for the Topic A hearing. This information needs to be available to all scientists taking part (in Topic B) and if possible updated.
- LAWA state (2013-2017) and trends (2008-2017) for streams and rivers in Southland were collated by Jane Kitson in evidence to the Topic A hearing and could be updated with latest data to 2019.
- Hogsden K.; Kilroy, C. (2019). Waiau Catchment water quality, periphyton and invertebrates. NIWA report 2019090CH, prepared for Meridian Energy. The report includes:
 - A summary of basic statistics and in some cases trends for ES SOE and NIWA NRWQMN water quality and biological data from the Waiau Catchment. The data used was for the period 2008-2018 and 2014-2018. The data is for rivers, streams and lakes that are sampled by ES and NIWA. The report also compares the data with the NPSFM attributes and existing SWLP water quality standards.
 - A summary of results of measurements at additional sites of interest to Meridian Energy collected for the first 5 months of a 3-year programme.
- The reports on the state of Southland waters listed in the Joint Witness Statements (JWS) from the Topic A hearing for lakes and estuaries/lagoons, and for rivers.
- Water quality and biological data for Te Waewae Lagoon referred to in the statement of rebuttal evidence of Nicholas Ward to the Topic A hearing

Information and reports required

A number of additional publications and reports to those above and listed in the JWS or included in evidence from Topic A are available that will assist with developing indicators and interim thresholds, including:

- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment & Conservation Council, and Agriculture and Resource Management Councils of Australia & New Zealand.
- Biggs, B.J.F. (2000a) Eutrophication of streams and rivers: dissolved nutrient-chlorophyll relationships for benthic algae. *Journal of the North American Benthological Society* 19:17-31.
- Biggs, B.J.F. (2000b) New Zealand periphyton guideline: detecting, monitoring and managing enrichment of streams. NIWA Christchurch.
- Burton, A. et al. (1996). Effluent Toxicity Test Variability. In Whole Effluent Toxicity Testing: an evaluation of methods and prediction of receiving system impacts. Ed. Grothe, D.R.; Dickson, K.L.; Reed-Judkins, D.K. SETAC Press, Pensacola.
- Clapcott, J.; Goodwin, E.; Snelder, T.H. (2013). Predictive models of benthic macroinvertebrates metrics. Cawthron Institute, Nelson.
- Clapcott, J.; Young, R.; Sinner, J.; Wilcox, M.; Storey, R.; Quinn, J.; Daughney, C.; Canning, A. (2018). Freshwater biophysical ecosystem health framework. Prepared for Ministry for the Environment. Cawthron Report No. 3104.
- Matheson, F.; Quinn, J.; Unwin, M. (2016). Instream, plant and nutrient guidelines: Review and development of an extended decision-making framework Phase 3. NIWA, Hamilton.
- MELP, 2004: Ambient water quality guidelines for boron. British Columbia Environmental Protection Division, Ministry of Water, Land and Air Protection.
- NIWA, 2014. Derivation of indicative ammoniacal nitrogen guidelines for the National Objectives Framework. Memorandum from Chris Hickey to Vera Power, 20 January 2014.
- SETAC, 2004: Whole Effluent Toxicity Testing: Ion Imbalance, www.setac.org/resource/resmgr/publications_and_resources/tip-ion.pdf downloaded 9 October 2015
- USEPA, 2013. Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater. United States Environmental Protection Agency Office of Water 4304 EPA- EPA-822-R-13-001 April 2013.
- Background documents available for the development of the NPSFM attribute states as provided on the MFE website.