Michael Stewart, PhD

Independent Commissioner - Environmental Chemistry/Water Quality Specialist

Education

PhD in Chemistry – University of Canterbury, 1997

M.Sc. (Hons) in Chemistry – University of Canterbury, 1994

B.Sc. – University of Canterbury, 1992

Making Good Decisions: Certification as RMA Decision Maker, 2017; Recertification, 2020

Experience Highlights

- Director, Streamlined Environmental Ltd, since December 2015
- More than 22 years professional experience as a chemist, having worked in the pharmaceutical /biotech (UK), academia (Australia), CRI and consulting (New Zealand) environments.
- 8 years, Environmental Chemistry Scientist (Level 3), NIWA, Hamilton, New Zealand.
- 3 years, Senior Research Officer (Level B), Institute for Molecular Bioscience, The University of Queensland, Brisbane, Australia.
- 2 years, Research Fellow (Level A), Marine Natural Products Research Group, The University of Melbourne, Melbourne, Australia.
- 3 years, Senior Natural Products Chemist, Institute of Grassland & Environmental Research, Aberystwyth, UK.

Dr Stewart has broad professional experience in many aspects of chemistry, having worked in pharmaceutical/biotech (UK), academia (Australia), and government and consulting (New Zealand) environments.

He is a co-owner of a specialist science consultancy and has applied research and commercial experience in environmental chemistry and water quality including: assessments of ecological effects; reviews of emerging contaminants in the aquatic receiving environment from SoE and RMA perspectives; review, design and implementation of monitoring programmes on legacy and emerging organic contaminants, water quality trend analysis; human health and ecological risk assessments; and development of chemical ecology tools for biodiversity and biosecurity applications.

Mike attained certification as an RMA Independent Commissioner in May 2017 under the “Making Good Decisions” programme and re-certification in December 2020. Recent environmental science expertise in the RMA space includes scientific studies to support consent applications, variation of consent, plan changes, and expert witness services.

Specialty areas:

RMA Science Support

Risk Assessments (Human and Ecological) of Legacy and Emerging Aquatic Contaminants

Environmental Chemistry/Water Quality

Chemical Ecology

Selected recent examples of experience

Consent for discharge of wastewater from a proposed development at Kingseat, Auckland, *Karaka Lakeview Ltd*, 2019-current. Project manager responsible for scoping, undertaking and overseeing scientific investigations and preparing an ecological effects report that will contribute to an application for a new wastewater consent.

Water quality expert, *Refining NZ*, 2019-20. Recently completed a water quality assessment to support the application by Refining NZ for renewal of existing resource consents for the Marsden Point Refinery site at Ruakaka. The assessment included standard water quality parameters as well as a risk assessment on process chemicals used on site as part of the refining process, many of which were under the veil of commercial secrecy. Worked closely with the Refining NZ team, legal, planners and other consultants to provide a technical report for inclusion in the AEE as part of the application. There were no submitters against the application, and it is likely there will be no hearing required.

Assessment of adverse effects from oil and grease discharges from Meridian Power Stations to the receiving environment, *Meridian*, 2019-20. To assist with re-consenting, Meridian required an assessment of whether the discharge of hydrocarbons from 6 hydroelectric power stations in the Waitaki catchment are likely to cause adverse effects in the receiving environment. A high-level risk assessment was undertaken, acknowledging the lack of relevant guidelines for total petroleum hydrocarbons in surface water, and focusing on constituents of potential concern (PAHs). A monitoring plan for hydrocarbons, stormwater and wastewater contaminants was also prepared to provide environmental data to inform the risk assessment.

Ecological risk assessment of emerging organic contaminants in Poverty Bay from wastewater overflows and marine WWTP discharges, *Gisborne District Council*, 2019-current. To provide scientific support to GDC, two separate risk assessments were carried out on EOCs in Gisborne: Overflows of untreated wastewater to streams, and discharge of treated wastewater to the marine environment. A consent hearing on wastewater overflows is scheduled for the first quarter of 2021.

Kinleith Mill reconsenting, *Oji Fibre Solutions*, Tokoroa, 2019-current. Undertook fieldwork and prepared a chapter in the overall effects assessment report on contaminants from the mill discharge in sediment and eel tissue and potential for ecological and human health effects.

