Before the Environment Canterbury Hearings Panel

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in the matter of	The Resource Management Act 1991
and	
in the matter of	a submission on a resource consent application by the Christchurch City Council – Comprehensive Stormwater Network Discharge CRC190445
between	New Zealand Steel Ltd
and	Christchurch City Council

October 2018

Statement of primary evidence of **Marcus Cameron** on behalf of **New Zealand Steel Limited**

Dated: 24 October 2018

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STATEMENT OF PRIMARY EVIDENCE OF MARCUS JOHN CAMERON ON BEHALF OF NEW ZEALAND STEEL LIMITED

24 October 2018

INTRODUCTION

1 My full name is Marcus John Cameron. I am a Senior Aquatic Scientist at Tonkin and Taylor. I hold a Master of Science (First Class Hons) degree in Marine Science from the University of Auckland graduating in 2005. I am a practicing member of the New Zealand Marine Sciences Society and the Society for Environmental Toxicology and Chemistry.

2 I have practised as a scientist for 13 years. During that time I have appeared as an expert witness at a number of hearings including: the 2017 Environmental Protection Authority Board of Inquiry hearing for the East West Link highway application; Environment Court hearings for the 2015 Matiatia Bay and 2017 Kennedy Point marina applications on Waiheke Island and several Auckland Unitary Plan hearings including Stormwater Provisions, Water Quality, the Rural Urban Boundary and Clevedon Waterways.

3 I have read the evidence of some witnesses[1] that is relevant to this NZ Steel's submission on the Christchurch City Council – Comprehensive Stormwater Network Discharge, and have read relevant sections of the officers' report.

4 I have been engaged by New Zealand Steel Limited (NZ Steel) to provide technical advice over the last year on hearings for the Auckland Council Stormwater Network Discharge Consent and Northland Regional Councils' Regional Plan. As such I have an understanding of the nature of NZ Steel's operations both within

[1]. S.42A Report, S.42A report Appendices 1, 5, 6, 7. Evidence of Brian Norton, Dr Belinda Margetts, Clint Cantrell, Paul Kennedy and Eric Van Nieuwkerk.

and beyond the Auckland Region. A background and overview to the NZ Steel business is provided in the further submission.

5 I have read the Environment Court's Code of Conduct for Expert Witnesses, including amendments. I agree to comply with this Code. I confirm that the issues addressed in this statement of evidence are within my area of expertise and I have not omitted to consider any material facts known to me that might alter or detract from my opinions expressed in this statement.

SCOPE OF EVIDENCE

6 My evidence covers the following:

6.1 Concerns regarding the accuracy of the Contaminant Load Model (CLM) used to predict current and future contaminant loads and the associated reliance on the ability of the model to measure progress against specific load reduction targets;

6.2 the lack of evidence of a clear link between the relative proportion of different sources of contaminants and the proposed management response;

6.3 the focus on a blanket approach to a limited number of drivers of ecosystem health without equivalent attention to other drivers and catchment specific characteristics; and

6.4 the focus on certain sources of zinc over other sources.

DETAIL OF CONCERNS

7 **Concerns with the accuracy and application of the contaminant load model:**

7.1 It appears that outputs from the model have largely been taken on face value without due regard to the accuracy and precision of the model and its outputs.

7.2 This brings into question the ability of the model to predict current and future contaminant loads and the likely impact of stormwater treatment options and interventions.

7.3 As such it also brings into question the use of the model to measure progress against the very specific contaminant load reduction targets proposed to be included in Stormwater Management Plans (SMPs);

7.4 Furthermore, the proposed load reduction targets do not appear to be linked to the Receiving Environment Objectives and Attribute Target Values (ATVs) that will be used to measure the overall effectiveness of stormwater treatment options and interventions into the future.

8 **The lack of a clear link between sources of contaminants and the proposed management response:**

8.1 There does not appear to be a clear link between the relative proportions of different sources of contaminants and the proposed management response, which could include restrictions on the use of certain building products.

8.2 The evidence presented by Dr Brett Ogilvie for the Proposed Auckland Unitary Plan (PAUP) (Attached as Appendix A) outlined that there is already a generally decreasing load of zinc to urban waterways as a result of replacement of older painted and unpainted galvanised steel roofs with new generation roofing materials (which includee painted and unpainted zinc-aluminium coated products) and that this change is being driven by market forces rather than any restriction on building materials.

8.3 Dr Ogilvie's analysis also indicated that any restrictions on the use of certain roofing materials would result in only a marginal zinc load reduction over continuing to allow the market to drive change.

8.4 Given that implementation of restrictions on certain building products is likely to be technically difficult and open to misinterpretation (as outlined in Andrea Rickard's evidence for NZ Steel) any restrictions on certain types of building materials appears to be problematic, as well as potentially unnecessary.

9 **The blanket approach to a limited number of drivers of ecosystem health:**

9.1 There appears to be a focus on a blanket approach to a limited number of drivers of ecosystem health (primarily copper, zinc and total suspended solids) without addressing other drivers (such as habitat quality and temperature) and catchment specific characteristics and risks.

9.2 As stated in paragraph 11 of the evidence of Paul Kennedy "The use of these targets provides a goal, but it must be recognised that the ecological state of waterways is driven by a wide range of physical and environmental factors some of which are not addressed using tools such as the C-CLM".

9.3 As such the seemingly narrow focus on copper, zinc and total suspended solids may render some management approaches ineffective and not provide the outcomes sought by the community.

10 **Other sources of zinc**

10.1 There are many sources of zinc in the environment, and many existing sources of zinc that are not proposed for control or management. These sources include existing buildings, external structures such as stairwells and fences, and direct sources of zinc to receiving environments such as the dissolution of sacrificial zinc anodes on boats.

10.2 As also outlined in the evidence of Dr Ogilvie (attached as Appendix A) other sources of zinc can be significant, and the focus on managing certain sources over others can therefore be disproportionate.

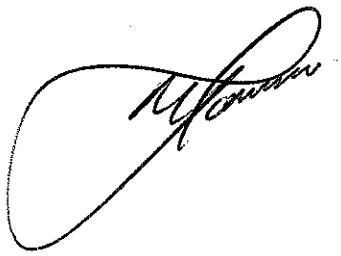
10.3 This concern is further reinforced by Dr Ogilvie's analysis that any restrictions on the use of certain roofing materials would result in only a marginal zinc load reduction over market driven change, while at the same time other unmanaged sources may remain constant or potentially increase over time.

IMPLICATIONS FOR NZ STEEL AND RELIEF SOUGHT

10.4 The planning implications for NZ Steel of the technical concerns raised here are covered in the evidence of Andrea Rickard for NZ Steel. I concur with Ms Rickard's concerns and the relief sought in her evidence.

