

Environmental limits in transition

Science, policy, and community aspirations in
New Zealand's new framework

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Where we're going

Part 1. The latest resource management reforms

Part 2. Guidelines and standards

Part 3. Three stories to make some points

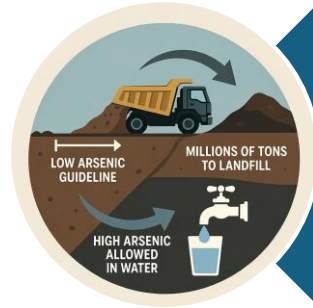
Part 4. A purposeful approach to the new limits

Summary



that time New Zealand went mad

- *“The little guideline that couldn’t”*



how we blame your garden for what might come out of your tap

- *“The little garden that was sent to landfill”*



the Mystery of the Broken Bovine Bones

- *“The little heifer who required emergency veterinary assistance”*

Part 1.
The latest
resource
management
reforms



- testing football helmets, 1912 -
(image for interest only, it's obviously unrelated)

Substantial programme – centrepiece ...

Replacing the RMA:

- [Spatial Planning Bill](#) and [Natural Environment Bill](#)



- For multiple info packs see [this MfE site](#)

Accompanied by big changes in:

- Local government, starting with dissolution of (elected) regional councils
- Central government, including a super-ministry (MCERT) which absorbs MfE

Some key features of the new system

Fewer local plans, more national direction

- A 'funnel' replaces the RMA pyramid
- Resource consents might halve

Enabled through **heavy** reliance on 'environmental limits'^{a, b, c}

Human health limits

- to be set nationally ... Minister/MoH

Ecosystem limits

- to be set by local government, using methodologies set nationally

Both types

- will be designed to accommodate community aspirations

(the fine print)

^a and some magical thinking.

^b 23 sections of the NEB are devoted to **environmental limits**, but the devil will be in the detail.

^c So – what are environmental limits, really?

Imagine the sound of a can being kicked down the road
Probably by a devil
At the moment, they're *that* exact sound:



Hold on, did you just say *community aspirations*..?

Natural Environment Bill ...

s53(2) When specifying the standard to which **human health** must be protected, the Minister must [...]

- consider the impact of the proposed limit in accordance with section 56

s55(1) Before determining an **ecosystem health limit**, a regional council must [...]

- consider the impact of the proposed limit in accordance with section 56

s56(b) A consideration of the impact of a proposed environmental limit or methodology requires an assessment of [...]

- the **needs or aspirations of communities** for **the economy, society, and the natural environment**

First Reading, 16 Dec 2025:

*“Central and local government decision-makers will be required to set binding environmental limits informed by **data and community aspirations**.”*

- Hon Chris Bishop (Minister responsible for RMA Reform)



So ... a central aspect of the change will be a shift in where core ‘balanced judgement’ is applied ...

Since 1991

- RMA Part 2 Purpose – achieving ‘sustainable management’
- Policy and plan rules as formal expressions of that purpose
- Environmental limits considered as a factor

In future

- In setting the environmental limits themselves

Part 2 Purpose and principles

5 Purpose

- (1) The purpose of this Act is to promote the sustainable management of natural and physical resources.
- (2) In this Act, **sustainable management** means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—
 - (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
 - (b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
 - (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

56 Assessing impact of proposed environmental limit or methodology

- A consideration of the impact of a proposed environmental limit or methodology requires an assessment of—
- (a) the positive, adverse, actual, potential, and cumulative effects of the proposed limit or methodology on either of the following (as applicable):
 - (i) on the life-supporting capacity of the natural environment;
 - (ii) human health;
 - (b) the needs or aspirations of communities for the economy, society, and the natural environment;
 - (c) the magnitude and spatial extent of—
 - (i) any over-allocation of national resources; and
 - (ii) any natural resources likely to be available for allocation as a result of the proposed limit or methodology;
 - (d) the implications of the proposed limit for the current and future use of natural resources and the benefits associated with that use;
 - (e) the efficacy and cost of available methods to manage effects within the proposed limit;
 - (f) alternative ways of providing for natural resource use that are consistent with protecting or enhancing the natural environment, including any alternative locations for natural resource use if the proposed limit allows for environmental degradation.

“The Bills also introduce entirely new complexity: environmental limits frameworks requiring sophisticated technical analysis...” – Bernard Jennings, ODT [[source](#)]

So it's...

Welcome to the **new frontier** for **environmental bunfights**

...the **environmental limit**



Part 2. Guidelines and standards



General concepts

Standards, and standards, and standards, and guidelines, and limits (oh my)

Standards

Sets of regulations about things

- e.g. Stormwater environmental performance standards, the NESCS regulations

A type of codified 'agreed best practice'

- e.g. 'New Zealand Standards'

Expectations about how you'll conduct yourself in public spaces

- e.g. No socks with sandals, [Parliament's declining standards](#)



Winston Peters enters a fugue state after hearing the word 'cunts'.