Reconsenting of wastewater discharge consents for Ravensdown Napier plants, *Ravensdown Fertiliser*, 2020-current. Primarily used as an environmental chemistry expert, undertaking an ecological risk assessment

of process chemicals to the receiving environment. Prepared chapter in a technical report that will contribute to an Assessment of Ecological Effects report.

Managing the risk to New Zealand of emerging organic contaminants research programme, *MBIE*, 2017-current. Key researcher in a multidisciplinary team of National and International researchers assessing environmental and economic risks to New Zealand from emerging organic contaminants. Brings expertise in aquatic passive samplers to design suitable devices that will sample a wide variety of disparate chemical entities from the environment.

Assessment of effects of nutrients and emerging contaminants from WWTP discharges for reconsenting applications, expert witness, *Watercare Services Ltd*, 2015-18. Fieldwork, laboratory analyses and desktop risk assessments on water quality (nutrient, metals and emerging organic contaminant) aspects of wastewater treatment plant discharges. Incorporation of information into assessment of ecological effects reports for inclusion in consent applications. This provided scientific support to advise Watercare in their applications for reconsenting wastewater treatment plants (Omaha, Snells/Warkworth, Waiuku/Clarks, Army Bay) in the Auckland region. Prepared summary of evidence for Snells/Warkworth (not required to attend hearing). Jim Cooke represented SEL as expert witness for Omaha. Appeared as the expert water quality witness for Watercare in the hearing for Waiuku/Clarks. Not required to present evidence for Army Bay. Long term (35 year) consents have been granted for all 4 WWTPs.

Assessment of ecological effects on the receiving environment associated with the discharge from the proposed membrane bioreactor wastewater treatment system for Lakeside development near Te Kauwhata, *Lakeside Developments 2017 Ltd*, 2017-18. Project managed and led the preparation of two assessment of effects reports from the discharge of wastewater to support the proposed development of Lakeside near Te Kauwhata. The first assessment incorporated wastewater from the development and Te Kauwhata WWTP, while the second assessed wastewater from the development only. Assessments incorporated aspects of fieldwork, laboratory analyses, wetland modelling and desktop risk assessments on water quality (nutrient, metals, emerging organic contaminants, QMRA). A landuse change was required to rezone from dairy farm to residential and Dr Stewart was a key witness in the hearing. The landuse change was subsequently granted.

Assessment of ecological effects from discharge of wastewater and stormwater on the receiving environment associated with the development of Whitford Manor Estate, *Le Coz Ltd*, 2017-19. Project management, fieldwork, laboratory analyses, modelling and desktop risk

assessments on water quality (nutrient, metals, emerging organic contaminants, QMRA) of proposed wastewater and stormwater treatment facilities to provide an effects report to support Le Coz Ltd to seek a variation of their consent to discharge contaminants via wastewater and stormwater to Turanga Creek. Consent variation was granted in 2019.

Literature review of the risks and adverse effects from waterborne contaminants in Otago, *Otago Regional Council*, 2016-17. Project manager and lead author on a review of existing information to identify contaminants present in discharges from stormwater, human wastewater, industrial and trade waste, and other potentially hazardous activities (such as agricultural and mining practices) in the Otago Region. Worked collaboratively with ORC staff to provide this first step in a risk assessment process to assess the potential impact these discharges may have on sensitive receiving environments in the Otago region and inform future changes to Regional Plans (Water, and Coast).

Risk assessment of antiscalant chemicals at Ohaaki, Wairakei and Tauhara Power Stations, *Contact Energy*, 2016-18. Contact Energy were interested in modifying resource consent conditions to allow for increased use of antiscalant formulations at their geothermal power stations. Developed site-specific risk assessments to provide robust scientific evidence to support Contact Energy to seek modifications to consent conditions.

An update on emerging organic contaminants of relevance for regional council marine sediment contaminant monitoring, *Auckland Council, Environment Canterbury and Greater Wellington Regional Council,* 2016. Lead author on report for NZ's three largest regional councils on an update of international and national research and legislative aspects of emerging organic contaminants. Includes recommendations on which emerging organic contaminants to include in future state of the environment marine sediment monitoring programmes.