10.5 As outlined in the evidence of Ms Rickard, the attached evidence of Dr Ogilvie and in my evidence, implementation of restrictions on certain building products is likely to be technically difficult, open to misinterpretation and of marginal benefit in zinc load reduction to that already driven by market forces.

10.6 Therefore, NZ Steel requests assurance that they will be involved in the development of any provisions that could place restrictions on their building products, clarity that any restriction on building products would be limited to unpainted galvanised steel, and collaboration in providing a technical definition for unpainted galvanised steel that avoids any confusion.



Marcus Cameron
24 October 2018

Attachment A – The evidence of Dr Brett Ogilvie in relation to New Zealand Steel's submissions on Topic 049 – Discharges, Stormwater and Wastewater for the Proposed Auckland Unitary Plan.

Before the Auckland Unitary Plan Independent Hearings Panel

in the matter of	The Resource Management Act 1991 and the Local Government (Auckland Transitional Provisions) Act 2010
and	
in the matter of	Proposed Auckland Unitary Plan Topic 049 – Discharges, Stormwater and Wastewater

PRIMARY STATEMENT OF EVIDENCE OF DR BRETT OGILVIE ON BEHALF OF NEW ZEALAND STEEL LIMITED 868, FS 2368

Statement of primary evidence of **Dr Brett Ogilvie** for **New Zealand Steel Limited**

Dated: 21 July 2015

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STATEMENT OF EVIDENCE OF DR BRETT OGILVIE

21 JULY 2015

SUMMARY

1 My name is Brett Ogilvie and I am presenting evidence on behalf of New Zealand Steel Ltd (NZ Steel). I am a Senior Environmental Scientist and Director of Tonkin & Taylor and have 25 years' experience in environmental consulting and research.

2 This evidence has been prepared in relation to New Zealand Steel's submissions on Topic 049 – Discharges, Stormwater and Wastewater.

3 My evidence is summarised as follows:

3.1 Auckland Council's evidence does not demonstrate a significant regional problem with zinc in rivers and streams, nor any resulting ecological problem, which warrants stringent region-wide rules for zinc-coated building products as proposed in the PAUP. There is also no evidence to indicate an increasing trend for zinc in Auckland's rivers and streams.

3.2 Although there are slightly elevated zinc concentrations in marine sediments in a small number of estuaries on the east coast of Auckland's isthmus, there is no evidence to directly link these to ecological degradation.

3.3 Council's own monitoring of Auckland's harbours and estuaries other than this small number of east coast estuaries shows that there is no evidence of a zinc problem in the wider marine environment, or of any resulting ecological degradation as a result of zinc. Several Auckland Council studies over the last 10 years have concluded that there will be little benefit from source control of zinc.

3.4 Notwithstanding the above, contaminant load modelling shows that the marginal benefit in terms of change in zinc loading to waterways, which will arise from the 'zinc rules' in the PAUP, is insignificant in absolute terms, and in the context of the change that has been occurring, and which will continue to occur, in the use of zinc-coated products. It is also insignificant in the context of other sources of zinc which will not be regulated by the PAUP to the extent proposed for building products.

3.5 It is likely that Council's focus on roads and buildings as the sources of zinc means that it has missed a potentially significant source of zinc to marine environments: sacrificial zinc anodes on ships, boats and marine structures. Zinc loads from these sources are potentially much larger than any incremental benefit arising from the proposed 'zinc rules'.

3.6 Council's own evidence, as well as technical reports prepared by Council prior to notification of the PAUP, concedes that zinc is used as an 'indicator' of urban pollution, and that it is difficult (if possible at all) to attribute adverse ecological effects to zinc alone. Council's s32 analysis has not assessed the benefits of the zinc rules in terms of reducing zinc alone, but given that the rules in question will target only one contaminant, the benefit-cost ratio is unlikely to justify the proposed rules.

3.7 Given the above, and in light of the trends in environmental zinc since zinc-aluminium coated products were introduced in the 1990s (as outlined in Dr Shedden's evidence) there is no technical justification for a rule set which proscribes the use of zinc-aluminium coated building materials, as is currently proposed in the PAUP. Consequently, I support the relief sought by New Zealand Steel Ltd.

INTRODUCTION

4 My full name is Brett Gilbert Ogilvie.

5 I am a Director and Senior Environmental Scientist with Tonkin & Taylor Limited, Environmental and Engineering Consultants, Auckland.

6 I am qualified to doctoral level in Environmental Biology and also have a degree in Environmental Economics, and have 25 years' experience in environmental research and consulting.

7 Further details of my qualifications and experience are set out in Appendix A to this brief of evidence.

8 I have read the Environment Court's Code of Conduct for Expert Witnesses, including amendments. I agree to comply with this Code. I confirm that the issues addressed in this statement of evidence are within my area of expertise and I have not omitted to consider any material facts known to me that might alter or detract from my opinions expressed in this statement.

SCOPE OF EVIDENCE

9 My evidence covers the following:

9.1 Zinc and its effects in Auckland's freshwater environments;

9.2 Zinc and its effects in Auckland's marine environments;

9.3 A potential 'missing source' of zinc to the marine environment;

9.4 The effect of the proposed 'zinc rules' on zinc loading to aquatic and marine environments;

9.5 The implications of zinc being used an indicator of contamination from urban stormwater;

9.6 The lack of any significant environmental benefit that will arise from the proposed 'zinc rules', and

9.7 The lack of any international precedent for rules of this nature.

10 In preparing this evidence, I have considered the evidence of Council officers and experts Mr Ian Mayhew, Dr Martin Neale, Dr Laura Buckthought, Mr Jonathan Moores, Mr Nicholas Vigar and Mr Marcus Cameron.

11 The technical basis for Council's position in relation to water quality, sediment quality and ecological health is set out in the evidence of Laura Buckthought, Marcus Cameron and Martin Neale. Mr Moores' evidence presents the results of modelling of yields of three contaminants under various future development scenarios. The evidence of all of these experts is relied upon by Mr Ian Mayhew in his planning evidence.

12 I have been supplied with a copy of Mr Moores' Contaminant Load Model, and have been involved in meetings between New Zealand Steel's experts and Mr Mayhew, Mr Moore, Mr Vigar and Ms Claudia Hellberg (all on behalf of Auckland Council), which has allowed me to better understand the basis for Council's position on stormwater quality management.

