



## **Jim G. Cooke, D. Phil.**

*Independent Commissioner Environmental Science Specialist  
(Freshwater Management, Catchment and Land Management,  
Coastal Management)*

### **Education**

- D. Phil. – University of Oxford, UK, 1986
- M. Phil. – Environmental Science, Massey University, Palmerston North, New Zealand, 1977
- Dip Ag. Sc. (Div I) - Soil Science, Massey University, Palmerston North, New Zealand, 1974
- B.Sc. – Earth Sciences/Biological Science, Waikato University, 1973

Dr Cooke has worked on a wide range of environmental science issues, including nutrient inputs to lakes, nutrient runoff from pastoral agriculture, nitrogen processing in streams and sediments, nutrient cycling in wetlands receiving wastewater, environmental flow issues, diffuse source pollution from agriculture, forestry and urban stormwater, and assessments of the environmental effects of power schemes and water supplies. He has worked on projects in NZ, Australia, SE Asia, and the UK. Dr Cooke has applied his extensive environmental science experience in RMA Decision Making on significant consent applications in Canterbury, Tasman, Wellington, Manawatu and Waikato. He has recently gained Chairs endorsement through the Good Decisions Programme (through to December 2020).

### **Experience Highlights**

- 29 years experience at NIWA (and predecessor organisations) as research scientist, business development manager, Manager NIWA Australia, Leader National Centre Water Resources,
- 11 years consulting experience Beca Infrastructure, Diffuse Sources Ltd, Streamlined Environmental
- Founded Streamlined Environmental Ltd 2013
- 9 years Independent Commissioner experience (Good Decisions) (current certification with Chair's endorsement expires 31/12/2020)

Dr Cooke also combines his environmental science expertise knowledge and interest in the RMA and Regional Planning processes with commissions that advise clients on measures to achieve RMA objectives. This includes studies to support consent application, plan submissions, expert witness services, mediation where independent expert is important, s127 and s128 consent reviews, and ICMPs. Recent projects have included, determining the fate and transport of nitrogen from treated municipal wastewater applied to land and the implications to Whangateau Harbour (to support consent application to Auckland Council), and determining critical contaminant loads from an urbanizing catchment surrounding Lake Rotokauri and determining stormwater treatment requirements (ICMP development).

Specialty areas:

*Making Good Decisions (Independent Commissioner)*

*RMA Science Support*

*Freshwater Management (Water Quality/Aquatic Ecology)*

*Water storage take and irrigation*

*Municipal and Industrial Discharges*

*Catchment and Regional Water Management*

*Greenhouse Gas Management*

*Coastal water management*

### **Selected examples of experience**

***Decision maker (Independent Commissioner)***

***Independent Commissioner, Talley's Fish and other Food processing consents for discharge permits and associated land use consents (diffuser, operation of hazardous substances facility) for disposal of water containing contaminants and stormwater into the Coastal Marine Area at Motueka, as well as discharge of contaminants (principally odour) to air. Tasman District Council (2017).*** Environmental Science specialist on 3-person panel considering these consents. Principal aquatic issues considered: benthic ecology, nitrogen and macroalgal accumulation, the reasonable mixing zone and visual effects (colour, clarity, oil and grease) – and the application of s107. Other principal issues were fugitive odours and the effects of neighbours, and iwi views on waste disposal.

***Independent Commissioner, Ostern Quarry Consents, Waikato Regional Council 2017.*** Environmental science specialist (freshwater management, land management and air quality) on 3-person panel considering consents for expansion of a quarry near Te Awamutu. Principal water management issues to considered were effects on groundwater and surface water abstractions on bore water supplies for neighbouring properties, and potential flooding and siltation issues in drains, stream, and neighbouring land. Land management and air quality issues related to land stability, and dust management from disposal of overburden. The principal issues overall related to iwi access to, and preservation of, Pa sites that were adjacent to the quarry.