Emerging organic contaminants (EOCs) in the Waikato region's coastal marine area, *Waikato Regional Council*, 2016. Most research on risks from EOCs in New Zealand has been related to the urban environment (for example, see report below). WRC required a review of EOCs relevant to a predominantly rural region. Carried out a review of likely EOC profile in Waikato (based on predominant industries) and recommendations for future monitoring programmes.

Review of Waikato Regional Council Estuarine Sediment Contaminant Monitoring Programme, *Waikato Regional Council*, 2016. WRC required a review of their estuarine sediment contaminant monitoring programme to ensure it is relevant and providing the information necessary for WRC to fulfil its obligations for environmental protection. Provided a critical assessment of technical issues which could impact on Council's ability to

satisfy relevant policy directives and recommendations on measures required to address these issues.

Development of passive sampling devices for analysis of bioavailable contaminants of current and emerging concern in the Waitemata Harbour, *Streamlined Environmental, NIWA, Auckland Council*, 2014-16. Lead on research programme to develop passive sampling devices as alternatives to shellfish and water spot sampling environmental contaminant monitoring. Results suggest that passive sampling is a complementary technique to other water sampling methodologies, but more research and validation is necessary before it will be accepted in the regulatory framework.

Broad scale water quality assessment to inform the Rotokauri Integrated Catchment Monitoring Plan*, Hamilton City Council, 2015.* As part of a study assessing the water quality impacts of the Rotokauri structure plan implementation to support an integrated catchment management plan for the scheme, led field and desktop analysis of heavy metals and current and emerging organic contaminants. This involved analysis of sediment and water contaminants and installation of passive samplers to measure "averaged" water concentrations of emerging contaminants and metals and comparison of results with relevant guidelines to assess potential ecological effects.

Rotorua District Council stormwater consent, *Rotorua District Council,* 2014. Project Manager assisting RDC in the preparation of a comprehensive stormwater consent for Rotorua city. Carried out a study to assess long-term water quality impacts arising from the cumulative effects of the quality and quantity of stormwater. The assessment strategy incorporated the characterisation of stream, drain and lake sediments, stream biological surveys, and heavy metal concentrations in freshwater mussels in Lake Rotorua.

Ecological risk assessment for applications of chlorine in the control of boat fouling by Mediterranean Fanworm, *Northland Regional Council*, 2014. Provided technical advice to NRC on correct methodology, risks and risk elimination for use of chlorine for control of invasive Mediterranean Fanworm on boats. This was in response to concerns raised by submissions to a resource consent application by NRC.

Te Waihora Mahinga kai biohealth study, *Te Waihora Management Board and Environment Canterbury*, 2013-2014. Lead investigator on a project to assess potential human health risks to local iwi from consumption of mahinga kai in the Te Waihora catchment. Developed risk assessment methods further from previous work. Communication of results with Te Waihora Management Board, Regional Council scientists, iwi and the larger community.

Novel method for quantifying lamprey migratory pheromone in NZ streams, *MBIE*, 2006-current. Development of methods based around Polar Organic Chemical Integrative Samplers (POCIS) and liquid chromatography-tandem mass spectrometry (LC/MS/MS) for detection of a lamprey-specific pheromone in New Zealand streams. The method is used to estimate resident lamprey larval populations in streams, which could be used as a baseline in restoration strategies to enhance this taonga species. To date, the methodology has been utilized in NZ by Auckland Council, Department of Conservation, Horizons Regional Council, Meridian, and MfE and Argentina in the Santa Cruz River catchment.

Prepared Evidence

Stewart, M (2018). Before an Independent Hearings Panel of Waikato District Council In the Matter of the Resource Management Act 1991 and In the Matter of an application by Lakeside Developments 2017 Limited for a private plan change. Te Kauwhata. 29 pp. 12 March 2018.

Stewart, M. (2017). Before an Independent Hearings Panel of The Auckland Council In the Matter of the Resource Management Act 1991 and in the matter of an application by Watercare Services Limited for regional resource consents required for the discharge of treated wastewater. Pukekohe. 26 pp. 12 October 2017.