...ological Intake Values... are calculated for five generic land use exposure parameters. SCS_{health} derived is presented in Tables ES1 and ES2. Con. referred to the more detailed version of these tables set out in sect. Additional residential sub-scenarios have also been derived.

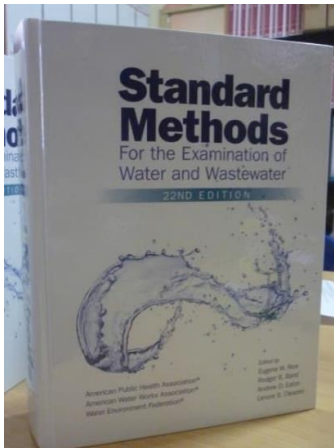
Summary of soil contaminant standards – SCS_{health} – for inorganic substances (mg/kg)

	Arsenic	Boron	Cadmium (pH 5) ¹	Chromium		Copper	Inorganic lead	Inorganic mercury
				III ²	VI			
Residential / lifestyle	17	NL	0.8	NL	290	NL	160	200
Residential 10% produce	20	NL	3	NL	480	NL	210	310
Density residential	45	NL	230	NL	1,500	NL	500	1,000
Commercial / industrial	80	NL	400	NL	2,700	NL	880	1,800
Commercial / industrial worker	70	NL	1,300	NL	6,300	NL	3,300	4,200

¹ Soil value is for pH 5. Values increase with increasing pH (see Appendix 2).
² SCS_{health} for boron, chromium III and copper represent levels well in excess of concentrations that would be harmful to the health of plants.
³ This is where the derived values exceed 10,000 mg/kg.

Numeric values, with units – also referred to as 'limits'

- Have a regulatory setting and consequences attached
- e.g. SCS values in the NESCS
- Domains can include air, freshwater, coastal water, land, and soil, biodiversity ...
- Focus of the new legislation



Guidelines

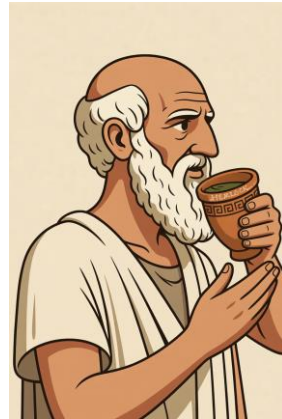
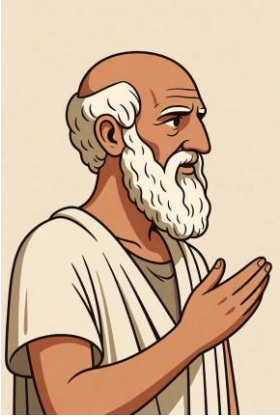
Numeric values – but used as reference thresholds

- An index of where you're up to, in your quest to pollute the environment
- Often more useful than standards – breadth and versatility of non-regulatory options
- → Michelle Begbie's talk

Philosophical approaches

Precautionary or protective
– erring on the side of
caution

Toxicologically-informed;
often called ‘science-
based’



(Socrates
drinking
hemlock)

Four approaches to deciding a number – broad brush ...

Quasi-arbitrarily

- Apparently out of thin air, perhaps based on current detection limits, or a suitably low-looking number.
- May relate to unacceptability, or precautionary thinking, rather than known risk.

Use of balanced judgement

- Consider the factors at play, key issues including costs, and select a best practicable number to prevent those problems
- e.g. narrative descriptions in the original Biosolids Guidelines

From a reference dose (RfD)

- Decide the level of harm you'll tolerate (first onset of effect, tolerated cancer risk)
- + safety factor → RfD
- Link to modelled exposure pathways to work out a number
- Hope that reality doesn't intrude
- (For microbes – infection risk can be used as a parallel)

From a species sensitivity distribution (SSD)

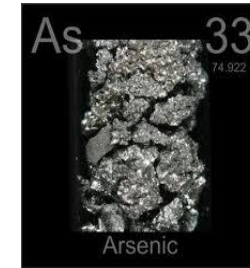
- Preferred for ecological guidelines and standards
- Also usually 'lowest effects level' based, but taken across species in an ecosystem



Example for a specific substance: *arsenic*

New Zealand guidelines or standards for concentrations of arsenic in various media:

1. **Drinking water:** 0.01 mg/L = 10 µg/L
2. **Food:** 1 mg/kg (cereals, molluscs and seaweed) or 2 mg/kg (crustacea or fish)
3. **Workplace air:** 0.05 mg/m³ = 50 µg/m³ (as an 8 hour time weighted average)
4. **Ambient air (outdoors, where there are people):** 0.0055 µg/m³ (as an annual average)
5. **Soils of new residential subdivisions:** 20 mg/kg
6. **Freshwaters (95% protection of aquatic organisms):** 13 µg/L (assuming arsenic is present as arsenate)
7. **Lake or river sediments (freshwater or marine):** 20 mg/kg (5% effects level) and 70 mg/kg (50% effects level)