13 I was also involved in the Topic 049 mediation sessions on 2 and 5 June 2015.

ZINC IN AUCKLAND STREAM ENVIRONMENTS

14 Zinc can enter the environment from both natural processes (e.g. weathering and erosion) and anthropogenic (e.g. zinc production, waste incineration, urban runoff) processes. It is an essential trace element required by most organisms for their growth and development, and is found in most natural waters at low concentrations (ANZECC, 2000). Therefore, unlike most

contaminants, there is an optimal environmental zinc concentration, which is greater than zero.

15 While no studies have been identified that specifically review optimal zinc concentrations for Auckland waterways, it has been reported that optimal zinc concentrations range between 1.0-50.0 µg/L for European alluvial lowland river habitat (van Assche, van Tilborg and Waeterschoot, 1996) and that a zinc benchmark (though it is not defined if this is an upper threshold) of 120.0 µg/L is considered protective to marine and freshwater life (State of Oregon Department of Environmental Quality, 2014).

16 With respect to zinc in Auckland's river and stream systems, Dr Buckthought's evidence presents summary zinc monitoring data for 15 sites in Council's river monitoring network, and compares these with the ANZECC 80% Level of Protection (LOP) trigger values for freshwater ecosystems (31 µg/L). The summary results show that while zinc readings are occasionally several times higher than the ANZECC trigger value, the majority of readings are below the ANZECC trigger value, and only three (heavily urbanised) sites had a median zinc concentration which is above the ANZECC trigger value, with one of these (Oteha Stream, Albany) having a median zinc concentration only slightly above the trigger value.[1]

17 The ANZECC trigger values have been derived with the intention of providing some confidence that there will be no significant impact on the environmental values if they are achieved. Exceedance of the guidelines indicates that there is potential for an impact to occur (or to have occurred), but does not provide any certainty that an impact will occur (or has occurred). Trigger values are concentrations that, if exceeded, would indicate a *potential* environmental problem, and so 'trigger' a management response,

[1] Dr Shedden's evidence further examines trends in zinc concentration in Auckland's rivers and streams

e.g. further investigation and subsequent refinement of the guidelines according to local conditions (ANZECC, 2000).

18 Put simply, the ANZECC trigger values are not intended to be used as 'bottom line' limits, and exceedances of the trigger value do not in and of themselves constitute an environmental problem. For the two monitored sites where zinc concentrations usually exceed the trigger value (Omaru Creek in Glendowie and Otaki Creek in Papatoetoe: both near the downstream end of tributaries of the Tamaki River), appropriate further investigation might include biological investigations to assess whether exceedance of the zinc trigger value has resulted in an ecological problem which might require some site-specific intervention. To my knowledge, this has not been carried out, and the evidence from Council's experts does not provide such an assessment. Dr Neale's evidence does not mention these sites, and it appears (from Figure 3 of Dr Neale's evidence) that Otaki Creek, despite Council's apparent concern about zinc problems, is not part of the river ecology monitoring programme.

19 If such an investigation had been carried out, and zinc was implicated as a primary or even a secondary cause of ecological degradation, I would in principle be supportive of site-specific intervention within these catchments, which might include limiting zinc runoff to the extent contemplated by Council. This would be consistent with the National Policy Statement: Freshwater Management 2014, which requires council's to set water quality objectives and limits on the basis of 'water management units'.

20 No evidence is presented by Council to suggest an increasing trend in zinc in Auckland's rivers and streams, and Dr Shedden's evidence confirms an overall decreasing trend.

21 However, on the basis of the above, I can see no justification for region-wide rules to limit the use of zinc coated building materials to this extent.

ZINC IN AUCKLAND MARINE ENVIRONMENTS

22 Mr Cameron's evidence provides a summary of marine sediment monitoring data from Council's State of the Environment monitoring programme. The parameters monitored comprise copper, lead, zinc and high molecular weight polycyclic aromatic hydrocarbons. Mr Cameron provides 'heat maps' showing contaminant monitoring status based on the combined 2013 Environmental Response Criteria (ERC) grades for all four parameters combined. The ERC scheme is described in ARC (2004) and assigns green, amber or red status for low to high sediment contamination levels, respectively. The amber band is narrow (124-150 mg/kg) and thus it is possible for a site to move between the green and red categories, with only a 20% change in zinc concentration. Thus the scheme is effectively 'binary' in nature.

23 It should be noted that the ERC scheme is deliberately conservative, and for zinc uses a red threshold which is 33% lower than the ANZECC interim sediment quality-low (ISQG-low) guideline. This is so that the ERCs can provide early warning signals which allow action to be taken before substantial impacts occur. This approach was taken, in recognition that urban intensification is occurring at a rapid rate, monitoring was showing that contaminants were accumulating quickly, and that preventing or slowing degradation is likely to be easier than reversing it (ARC, 2004).

24 For the purpose of NZ Steel's submission, it is more useful to examine the data in relation to ERCs for zinc alone, rather than the other contaminants which do not pose an issue for NZ Steel. Figure 1 below (from Mills *et al*., 2012, for which I note Mr Cameron was a co-author), shows the zinc ERC status for sites monitored under three of Council's monitoring programmes (<500 µm fraction). Figure 2 shows the equivalent data for the <63 µm fraction.