Stewart, M. (2017). Statement of Michael Stewart for Watercare Services Limited in the matter of the Resource Management Act 1991 and in the matter of an application for resource consent for the Warkworth and Snells Wastewater Treatment Plant ("WWTP") under the Auckland Unitary Plan – Operative in Part. 4pp. 21 February 2017.

Selected Recent Reports

Stewart, M., 2020. Water quality assessment at Marsden Point oil refinery to inform resource consent renewal applications. Report # Refining NZ1801-FINAL for AEE, Streamlined Environmental, Hamilton, 130 pp. without appendices.

Stewart, M., 2020. Assessment of adverse effects from oil and grease discharges from Meridian Power Stations to the receiving environment. Report MER1901–Final 30-03-20, Streamlined Environmental, Hamilton, 38 pp.

Stewart, M., 2020. Water quality sampling design for Meridian Power Stations. Report MER1901–WQ Sampling Design – Final, Streamlined Environmental, Hamilton, 20 pp.

Stewart, M., 2020. Ecological risk assessment of emerging organic contaminants in Poverty Bay from the ocean outfall wastewater discharge. Report GDC1801–EOC-MAR-Final 24-11-20, Streamlined Environmental, Hamilton, 27 pp.

Stewart, M., 2020. Ecological Risk Assessment of Emerging Organic Contaminants in Poverty Bay from Wastewater Overflows. Report GDC1801–EOC-OVF-Final, Streamlined Environmental, Hamilton, 25 pp.

Stewart, M., Tremblay, L., 2020. Review of the risks from emerging organic contaminants in waterbodies to human and environmental health in Southland. Report ESO1901–Final 24-04-20, Streamlined Environmental, Hamilton, 63 pp.

Stewart, M., Northcott, G., 2020. Analysis of Emerging Organic Contaminants in the Bay of Plenty: Data Report. BPR1801– Final 11-09-20, Streamlined Environmental, Hamilton, 103 pp.

Phillips, N., De Luca, S., Leitch, K., Stewart, M. 2020. Current State and Assessment of Effects on the Aquatic Environment Associated with the Ravensdown Napier operations. RVD1901, Streamlined Environmental, Hamilton, 126 pp.

Phillips, N., Boubée, J., Cox, T., Dada, C., Eivers, R.S., Leitch, K., Stewart, M. 2020. Kinleith re-consenting AEE: Technical Reports, Streamlined Environmental, Hamilton, 292 pp.

Dada, C., Stewart, M., Phillips, N., 2019. Whitford Manor Estate AEE: follow-up assessment to address RFI from Auckland Council. Report LCL1801, Streamlined Environmental, Hamilton, 59 pp.

Baker, C., Stewart, M., 2019. The distribution and relative abundance of lamprey in the Santa Cruz River catchment. Prepared for Instituto de Diversidad y Evolución Austral., 18 pp.

Stewart, M., Phillips, N., 2018. Phycocyanin sensor calibration in the Waikato. Waikato Regional Council Technical Report 2018/29., 80 pp.

Dada, C., Stewart, M., 2018. Whitford Manor Estate AEE: follow-up assessment to address s92 questions from Auckland Council. Report LCL1702–Final-16-07-18, Streamlined Environmental, Hamilton, 152 pp.

James, M., Stewart, M., Dada, C., 2018. Assessment of Ecological Effects on the receiving environment from the discharge of treated wastewater from the Waiuku WWTP – short-term consent. Prepared for Watercare Services Ltd. 147 pp.

James, M., Stewart, M., Dada, C., Kelly, S., Jamieson, S., 2018. Assessment of Ecological Effects on the receiving environment from the discharge of treated wastewater from an Army Bay WWTP. Prepared for Watercare Services Ltd. 103 pp.

Stewart, M, Cooke, J, Dada, C., 2017. Assessment of ecological effects on the receiving environment associated with the discharge from the proposed membrane bioreactor wastewater treatment system. Option 1: Treatment of all wastewater generated by Te Kauwhata (current and future), Springhill Prison (current and future) and the Lakeside development. Report LDL1701–FINAL-V2, Streamlined Environmental, Hamilton, 170 pp.