‘A limit needs to be set using only biophysical criteria.’ *

There are no ‘science-based’ standards

- In their operational context, no limits are set that use only biophysical criteria
- All limits also codify policy choices, which reflect values
- Science can’t tell you what your values should be – it’s not a living entity, and (importantly) it’s not your Mum

However (!) there are plenty of ‘science-informed’ standards



All guidelines, standards, or limits:
→ incorporate and are expressions of
→ innate, cultural, agentic, spiritual and/or political

human values

Human life

- Health and wellbeing, of children in particular, and environmental resources that we (humans) depend upon – **human values about humans**

Kaitiakitanga

- Preventing degradation of the mauri (vitality, life force and energy) of air, water, land and soil – **human values about the cosmos and our role in it**

Ecosystem wellbeing for its own sake

- From a simple protective disposition, to greenish concepts around the need to care for intrinsic values of ecosystems – **human values about nature**

Knowledge, truth and mastery

- Human need to know, characterize, quantify, master, predict and control (exert agency) – **human values about science, progress, and technical knowhow**

Back to humans. Did we mention them?

- Emotional factors: inchoate or indeterminate scary harm, fear of contagion, and disgust (farm effluent irrigation) – **hardwired human predispositions**

Some of these values are essentially hard-wired cognitive biases, but there's (usually) nothing wrong with that

Let's find out something about your values

If one of these must die, so the other can live, which would you choose to remove?

- a. Mature kauri, kauri seedling
- b. Mature SQEP, innocent baby

→ In terms of either a 'life yet to life' argument, or an 'embodied ancient wisdom' argument, are your choices consistent?

→ Unless they're Socrates, most people don't arrive at their values using any process involving logical deduction. Most values are either pre-loaded or socially conditioned.

→ Which is fine. For the most part.



Risk-based human health limits

Science bits

- Toxicological reference values
- Chemical fate and transport parameters
- Exposure pathway modelling
- Bioavailability/bioaccessibility data

Policy decisions

- Level of acceptable risk
- Uncertainty/safety factors
- Protection endpoint and level
- Exposure assumptions and scenarios
- Allocation of risk across pathways

SSD-based ecological protection limits

Science bits

- Toxicity data compilation
- SSD curve fitting
- Extrapolation to community threshold
- Data quality screening & representativeness

Policy decisions

- Differentiation between environmental settings, e.g. land-use categories, aquatic ecosystem types
- Level of species protection that **will** apply, in operational practice, to each environmental setting
- Level of regard for sentinel species (kiwi, kokopu?)
- Whether to use the derived value, or apply an 'added-risk' approach
- Endpoint selection priority & chronic vs. acute
- Application of assessment/extrapolation factor (AF)
- Minimum data requirements & taxonomic coverage

Back to where we are, and where we're going

What many people would like:

- Science-based values based on biophysical limits

What we currently have:

- Science-informed limits, set within policy frameworks, which reflect value judgements

What the new approach involves:

- Explicit inclusion of some specific societal values that the new limits **must** consider