***Independent Commissioner, AFFCO Feilding Meat Works Resource Consents, Horizons Regional Council, 2016-17*** Freshwater Management Specialist on 3-person panel deciding on applications from AFFCO(NZ) Ltd for continued operation of its Feilding Meatworks. The consents sought included discharge permits to water (Oroua River), land (land disposal), groundwater (seepage for treatment ponds), and air (odour). The applicant's proposal included an expanded irrigation area and disposal to the Oroua River only when flow > 20<sup>th</sup> Flow Exceedance Percentile. The principal water management issues considered were: effects of discharge on Oroua river (nutrients, periphyton growths, public health, cumulative effects), and, effects of N leaching from treatment ponds on groundwater. Other issues that were considered important in the Decision were; (i) Maori values and perspectives with respect to the Oroua River, and, (ii) the value of the existing investment and the positive effects on the local economy. The consents were granted for a term of 19 years (common expiry date with other discharges to the Oroua) rather than the 35 years sought by the applicant. Dr Cooke wrote the sections on freshwater management in the Decision and reviewed and modified the conditions on behalf of the panel.

***Independent Commissioner, AFFCO Horotiu Meat Works Resource Consents, Waikato Regional Council, 2016.*** Freshwater management specialist on 3-person panel considering applications by AFFCO NZ (Ltd) for continued operation of its Horotiu Meat Works. The application included water permits, landuse consents, and discharge permits (14 applications), the most contentious of which was the discharge permit for treated wastewater to the Waikato River. The principal issues considered were: (i) how the Vision and Strategy for the Waikato River should be interpreted and applied, (ii) what constitutes the "existing environment", (iii) whether or not to apply the "permitted baseline", (iv) what the appropriate discharge limits are, specifically for, but not limited to, nitrogen and phosphorus, both in the immediate and longer terms, (v) whether

conditions limiting E. coli in the discharge are necessary and, if so, the form of those conditions, (vi) whether or not the rendering plant needs to be fully enclosed, (vii) whether or not ponds should be lined, and (viii) the term of the consents. Environmental science issues that had an important bearing on the decision were: *river water quality*, particularly the relative sensitivity to nitrogen and/or phosphorus, aquatic ecology (effects on migratory fish, benthic ecology, algal ecology), *public health microbiology* (whether E coli have any relevance as a pathogen indicator and/or whether a full quantitative microbial risk assessment (QMRA) should be carried out), *air quality* (odour), *soil science* (fate and transport of contaminants through soils from pond leakage). Drafted environmental science parts of the decision.

***Independent Commissioner, Motuapa Marina, Lake Taupo Consent Application. Waikato Regional Council 2015*** Environmental Science Specialist (Freshwater Management, ecology and biodiversity) on 3-person panel considering an application from Department of Internal Affairs to construct and operate a new marina at Motuapa, near Turangi. An existing marina, which has poor water quality operates under permitted activity status. The principal issues under dispute were: (i) whether the permitted activity status remained for the new marina, (ii) the effectiveness of a proposed recirculation system within the new marina and conditions required (or otherwise) to monitor its effectiveness, (iii) the impacts of a reclamation on a rare 'turf' species, *Isolepis fluitans*, and the effectiveness of biodiversity offsets proposed by the applicant. Environmental science expertise that was important in the decision-making process included *lake and embayment water quality*, *aquatic plant biodiversity*, and conservation *biodiversity offset* principles. Drafted environmental science parts of the decision.

***Independent Commissioner, Mangatangi Coal Mine Consents. Waikato Regional Council and Waikato District Council 2013***, Environmental Science Specialist (Water management/Ecology, Air Quality) expert on 3-person panel considering applications by Glencol Ltd (Fonterra Subsidiary) to develop and operate an open cast coal mine near Mangatangi. The principal technical issues considered were *air quality* (coal dust and the potential for health issues amongst local residents), *hydrology and water allocation* (environmental flows and abstractive volumes required for dust control), and *water quality* of discharges (principally boron, and suspended sediment). Drafted freshwater management parts of the decision.

***Independent Commissioner. River Recharge with Groundwater. Greater Wellington Regional Council 2013***. Freshwater Management Specialist on panel considering application for consents from Kapiti Coast District Council, to recharge the Waikanae River with groundwater pumped from the Waikanae deep aquifer to maintain minimum flow levels at times of heavy abstractive demand for the Kapiti Coast drinking water supply. Principal environmental science issues considered were; (i) *groundwater geohydrology* particularly potential for saline intrusion from excessive pumping, (ii) *river water quality* the potential for groundwater pumping to add higher levels of contaminants to the river than occur without pumping, (iii) *aquatic ecology* algal proliferation in the lower Waikanae River (especially cyanobacteria), migratory fish avoidance; and (iv) *wetland ecology* effects of fluctuating water levels on plant ecology in significant wetlands.