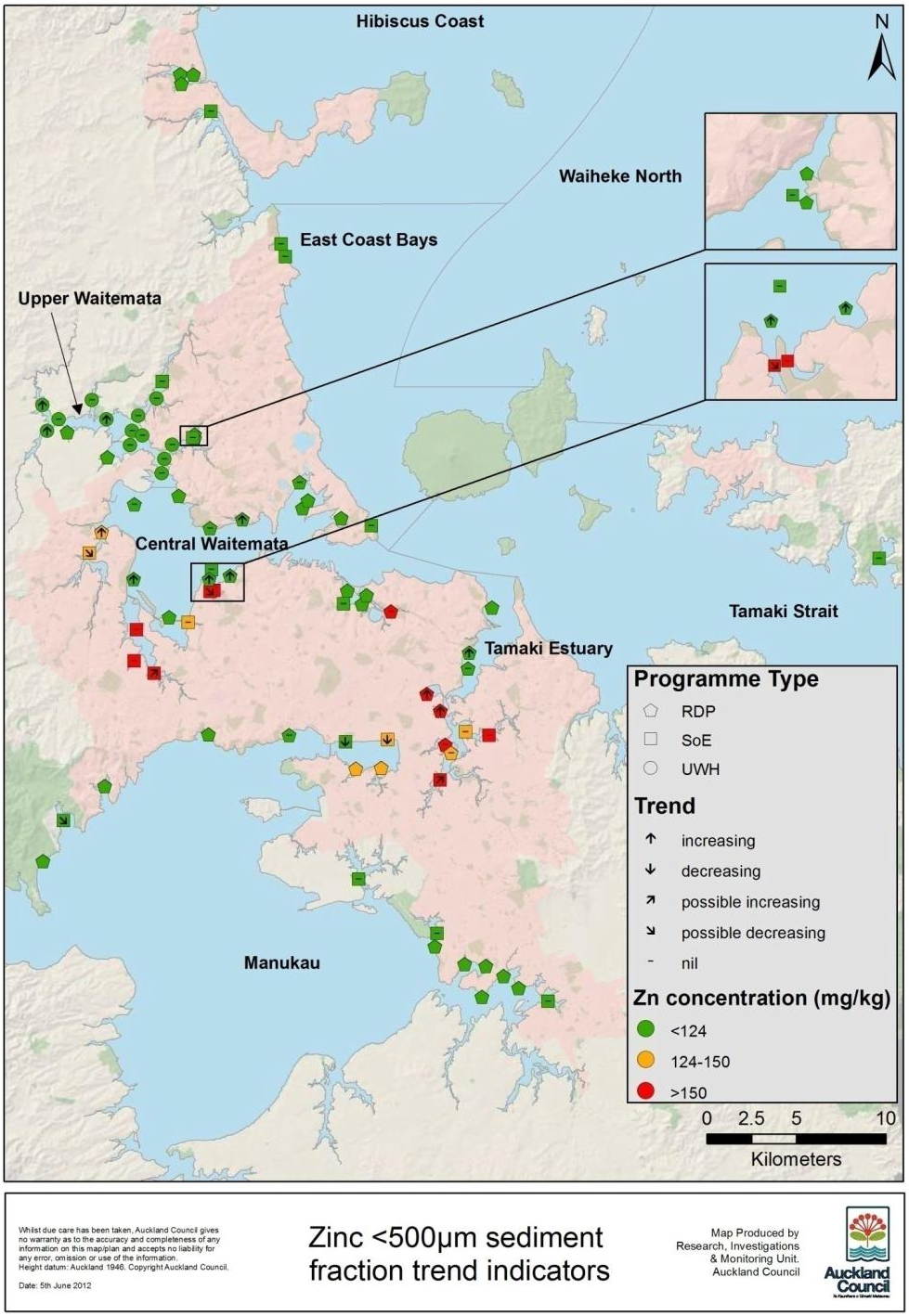

*Figure 1. Sediment Zinc ERCs (red, amber, green) and trend indicators: <500 µm fraction (*from Mills et al. (2012).

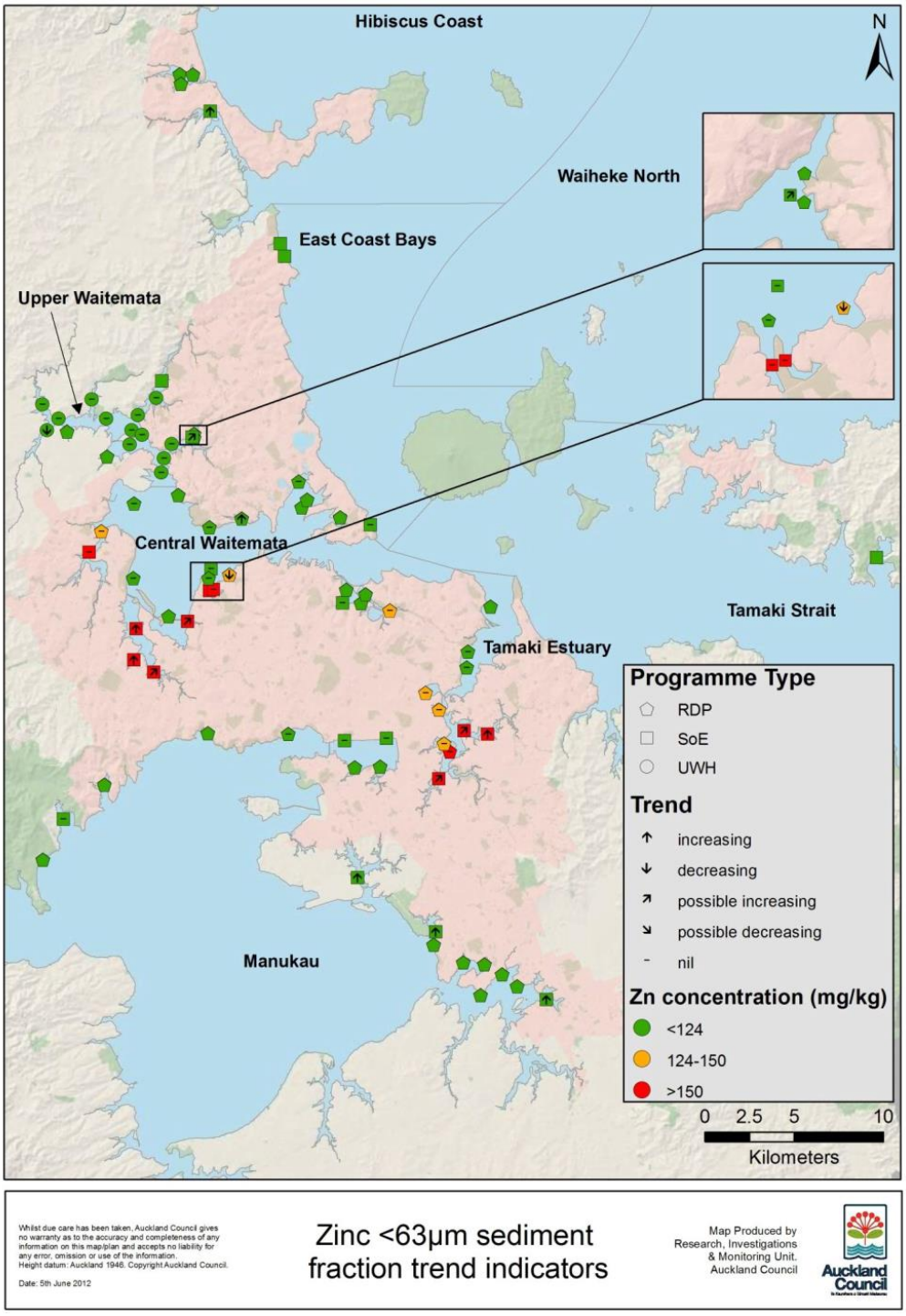

Figure 2. Sediment Zinc ERCs (red, amber, green) and trend indicators: <63 µm fraction (from Mills et al. (2012).