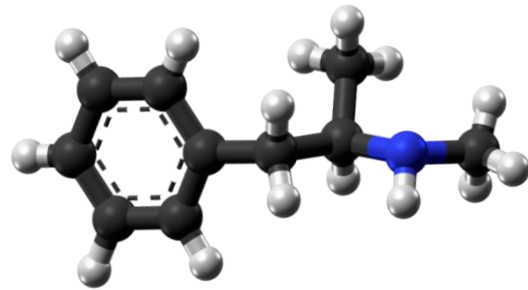
Part 3. To our stories



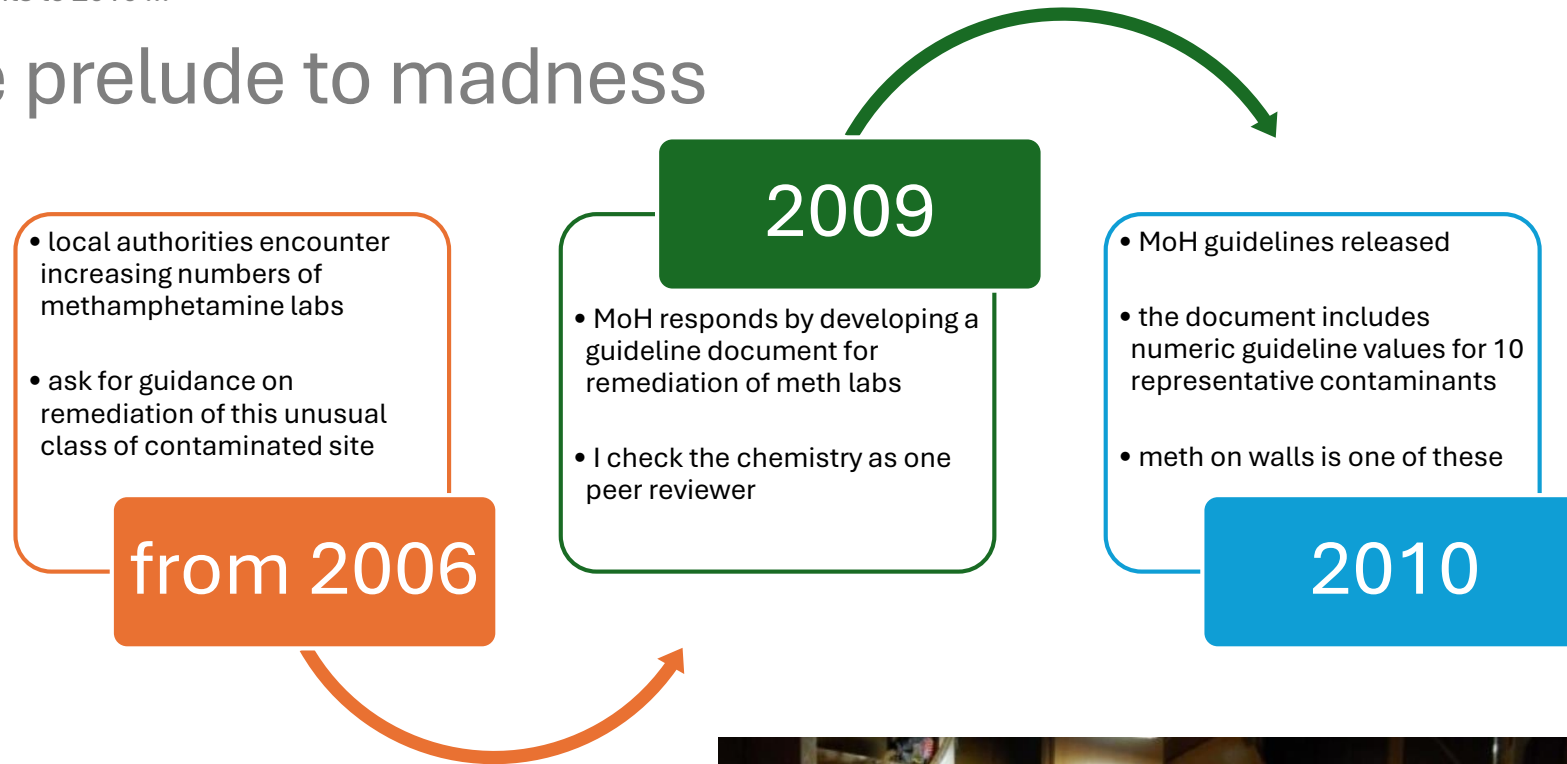
Story 1 - that time New Zealand went mad

also known as 'The little guideline that couldn't'

Meth testing of ordinary homes



the prelude to madness



CAMERON BURNELL/FAIRFAX MEDIA



Source: Quinovic Nelson: <https://www.quinovic-nelson.co.nz/>

Guidelines for the Remediation of Clandestine Methamphetamine Laboratory Sites

Disclaimer

These guidelines have been developed using a pragmatic approach to the safe remediation of non-workplace sites that have been used in the illicit manufacture of methamphetamine. Users of this document should seek expert advice to determine if this guideline is applicable to their individual circumstances. The Ministry of Health and the author will not be held liable for any actual or potential economic or adverse effect(s) arising from the use of this information.

Ministry of Health. 2010. *Guidelines for the Remediation of Clandestine Methamphetamine Laboratory Sites*. Wellington: Ministry of Health.

Published in August 2010 by the
Ministry of Health
PO Box 5013, Wellington 6015, New Zealand
ISBN 978-0-478-36653-2 (print)
ISBN 978-0-478-36050-3 (online)
HP 5213

This document is available on the Ministry of Health's website:
<http://www.moh.govt.nz>



A suggested cleanup guideline for meth residues on surfaces. One of ten representative substances.

'...that have been used in the illicit manufacture of methamphetamine...'

Table 3: Summary of remediation guidelines for New Zealand residential properties

Key chemical	Indoor criteria		Outdoor soil (mg/kg)	Potable water (mg/L)
	Surface (µg/100cm ²)	Air ⁹ (mg/m ³)		
Benzene	a	0.0036 ^o	1.1 [#]	0.01*
Hydrogen chloride	a	0.009 [^]	b	x
Iodine	20 ^Δ	0.0008 ^Δ	780 [±]	x
Lead	2 ⁺	0.0002 ^o	±	0.01*
Mercury (inorganic)	35 ^Δ	0.0033 ^o	±	0.007*
Methamphetamine	0.5 ^Δ	b	5 ^Δ	x
Phosphine	a	0.0004 ^Δ	c	x
Toluene	a	0.3 [^]	68 [#]	0.8*
Xylenes (total)	a	0.7 [^]	48 [#]	0.6*
pH	6-8	NA	4.5-8 (typical range)	6-8*

Notes:

- a No surface residue guideline has been provided for this chemical as it is considered volatile and would not be present as surface residues (or dust) for a sufficient period to be of concern.
 - b No guideline has been derived for these key chemicals. Only volatile chemicals (or gases) have been considered as they may continue to off-gas from porous surfaces over time. For example, anhydrous hydrogen chloride will readily combine with soil moisture and infiltrate the soil, dissolving some of the soil material, especially carbonates. Neutralisation of the acid will occur (OEHHA 2008).
 - c It is not considered necessary to attempt to measure for phosphine in soil because phosphine gas is not expected to be present in soil for a sufficient period of time to be of concern.
 - X At the time of writing no relevant guideline values for these chemicals were available from peer-reviewed sources of relevance for the protection of human health.
 - ☒ At the time of writing the Ministry for the Environment's proposed *National Environmental Standard for Assessing and Managing Contaminants in Soil* was still under development and confirmation of these numbers was awaiting finalisation. The Ministry for the Environment should be consulted to ensure that these soil guideline values are consistent with the gazetted NES. In practice, the NES is treated like a rule in a plan, and it will override any existing rule that is more lenient. In some circumstances, councils can impose a rule or consent that is more stringent than the NES but only if the standard expressly states that they can.
 - + Derived from some states within the United States that have adopted regulations or numeric decontamination guidelines for clan meth labs.
- NA Not applicable as pH is not a chemical compound.
- [^] Derived from the OEHHA (2008).
- ^Δ Derived from Environmental Risk Sciences (2009).
- ^o Derived from the New Zealand ambient air quality guidelines (Ministry for the Environment 2002).
- [#] Derived from the *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (Ministry for the Environment 1999). Values for residential soils have been applied and within those, sandy soils and soils less than 1 metre in depth, as a default. Refer to Table 4.10 – Tier Soil acceptance criteria *Residential use* (Ministry for the Environment 1999).
- [±] Derived from USEPA Regional Screening Levels (formerly called Preliminary Remediation Goals).
- * These guideline values for contaminants relating to potable water use have been derived from the health-based determinants (maximum acceptable values) set out in the *Drinking-water Standards for New Zealand 2005 (revised 2008)* (Ministry of Health 2008). These guideline values have been developed with a particular reference to the protection of public health, giving consideration to exposure via the ingestion of water, the inhalation of volatile compounds and absorption following direct contact.

2010-2016
 New Zealand goes mad



P lab makes neighbours sick

10 Nov, 2007 6:54pm 5 minutes to read



Shanelle Borfase has had to give up a job and dancing. Photo / Doug Sherring

By Rebecca Milne



14:43, Jan 31 2009



BRUCE MERCER/WAIKATO TIMES

CLEAN-UP: Contractors fill a skip with household items from the Hamilton property where a P-lab was found last week.

Landlords in two North Island cities face huge bills after police found P-labs on their properties.

The landlord of a Hamilton house at the centre of a P-lab bust last week will be billed by the city council for forensic tests to determine if it has to be demolished.

The owner of the Newcastle Rd house, Kerry O'Rourke, told the Waikato Times he had been advised by his lawyer not to comment while police were investigating. "The only thing I can say is that I'm devastated," Mr O'Rourke said.

"I'm just hoping the house doesn't get pulled down."

Police left the property yesterday and the Hamilton City Council has taken over the site.

When the Waikato Times visited the house this morning, a large rubbish skip arrived at the property. Three people in protective white suits were throwing a number of items into it, including mattresses, crates of beer bottles, computer monitors and old chairs.

(image source: deconassist.com.au – for illustration only)

then to now ...

Cleanup guidelines for meth itself ($\mu\text{g} / 100 \text{ cm}^2$)

(2010 Ministry of Health guidelines for lab remediations)

0.5

2010-16 testing embeds in the residential property market

- MoH guideline is used out of scope, because there's nothing else

2016-17 various central government shenanigans occur

- Housing NZ commissions work → I suggest a more appropriate minimum risk level, still includes 300 fold safety factor, bunfights ensue
- Standards NZ process sets another threshold, makes everything worse

12.5

1.5

2018 Chief Science Advisor's report released

- Formal recognition NZ went mad. New health threshold recommended:
- Public narrative reverses; some testing companies fight
- Residential Tenancies Act amended, process initiated for bespoke regs

15

2026

- (16 April). New regulations finally come into effect

15

(cleanup)

30

(vacate)

Professional lesson..?

Know your limits

... and also, no guideline should be unleashed on the environment unless it has –

a specified review timeline !

Story 2 - time we blamed your garden for what might possibly come out of your tap

also known as 'The little garden that was sent to landfill'

Arsenic in drinking-water, and soil



NEW ZEALAND
LAND AND GROUNDWATER
CONFERENCE 2024
22 - 24 OCTOBER - AUCKLAND

ALGA

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Tolerable risks and untenable outcomes

it's time

to review

the national
soil standard

for arsenic

Nick Kim

- Senior Lecturer Massey University (Wellington)

Michelle Begbie

- Team Leader, Geothermal, Air Land, Ecology, and Contamination, Waikato Regional Council (Hamilton)