**Independent Commissioner. Application for irrigation consents RH Robertson. Environment Canterbury 2013.** Chair (Sole Commissioner) and Freshwater Water Management Specialist hearing applications (take and use, dam, discharge) for a deer farm in the Hakataramea Valley. Principal issues considered were *environmental flows, aquatic ecology effects, bore water supply, dam safety*. Wrote and issued decision)

**Independent Commissioner Otorohanga Wastewater Discharge consents. Waikato Regional Council 2012.** Freshwater Management Specialist of 3-person panel member for this application (renewal) to discharge treated wastewater to the Mangarongo Stream (tributary of the Waipa River). Principal issues considered were *water quality* particularly bacteria and *public health issues*, and nutrient. Drafted water management and public health aspects of the decision.

**Board of Inquiry into Upper Waitaki Dairy Effluent Discharge Consents 2010** Appointed by the Hon Nick Smith to a Board of Inquiry into effluent discharges arising from 'cubicle dairy' proposals in the Upper Waitaki. (Chaired by Judge Borthwick). The Board met for only one day as the applicants withdrew these landuse consent applications pending the results of the water take applications considered by Environment Canterbury (see below).

**Independent Commissioner - Upper Waitaki Resource Consents Hearing, Environment Canterbury 2009-2012.** Environmental Science (Freshwater management, ecology and biodiversity, land and catchment management) specialist of a 4-person panel considering the application for 61 consent applications to take and use (for consent applications in the Upper Waitaki Catchment and associated land use consents). The main issue was the cumulative effects of irrigation on the trophic status of Lake Benmore and the water quality and ecological effects (periphyton) on associated inflowing rivers and streams, and groundwater. Other significant effects considered include landscape (greening of Mackenzie Basin), farm management practices and on-farm monitoring, economic costs and benefits, terrestrial ecology, and Maori cultural values. Environmental science issues that were significant in the drafting of decisions included: *water quality* – particularly potential for increased nutrient discharges from large scale irrigated dairy farms on low nutrient status water in the Ahuriri Arm of Lake Benmore, *hydrodynamic modelling* of same, *soil science* – fate and transport of nutrients on skeletal soils, groundwater flow and directions, *aquatic ecology* – potential effects on algae and fisheries. Drafted environmental science chapters of Part A (catchment wide issues) and many of the individual decisions.

### **RMA Science/Policy Support**

**Water quality implications of lakes created for a proposed residential subdivision in north Hamilton. Hamilton City Council (2017)** Advisor to HCC on water quality aspects of a proposed landuse change (from industrial (sand quarrying) to residential. The developer (Perry Group) proposes a mixture of residential and recreational (using lakes created by quarrying

activities). HCC are concerned because of the potential liability to the city, should the lakes become eutrophic.

***Implication of Healthy Rivers 1 for Port Waikato, Waikato Regional Council (2016)*** Led a think piece on the implications of objectives, policies, and rules likely to be in place from Healthy Rivers 1 (Waikato river) on the Coastal Marine Area (CMA) at Port Waikato, and what learnings can be applied to future Healthy River Plans in terms of management of the CMA.

***Developing knowledge-based monitoring frameworks for estuaries, Waikato Regional Council (2016 current)*** Member of Streamlined Environmental team developing a flexible framework for identifying and prioritizing sites for data collection within the CMA, based on an understanding of key drivers in the catchment, which integrates a range of interrogation and decision support tools, and that accommodates variations in data quantity/quality.

***Section 127 review of discharge conditions at Pukete WWTP, Hamilton city council/MWH 2016*** Provided independent scientific assessment for HCC's application under s127 RMA for a review of consent conditions.

***Case Manager – s128 Review Waikare/Whangamarino, Department of Conservation 2014-15*** Assisted the Department in developing a case strategy to obtain better conditions to reduce the impact of sediment discharge from Lake Waikare to the Whangamarino River and (incidentally) to the Whangamarino wetland. Liaised with expert witnesses and reviewed evidence to ensure it was consistent with the strategy and the Barrister handling the case on behalf of the Department.

***Review of limits proposed in the Greater Wellington Regional Plan review process, Department of Conservation 2014*** Analysed the rules and policies from the Greater Wellington Regional Plan working document in relation to the water quality aspects. The assessment considered whether the proposed limits and objectives were sufficient to achieve protection of freshwater biodiversity values, in terms of rivers, lakes, wetlands and groundwater.