25 It can be seen from Figures 1 and 2 that the majority of monitored sites are ERC 'green' (contaminants presenting low risk to the biology, so the site is unlikely to be impacted). However, some

sites are ERC ‘amber’ (contaminant levels elevated, biology possibly impacted) and ‘red’ (contaminant levels high, and the biology is likely to be impacted).

26 The amber and red ERC sites are located in the low-energy upper sections of a small number of estuaries – primarily of the Waitemata Harbour and Tamaki estuary, but also three amber sites in Mangere Inlet (for the <500 µm fraction only). These locations are typical ‘settling zones [which] are prone to contaminant accumulation and [where] some level of degradation is expected’ (ARC, 2004). While they are subject to tidal flushing, because of their locations within long, narrow estuaries, contaminants can be retained in these locations for numerous tidal cycles, making their sediments more susceptible to contamination than the sediments of open waters.

27 It is worth noting that the maps in Figures 1 and 2 show only a portion of the Auckland region, and that amber and red ERC sites represent only a small fraction of the 1,800 km of coastline in the Auckland region.

28 Mr Cameron’s evidence also presents a summary of zinc trends across inshore marine sediment quality sites. He notes that contaminant levels at most sites have remained broadly the same since monitoring began in 1998, and (somewhat tautologically) comments that any improvements have generally been from a degraded baseline. Of the 61 sites monitored for zinc, 50 sites have shown no change, five sites are deemed to have decreasing zinc and six sites are deemed to have increasing zinc.

29 Figure 3 below presents information on sediment zinc trends at three “open harbour” sites (Henderson, Shoal Bay and Central Waitemata Harbour), based on downcore profiling undertaken as part of the ‘Central Waitemata Harbour’ study. Similar to Mr Cameron’s data, these show no change in recent years, although

in this case the window of no change extends back to the period 1970-1980.

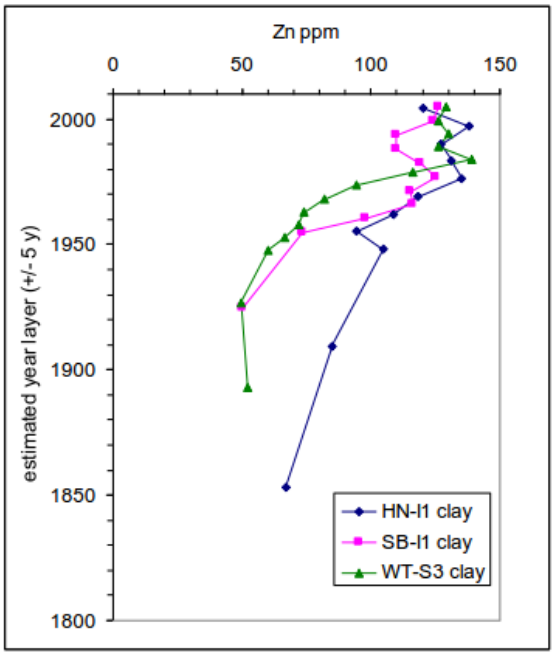

Figure 3. Downcore concentration profile of zinc in the clay fraction (<25 µm), with sediment depth converted to approximate depositional year at accuracy of approximately +/- 5 years (from Aherns et al. *2008)*

30 While noting that Dr Shedden provides further analysis of zinc trends, my interpretation of the above information is that overall, there has been no change in sediment zinc concentration since the 1970s (for open harbour sites) or since at least 1998 (in the case of the inshore sites), despite increasing urbanisation. I also conclude that, if the increase in sediment zinc concentration is in fact the result of rapid urbanisation in the early part of the 20th century, the open harbour sites stabilised relatively quickly in the late 20th century. There is no evidence that there are significant zinc sources (e.g. in the upper estuaries) which are causing open harbour zinc concentrations to continue to increase.

31 Furthermore, I note that the Central Waitemata Harbour studies concluded that:

31.1 Central Waitemata Harbour bed sediment concentrations of zinc are not expected to reach toxic levels based on assumptions of future trends in urban land use and activities; and

31.2 Zinc source control targeting industrial building roofs produced limited reduction of zinc accumulation rates in the harbour because industrial areas cover only a small proportion of the catchment area and most unpainted galvanised steel roofs are expected to be replaced with other materials within the next 25 to 50 years.

32 Looking more broadly than the sediment quality monitoring sites which are the focus of Mr Cameron's evidence, it is worth noting that Auckland Council's ecological monitoring of the Manukau Harbour over the last 25 years (Greenfield *et al.* 2013) has concluded that, despite ongoing urbanisation and industrialisation in catchments adjacent to the Manukau Harbour, and poor health of some of the inlets, the extensive sand flats and the main body of the harbour are not becoming degraded.

33 Similarly, ecological health monitoring of the Mahurangi estuary showed no trend over 20 years (Halliday *et al.*, 2013). When benthic health in the estuary was assessed against sediment metal concentrations and sediment muddiness (resulting from sediment runoff from land), it was concluded that the benthic community assemblages are more influenced by sediment mud content than by copper, zinc and/or lead.

34 These data, from monitoring of 'outer zones' indicate that the objective of providing greater protection to outer zones (versus settling zones) due to their sandier nature and the greater sensitivity of organisms living in them (ARC, 2004) is being achieved.

35 Overall, I concur with the words of Mills *et al.* (2012), presented below:

> *Overall, the sediment contaminant monitoring data analysed in this project indicate that the spatial patterns of contamination are essentially the same as reported previously, and that contaminant concentrations in most areas have not changed greatly since 1998. This picture is generally consistent with modelling predictions, and provides some reassurance that rapidly increasing contamination in Auckland's estuaries, as a result, for example, of stormwater discharges, is not a widespread occurrence.*

36 If locations are identified where zinc is clearly shown to be causing ecological problems (and further investigations may show this in the Whau and Tamaki estuaries), then I would support an approach whereby further assessment of local situations is undertaken "to determine the best manner in which to intervene and make improvements in the short and long terms". Such an approach is what was recommended in the Central Waitemata Harbour study[2], and would be consistent with the direction provided by the NPSFM, which recognises the connection between freshwater bodies and coastal water.

A POTENTIAL 'MISSING SOURCE' OF ZINC TO THE MARINE ENVIRONMENT

37 Mr Cameron's evidence briefly discusses (and dismisses as not being significant) two sources of zinc to Auckland's marine environment from sources other than stormwater. These sources are antifouling paints (applied to boats, ships and marine structures) and landfills and contaminated sites. Although I consider that both sources are worthy of further investigation and monitoring, based on available data I cannot disagree with Mr Cameron's conclusion.