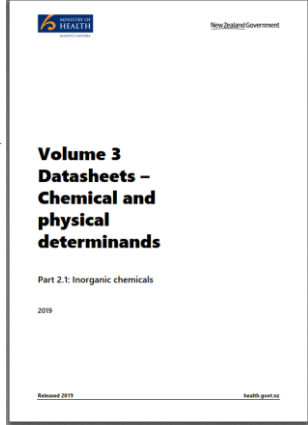
Andrew Rumsby

- Principal Environmental Chemist, EHS Support New Zealand Ltd (Auckland)



MAV for arsenic
(10 µg/L)

Water Services (Drinking Water Standards for New Zealand) Regulations 2022



Risk-settings for soil and drinking-water

Your tap-water is allowed to provide you with **35 times more arsenic** than is permitted from your garden soil

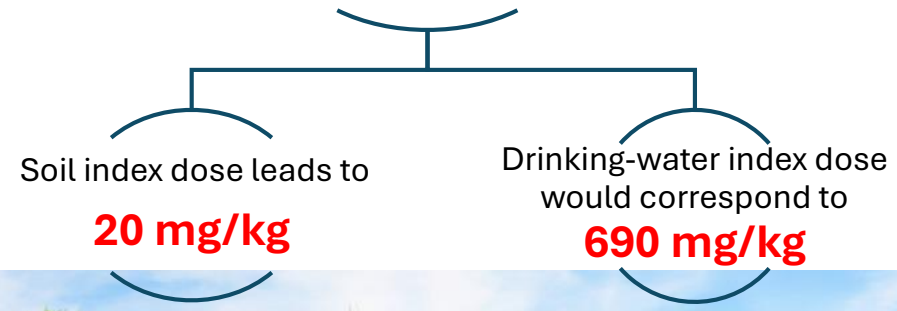
wildly inconsistent

Adopted index doses:

- Garden soil **0.0086 µg/kg/day**
- Drinking-water **0.3 µg/kg/day**



How drinking-water tolerance **would compare** (standard residential soils)



Drinking-water MAV

10 µg/L

- ingest 2.5 L per day water, you get 25 µg arsenic

Soil SCS

20 µg/g

- ingest 0.025 g (25 mg) soil, you get 0.5 µg arsenic
- Add in home vege consumption (another one-third) → so the total intake linked to soil is about 0.75 µg arsenic

Why wasn't the soil SCS set higher?

- because you might already be getting too much arsenic from your tap. 'Dose over-allocated.'
- a low calculated value then led to linking the SCS to the upper end of the natural background

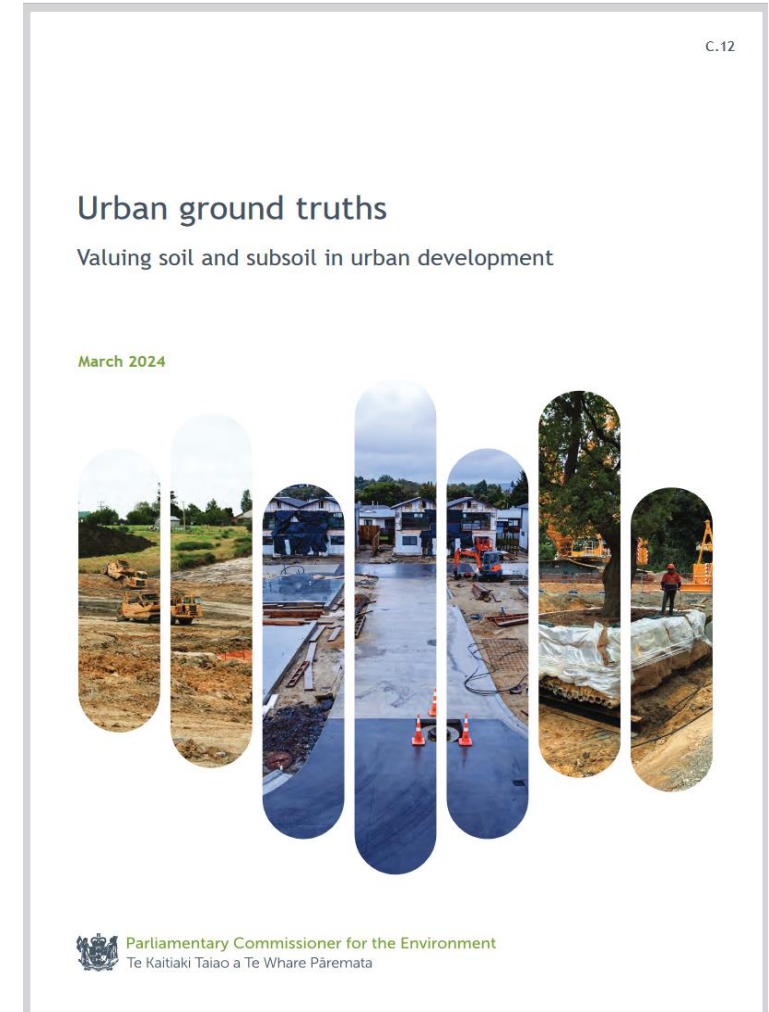
Why was the drinking water MAV set so high?