## Professional Organisations

- International Water Association (member since 2003). Board member specialist group on Diffuse Pollution 2006-2011). Co-chair and organizer 15<sup>th</sup> International Conference on Diffuse Pollution, Rotorua, NZ September 2011, Chair IWA NZ committee 2011-2013
  - Member NZ Freshwater Sciences Society since 1993
  - Member Water NZ (intermittently since 1993, but current member)
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***Regional Council Freshwater Management Methodologies – accounting systems and limit setting, Ministry for the Environment 2013.*** Water quality expert team member of NIWA-led project assessing Regional Council readiness for limit setting as defined by the National Policy Statement for Freshwater Management, and the water quality and quantity accounting requirements of the 2013 and beyond water reforms.

***Expert Witness Proposed Canterbury Land and Water Regional Plan, Fish and Game North Canterbury 2013.*** Presented water quality evidence to Commissioners deciding on the proposed plan, utilising modeling results from Dr Tim Cox on the potential effects of different irrigation scenarios on nitrogen concentrations and loads in the Ashburton, Selwyn-Waihora, and Rakaia Rivers.

***Independent Chairman of Te Kauwhata Consultation Group, Waikato District Council, 2011 -2012*** WDC applied to renew consents to discharge treated wastewater from Te Kauwhata into Lake Waikare, a hypertrophic lake beside Te Kauwhata. Dr Cooke chaired a series of meetings between the council and submitters, mediated between the parties and provided an independent

scientific view on the principal issue which was the continuing deterioration of the lake. At the final meeting of the TKCG in February 2012, the submitters agreed to withdraw their submissions and WDC agreed on a staged approach for ceasing discharge to the lake over a 12-year period. WDC also agreed to provide funds for mitigation annually until the land disposal scheme is commissioned.

***Scientific methods to support a Proposed National Environmental Standard (NES) on Environmental Flows and Levels, Ministry for the Environment (MfE), 2006 – 2007.*** Dr Cooke was project manager for this project, which involved providing a road map for assessing environmental flows and levels in rivers, lakes, wetlands, and groundwater to support the proposed NES Environmental for flows and water levels. The project also involved ensuring that there was a consensus view amongst experts drawn from NIWA, Geological & Nuclear Sciences, Cawthron Research Institute, Massey University, Aqualinc Research Ltd and Beca Ltd.

***Definitions of ‘reasonable mixing’ and ‘mixing zone’, Auckland Regional Council, 2007*** Dr Cooke led this project for Auckland Regional Council to derive a robust definition for inclusion in the Auckland Air, Land and Water Plan, taking both scientific and legal issues into account. Published as Auckland Council Technical Report 2010/045

### ***Consents/AEE support***

***Lakeside development around Lake Waikare (Te Kauwhata) Lakeside Developments Ltd 2017*** A member of the Streamlined Environmental team that conducted an Assessment of Ecological Effects (AEE) for a proposed new Membrane Bioreactor (MBR) plant combined with a subsurface flow wetland to treat the wastewater from the 194 ha (~1600 lot) development, as well as wastewater from Te Kauwhata township (currently served by an aquamat/pond system). The study demonstrated that the MBR/wetland from the combined Lakeside Development /TeKauwhata township would result in lower loads of nutrients, microbial contaminants, metals and emerging contaminants than the the existing TeKauwhata WWTP exports currently. This concept of “betterment” is consistent with the objectives of the Vision and Strategy of the Waikato River (Te Ture Whaimana o Te Awa o Waikato).

***Fate and transport of nitrogen in treated wastewater applied to land from Omaha WWTP. Watercare Services Ltd 2015.*** Dr Cooke led this major study, which will be used to support consent applications to Auckland Council. We conducted biochemical assays at irrigation sites (Omaha Golf Course and a eucalypt stand) situated on opposite sides of Whangateau Harbour. From these assays, chemical measurements at different depths of the soil profile, estimates of nitrogen uptake, and hydrogeological data (supplied by other consultants working on the project) we constructed a probabilistic model of nitrogen fate and transport. From this model we were able to show that most of the nitrogen applied in treated wastewater was lost by denitrification in unsaturated and saturated zones between the irrigation sites and the harbour and that effects on the harbour would be negligible, even with an increase in the volume of treated wastewater. Dr Cooke appeared at the consent hearing in 2017.