38 However, a potentially significant source of zinc which Mr Cameron does not mention is sacrificial zinc anodes, which are

[2] From Aherns *et al.* (2008).

attached to metal parts of ships and boats (both commercial and pleasure craft) as well as marine structures such as pipelines, towers and sheet piling. They are designed to corrode preferentially to other metals, and therefore reduce corrosion of the structure being protected. Thus they constantly release zinc into the marine environment, requiring periodic replacement with new zinc anodes. Depending on the metal to which they are coupled, the surface of zinc anodes may dissolve at a rate of several millimetres per year (Zhang, 2010).

39 Overseas studies have concluded that zinc released from anodes can be a significant source of zinc to the marine environment. A study in the San Diego Bay area concluded that 66% of the ongoing zinc input to the region comes from zinc anodes on ships, with a slightly smaller percentage coming from stormwater runoff, and the remainder coming from antifouling paints and anodes on pleasure boats (Chadwick *et al*., 1999). Several other studies (e.g. Bird *et al.*, 1996; Matthieson *et al.,* 1999; Rousseau *et al.*, 2009; Caplat *et al.* 2012) have found zinc anodes to be a significant source of zinc to the coastal marine environment, and that zinc from anodes may have adverse effects on marine life.

40 Auckland, and the Waitemata Harbour in particular, has been an attraction for recreational and commercial boating for centuries. Beca (2012) studied pleasure craft numbers in the Auckland region, with the following headline statistics:

Estimated total number of pleasure boats in Auckland (2006)	74,700 (including at least 8,100 motor launches and keel boats which would be permanently moored)
Estimated number of swing moorings (2011)	4,322 (predominantly on the east coast: zero registered moorings on the Kaipara and Manukau Harbours)
Marina berths (excluding dry stacks)	6,377 (all on the east coast)

41 In addition to pleasure craft, the Waitemata Harbour has a constant traffic of commercial craft. Ports of Auckland Ltd handles approximately 1,600 ship calls per year (POAL, 2014). In addition to these port facilities there are a number of ferry terminals, the Devonport Naval Base and private wharves at locations such as Gabador Place (Tamaki River) and Chelsea Wharf. Commercial ships typically have several hundred kilograms of zinc anodes attached to their hulls, to protect metal parts such as rudders, propellers and bow thrusters from corrosion (K Hannaford, DiveCo Ltd, pers. comm).

42 In light of the tonnage of zinc anodes which are present in Auckland's waters at any one time, and the relatively fast corrosion and dissolution rates of these, they are likely to represent a zinc source in the order of many thousands of kilograms per year into Auckland's coastal waters, and tidal flow would push this zinc into the upper reaches of estuaries, for example to locations where there is fine sediment with a high propensity to sorb dissolved zinc from the water column. While I have not accurately quantified this zinc load, I note that all of the 'red' monitoring sites identified by Mr Cameron are on the Waitemata Harbour side of the isthmus, Auckland's main boating harbour. If claddings are in fact a significant source of zinc in marine environments, then one would expect the Manukau side of the isthmus (which also has significant zinc-coated roofing) to show a similar pattern.

43 Despite the fact that zinc is not currently increasing in Auckland's coastal waters or sediments, if it is found to do so in the future, in my view any investigation should include sacrificial anodes as a potential source.

THE EFFECT OF 'ZINC RULES' ON ZINC LOADING TO AQUATIC ENVIRONMENTS

44 As previously stated, I have received a copy of the 'Contaminant Load Model' (CLM) which has been used by Mr Moores to analyse the effects of various development and regulation scenarios on

contaminant loading to Auckland's aquatic environments. My colleagues at Tonkin & Taylor have, under my direction, used this model to assess in more detail the effects of the 'zinc rules' on total zinc load to the Whau estuary. The Whau estuary was chosen because it is the basis for a large part of Mr Moores' work and represents a catchment with a mix of residential and industrial land use, as well as roads and other paved areas. However, it should be recalled that the Whau estuary is one of the few estuaries which currently has sediment quality of ERC 'red' status, and thus it represents a 'worst case' scenario in terms of current zinc load and likely future zinc load.

45 As stated in Mr Moores' evidence[3], zinc yields from painted and unpainted zinc-aluminium coated roofing are assumed to be 0.02 g/m^2/y and 0.2 g/m^2/y respectively, and the yield from unpainted galvanised steel is assumed to be 2.24 g/m^2/y. Thus the yield from unpainted zinc-aluminium coated material is less than 10% of that from unpainted galvanised material.

46 Appendix B to my evidence provides a summary of the outputs of modelling various "intensification" and regulatory scenarios on the total zinc load from the Whau catchment, versus the current situation (existing case)[4]. The current situation is that roofing is considered to contribute around half of the 2,700 kg/year of zinc arising from the catchment. The CLM predicts that with no regulatory intervention, the total zinc load from roofing would reduce from 1389 kg/year to 280 kg/year (assuming no intensification: Case 1A) or 450 kg/year under a full intensification scenario (Case 1B), as Aucklanders replace old galvanised roofs with new-generation roofing materials (in the model, assumed to be a mixture or painted and unpainted zinc-aluminium coated material). The 'likely' scenario would be somewhere between

[3] Appendix A of Mr Moores' evidence.

[4] Explanatory notes at the bottom of my Appendix B describe the scenarios and I will not repeat these here.

these two figures. With the PAUP rules in place (effectively prohibiting unpainted zinc-aluminium coated material), the zinc load would reduce by a further 173 kg/year under a 'no intensification' scenario (2A) or 284 kg/year under a 'full intensification' scenario (2B). Again, the 'likely' scenario would be somewhere between these two figures.

47 The CLM modelling of the Whau catchment highlights that, regardless of the assumed intensification scenario, the vast majority of the potential reduction in zinc runoff from roofing material can be achieved with no regulatory intervention, i.e. by letting the market continue to drive the replacement of old painted and unpainted galvanised material with zinc-aluminium coated material which has much lower zinc yield, as it has done over the last 20 or so years.

48 The proposed regulatory interventions will result in only minor marginal benefits beyond the 'market trend' scenario (reducing total zinc loading by no more than 10%, even under the worst-case intensification assumption).

49 I am not aware of Council having attempted to quantify the likely effects of the proposed zinc rules on sediment quality with respect to zinc. In the absence of such analysis, and based on the changes in zinc loading predicted by the CLM, I have made preliminary calculations of the marginal effects of the 'zinc rules' on sediment quality in the Whau estuary. Based on extremely conservative assumptions about tidal flushing and uptake by sediments[5], I calculate that the change in average sediment zinc concentration within the Whau estuary would be <6 mg/kg (<3% of current concentrations), which is inconsequential in the context of both the existing zinc concentrations and the ERCs. If the

[5] For the purpose of this calculation, I have assumed no tidal exchange with the main Waitemata Harbour, and therefore no loss of zinc to the Waitemata and no dilution within the Whau. I have also assumed 100% uptake of the stormwater zinc load in the upper 2 cm of sediment.

conservative assumptions were replaced with 'likely scenarios' the resulting change in sediment zinc concentration would be much less than 6 mg/kg, and in my opinion, unlikely to be measurable.