- A main reason: too costly to upgrade the infrastructure

One of the results ...



Landfill
disposal of
valuable soil



The landfill disposal problem is closely linked to fact that the lowest arsenic SCS is **indexed to natural background**.
That in turn came about because of the **compromise for drinking-water**.

Professional lessons..?

All limits embody values*

*The only question is what those are. In this case, for the drinking-water MAV there was a pragmatic aversion to the difficulty and costs of improving drinking-water infrastructure, which overrode toxicological ideals. The specific values are (a) maintaining an easy life, and (b) New Zealand remaining solvent.

Sometimes limits trigger
perverse policy outcomes**

**The above decision then contributed to an unusually low number being set for the soil SCS, and through a link to soil background values, this has in turn lead to millions of tonnes of valuable soil resource being unnecessarily landfilled, every year.

... And once again, no limit should really be released into the wild without having – a specified **review timeline** !

Story 3 – the Mystery of the Broken Bovine Bones

also known as ‘The little heifer who no longer could’

Fluorine in agricultural soils

*Once upon
each year there
are 4,000-5,000
young dairy
COWS...*

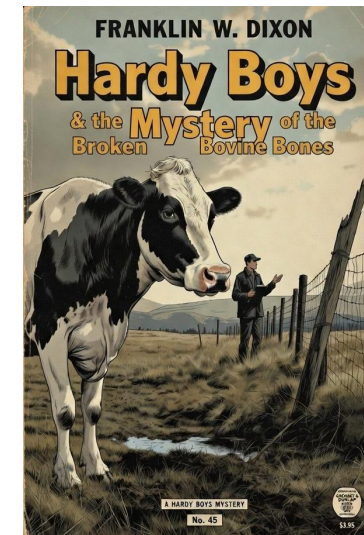
> [Animals \(Basel\)](#). 2024 Feb 5;14(3):524. doi: 10.3390/ani14030524.

An Assessment of the Epidemiology and Herd-Level Impact of the Fractured Humerus Epidemic in New Zealand Dairy Cattle, 2007–2015: Results from Four Studies

Jaimie C Hunnam ¹, Kevin Lawrence ², Zul Bahar A Rashid ², Ben Hitchcock ³, Scott McDougall ³, Alvaro Wehrle-Martinez ², Jenny F Weston ²

Affiliations + expand

PMID: 38338167 PMID: PMC10854585 DOI: 10.3390/ani14030524



(Image courtesy of Grok)

Phosphate fertilisers



Have underpinned the viability of agriculture

Contain elevated P, Ca, S, Cd, F & U

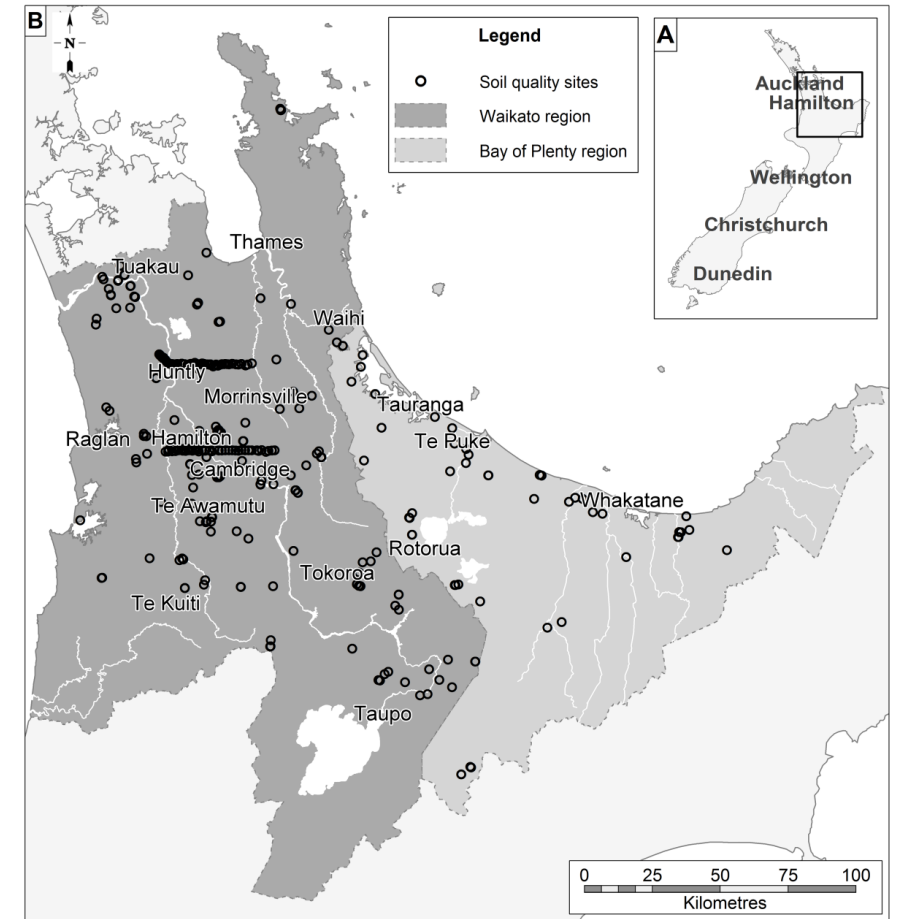
Most added Cd, F & U retained in topsoil