Stewart, M, Dada, C, Cooke, J., 2017. Assessment of ecological effects on the receiving environment associated with the discharge from the proposed membrane bioreactor wastewater treatment system. Option 2: Treatment of all wastewater generated by the Lakeside development only. Report LDL1702–FINAL DRAFT, Streamlined Environmental, Hamilton, 167 pp.

Dada, C., Stewart, M., 2017 Assessment of ecological effects from discharge of wastewater and stormwater on the receiving environment associated with the development of Whitford Manor Estate. Report LCL1701–FINAL, Streamlined Environmental, Hamilton, 142 pp.

Stewart, M., Cooke, J., Phillips, N., Freeman, M. 2017. Literature review of the risks and adverse effects from discharges of stormwater, wastewater, industrial and trade waste, and other hazardous substances in Otago. Prepared for Otago Regional Council. 153 pp. See ORC website for report.

Stewart, M. and Phillips, N., 2017. Risk assessment of antiscalant chemicals at Ohaaki, Wairakei and Tauhara Power Stations. Prepared for Contact Energy, CON1601–FINAL, Streamlined Environmental, Hamilton, 49 pp.

Stewart, M., Cooke, J., 2016. Assessment of effects of the discharge of treated wastewater from Clarks Beach WWTP on water and sediment quality in the Southern part of the Manukau Harbour and Waiuku Channel. Prepared for Watercare Services Ltd. 64 p.

Stewart, M., Cooke, J., 2016. Nutrient yields for the Mahurangi catchment and Warkworth Wastewater Treatment Plant. Prepared for Watercare Services Ltd. 27 p.

Stewart, M., 2016. Assessment of contaminants of emerging concern in the context of the proposed South-West Manukau wastewater servicing consent project. Prepared for Watercare Services Ltd. 18 p.

Stewart, M., 2016. Assessment of emerging contaminants in the discharge from the Waiuku WWTP – Technical Report. Prepared for Watercare Services Ltd. 13 p.

Stewart, M., 2016. Assessment of emerging contaminants in the discharge from the Omaha WWTP – Technical Report. Prepared for Watercare Services Ltd. 12 p.

James, M., Stewart, M., Phillips, N., Cooke, J., Kelly, S., Goldwater, N., 2016. Assessment of Ecological Effects on the receiving environments from a discharge of treated wastewater from a combined Snells Beach and Warkworth WWTP. Prepared for Watercare Services Ltd. 148 p.

James, M., Stewart, M., Phillips, N., Cooke, J., 2016. Assessment of Ecological Effects on the receiving environment from the discharge of treated wastewater from the Omaha WWTP. Prepared for Watercare Services Ltd. 109 p.

James, M., Stewart, M., Phillips, N., Cooke, J., 2016. Assessment of Ecological Effects on the receiving environment from the discharge of treated wastewater from a combined Clarks Beach, Waiuku and Kingseat WWTP. Prepared for Watercare Services Ltd. 109 p.

Stewart, M., 2016. Emerging organic contaminants in the Waikato region's coastal marine area compared to other New Zealand regions. Report WRC1604–1, Streamlined Environmental, Hamilton. 36 pp.

Stewart, M., 2016. Review of Waikato Regional Council Estuarine Sediment Contaminant Monitoring Programme. Report WRC1601-1, Streamlined Environmental, Hamilton, 61 pp.

Stewart, M., Northcott, G., Gaw, S., Tremblay, L., 2016. An Update on Emerging Organic Contaminants of Concern for New Zealand with Guidance on Monitoring Approaches for Councils. *Auckland Council Technical Report 2016/006*. 120 p.

Stewart, M., 2015. Review of chemical tracers for differentiating wastewater treatment plant effluent from septic tank leachate and other faecal sources in the environment. Prepared for Watercare Services Ltd, 24 p.

Cooke, J., Cox, T., Stewart, M., Phillips, N.,2015. Rotokauri ICMP – Broad scale Water Quality Assessment. 95 p.

Peer-Reviewed Publications and Book Chapters

24 in peer-reviewed scientific journals (12 as first author), and 5 book chapters. Available on request.