50 It should be noted that we, and Council's experts, have focussed on the Whau catchment because it represents a worst-case catchment. I would expect that the marginal benefits of the proposed regulatory framework would be even more modest in other catchments which do not have such a great degree of industrial land use.

ZINC AS AN INDICATOR OF CONTAMINATION FROM URBAN STORMWATER

51 It is recognised that zinc may be of less concern as a contaminant in its own right, but more useful as an indicator of other contaminants that are commonly associated with urban runoff, and whose concentrations are known from empirical data to be closely correlated with zinc concentrations. It is broadly acknowledged, for example by Anderson *et al.* (2006), that potential ecological impacts of simultaneous multiple stressors are not well understood.

52 To effectively manage marine contamination, we must be mindful of the role of zinc as an indicator of pollution, and not just as a contaminant in its own right. By using zinc as a proxy for other contaminants, but subsequently focusing our interventions on zinc (for example by proscribing the use of zinc coated building materials), we may fail to address other contaminants that are potentially of more concern, either on their own or cumulatively. In my opinion, this would also apply to any other 'single contaminant' rules that are not supported or justified by monitoring data which indicate adverse effects of that contaminant.

53 Council's s32 analysis has not assessed the benefits of the zinc rules in terms of reducing zinc alone, but given that the rules will

target only one contaminant, the benefit-cost ratio is unlikely to justify the proposed rules.

EFFECT OF, AND PRECEDENT FOR, THE PROPOSED ZINC RULES

54 Based on my analysis presented above, it can be seen that relatively small areas of Auckland's marine environment show ecological degradation from stormwater runoff, or from zinc contained in stormwater. Furthermore, monitoring of freshwater and marine environments over the last two decades shows that zinc contamination is not worsening, and Dr Shedden's evidence shows that it is largely improving. Modelling shows that the proposed 'zinc rules' which proscribe the use of zinc-aluminium coated steel will have negligible marginal effect on zinc loads and therefore the effects of zinc.

55 Consequently, I see no technical basis for the proposed zinc rules. Ms Rickard addresses this further in a planning context in her evidence.

56 However, to put the proposed zinc rules in context, I have carried out a literature search of international regulations or guidelines around the use of zinc coated building-products. This has covered Australia, Japan, Europe, and various states of the USA. While design guidelines from some jurisdictions discourage the use of 'galvanised' (as opposed to zinc-aluminium coated) materials on the basis of zinc yield, none of them place any formal constraints on their use. They certainly do not go as far as to limit the use of zinc-aluminium coated materials to the extent sought by Auckland Council (which are, in effect, a ban on unpainted zinc and zinc-aluminium materials). Thus the Auckland Council's proposed regional zinc rules are without any international precedent.

CONCLUSION

57 The marginal water and sediment quality benefits of implementing the proposed zinc rules, over and above a ‘market’ trend approach, are negligible, and it has not been demonstrated that they will result in any ecological improvement in either the freshwater or marine environments.

58 On this basis, I support the relief sought by New Zealand Steel Ltd, that the proposed rules seeking to limit the use of zinc-coated building products (either galvanised- or zinc/aluminium coated) be deleted in their entirety.

Brett Ogilvie for New Zealand Steel Ltd
21 July 2015

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APPENDIX A. QUALIFICATIONS & EXPERIENCE

I hold the qualifications of:

- Bachelor of Science in Zoology from the University of Otago,
- Master of Science (Honours) in Zoology (Freshwater/Marine Biology) from the University of Otago,
- Doctor of Philosophy in Environmental Biology from the University of Essex, UK,
- Bachelor of Arts in Environmental and Natural Resource Economics from Massey University.

I am currently a(n):

- Member of the NZ Freshwater Sciences Society, formerly NZ Limnological Society (intermittently, 1988-present),
- Honorary Lecturer in Biological Sciences at Waikato University (2007-present),
- Member of the Chartered Institution of Water and Environmental Management, UK (MCIWEM) and Chartered Water and Environmental Manager (C.WEM) (1996-present),
- Member of the Society for Biology, UK (MSB) and Chartered Biologist (CBiol) (1996-present).

I have completed the Ministry for the Environment's "Making Good Decisions" course (currently re-certified until 2019), and have also completed the Auckland (Regional) Council's training in Stream Ecological Valuation (SEV) methodology, including in the updated (2011) methodology.

I have been employed as a Senior Environmental Scientist with Tonkin & Taylor since January 2002, as Ecology Team Leader since 2006, and have also served on the firm's Board of Directors since 2007. Prior to joining Tonkin & Taylor, I was employed as a Senior Environmental Scientist with WS Atkins plc, the UK's largest engineering-based consultancy (1995-2001), and before that was employed as a Research Scientist in Environmental Biology at the University of Essex, UK (1991-1995), funded by the UK's Natural Environment Research Council.

In my early career, I conducted research into the cycling and biological effects of contaminants in freshwater and coastal marine environments, resulting in several publications in international, peer-reviewed journals.