**ICMP for Rotokauri Urban Development Hamilton City Council 2014-15** Dr Cooke led a Streamlined Environmental team assessing the water quality impacts of the Rotokauri structure plan implementation to support an integrated catchment management plan for the scheme. The study focused on Lake Rotokauri (but also Lake Waiwhakareke and downstream waterbodies). and the potential for contaminants during and after construction of the urban area to cause a deterioration in water quality. Dr Cooke developed spreadsheet models of nitrogen and phosphorus leaving developing and mature areas. These were input into a SLAM (Simplified Lake Assessment Model) developed by Tim Cox to predict the resultant effects on phytoplankton levels within the lake. The validated model was then used to predict the level of on-site treatment of urban runoff required to result in no net decline in the quality of the lake. 70% removal of phosphorus was shown to be necessary to ensure no net decline. We also installed passive samplers in existing lake inlets and outlets and measured emerging contaminants and metals, which provided background data for proposed monitoring programmes during the urbanization process. A conference paper on the project was presented at the Water NZ stormwater conference 2017 ([Stormwater paper](#))

**Lake Waikare Water Quality Modelling: Investigation into flushing with Waikato River Water, Waikato District Council. 2014.** Project manager and team member of this study carried out to assist WDC to gain consent for continued discharge of Te Kauwhata's treated wastewater into Lake Waikare (submitter requested that a flushing study be done before withdrawing his opposition to the consent). We collected sediment samples from the bottom of Lake Waikare and samples from tributaries around the lake to supplement other data sources and to calibrate a SLAM (Simplified Lake Assessment Model). We obtained a satisfactory calibration and modelled the effects of various flushing flows on algal biomass within the lake. The results showed that flushing would potentially be effective at reducing peak algal biomass but that very large flushing flows would be required. In addition, flushing the lake could potentially move the problem to the Whangamarino wetland and Waikato River. A conference paper on the project was presented at the Water NZ annual conference 2015 ([Flushing paper](#))

**Verification of diffuser performance below the Masterton WWTP discharge to the Ruamahanga River, Masterton District Council 2014** Conducted a two dye dilution studies under summer and winter conditions to verify (consent condition) the size of the reasonable mixing zone calculated in the consent application. Rhodamine WT dye was pumped into the final mixing chamber at the WWTP and the concentration of dye measured in transects down the river. The study concluded that mixing would be improved if the if there were greater initial dilution by getting the effluent out into the main channel.

**Review of mercury and heat treatment options for Wairakei power Station, Contact Energy Ltd. 2013 & 2016** Reviewed best practical options available internationally to reduce mercury and heat discharges to fulfill a consent condition for CEL with respect to its discharges to the Waikato River.

**Determining the effects of abstraction on water quality and ecosystem health of the Mangaotea Stream, Trustpower Ltd Taranaki, 2012**  
Designed a monitoring and modeling programme to investigate concerns of

submitters who suggested that abstraction from the Mangaotea stream, Taranaki would lead to elevated temperatures and depleted levels of dissolved oxygen that could impact upon aquatic life, particularly fish. Used sonde data collected under mid-summer conditions to calibrate the WAIORA model and showed that the abstraction caused less than minor variances in water temperature and dissolved oxygen, and that the minimum flow consent condition imposed by Taranaki Regional Council would safeguard aquatic life.

***Freshwater ecology expert on Southern Dams Audit Team, Watercare Services 2000 – 2011*** Freshwater ecology/water quality expert on three-member panel to audit Watercare's compliance with respect to resource consent conditions for their water supply reservoirs in the Hunua ranges. Provide annual auditing of monitoring reports and ad hoc advice on matters relating to conditions and compliance.

***Assessing constructed wetland option for treating condensate from the Paihiatua Dairy Factory, Fonterra, 2008*** Dr Cooke undertook an assessment of the feasibility of using a constructed wetland for treating condensate before it discharged into a small stream leading to the Mangatainoka River. This was a precursor to applying for a consent to discharge the condensate He concluded that a constructed wetland would not be cost-effective but provided Fonterra with a range of disposal options to solve the undesirable growth problem in the tributary.

***Masterton Wastewater Treatment Plant, Assessment of Environmental Effects, Masterton District Council, 2006-2009*** Dr Cooke contributed to this Assessment of Environmental Effects, which demonstrated the improvements in public health and river water quality that would arise from land irrigation of treated effluent at times. Presented evidence on diffuse pollution sources water quality, mixing processes and reasonable mixing at the consent hearing in February 2009.