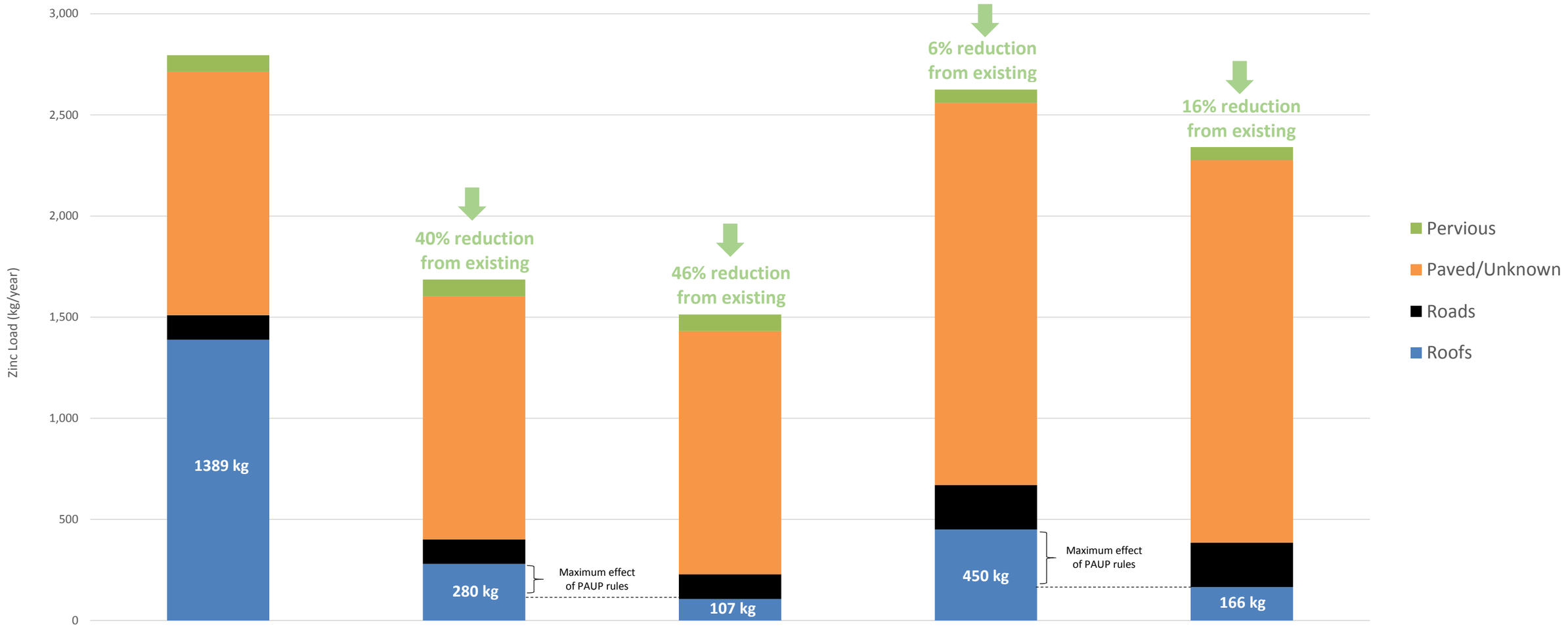
For the last 20 years I have worked as a consultant in freshwater and marine water quality and ecology, in New Zealand and in over 20 overseas jurisdictions (Europe, Middle East, Africa and Asia-Pacific).

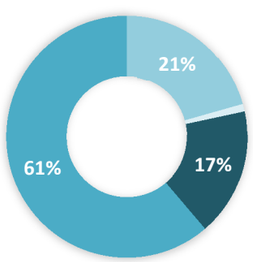
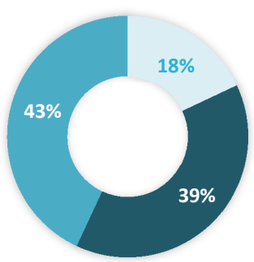
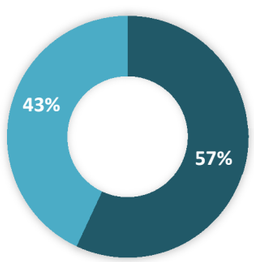
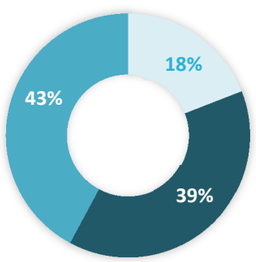
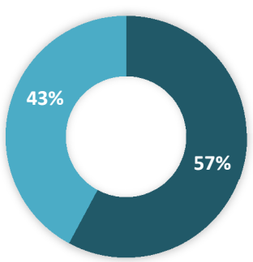
I have served as an expert witness in water quality, freshwater and marine ecology at Council, Environment Court and Board of Inquiry hearings and mediations under New Zealand's RMA, as well as equivalent overseas instruments. These have included:

- Proposed Auckland Regional Plan: Air, Land and Water hearings, for Waste Management (New Zealand)
- Proposed Auckland Unitary Plan (PAUP) Topic 006 and 046 hearings, for New Zealand Steel Ltd
- Proposed Auckland Unitary Plan (PAUP) Topic 046 and 047 hearings, for New Zealand Transport Agency
- Meremere Power Station Site Rehabilitation, for Genesis Energy
- Glenbrook Site 1 Landfill, for New Zealand Steel Ltd
- Bunnings Silverdale development, for Bunnings Ltd
- Onehunga Foreshore Restoration Project, for Auckland Council
- Transmission Gully Motorway Board of Inquiry, for Minister of Conservation
- Redvale Landfill, for Waste Management
- Needingworth Quarry Restoration, for Cambridgeshire County Council, UK
- Bonne Nuit Bay wastewater treatment scheme, for Public Service Department, States of Jersey
- Bujagali Hydropower Station, Uganda, for AES Nile Power (public hearings under Uganda EIA Regulations and World Bank Operational Policies).

APPENDIX B. SUMMARY OUTPUT FROM CLM MODELLING OF THE WHAU CATCHMENT

Comparison of annual zinc load generated in the Whau River Catchment



ASSUMPTIONS	EXISTING CASE	CASE 1A	CASE 2A	CASE 1B	CASE 2B
Intensification	None	None	None	Full	Full
Roof breakdown	Current	Market trend	PAUP	Market trend	PAUP
Roof area breakdown					

NOTES:

-Zinc loads calculated using the yields given in the Auckland Council Contaminant Load Model

-Existing areas (no intensification) were taken from Auckland Council's CLM study for the entire Auckland region for the Whau and Te Atatu South catchments

-The 'full' Intensification scenarios assume 100% growth in vehicle loads while the total road area remained constant. For paved surfaces and roofs it was assumed the areas would increase to occupy 60%, 100% and 100% of residential, commercial and industrial land, respectively. The increase in impervious surface was offset by a corresponding decrease in urban grassland. The proportion of roof areas to paved areas remained constant. The unknown component was assumed to increase proportionally to paved areas

-The 'current' roof breakdown is derived from the estimates made for Auckland Council's CLM study

-The 'market trend' roof breakdown was based on the Central Waitemata Harbour Study (CWHS) data. The assumed breakdown is 10% uncoated zinc roofing, 40% coated zinc products, 50% other roofing materials for residential areas, 15% uncoated zinc roofing, 50% coated zinc roofing, 35% other roofing materials for commercial areas and 75% uncoated zinc roofing and 25% coated zinc roofing for industrial areas

-The 'Unitary Plan' roof breakdown is based on the 'market trend' breakdown but assumes the Unitary Plan rules in their current form will result in all the uncoated zinc roofing in the catchment being substituted for coated zinc roofing. Note coated zinc roofing has the same yield as 'other roof materials'.

-The loads reported are the generated zinc load in the catchment. As such, the results do not take into account any reduction in contaminant load as a result of treatment.