Gradual accumulation; largely irreversible



Waikato and Bay of Plenty:

298 properties

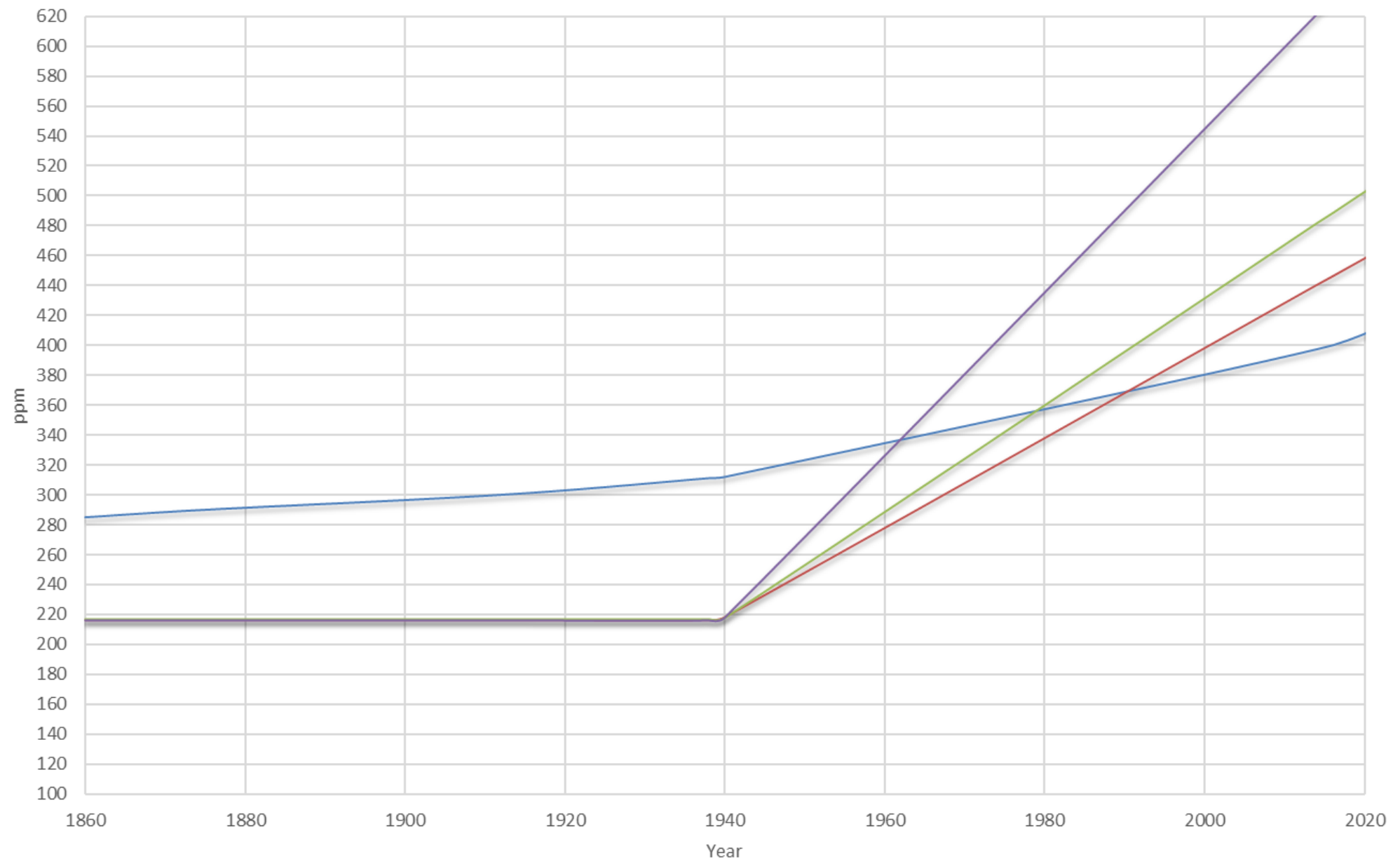


Full details:

Anthropogenic fluorine accumulation in the Waikato and Bay of Plenty regions of New Zealand: comparison of field data with projections

Nicholas D. Kim¹ · Matthew D. Taylor² · John J. Drewry³

Category	Statistic	Pastoral soils			Horticultural soils			All farmed soils (N=264)
		Dairy (N=120)	Drystock (N=90)	All Pastoral (N=214)	Arable (N=31)	Orchard (N=19)	All Hort (N=50)	
Observed total F concns (mg/kg):	Mean	481	389	440	420	469	438	440
	Std dev	128	145	143	99	164	128	140
	95% CI	458-504	359-420	421-459	384-456	390-548	402-475	423-457
	Median	482	372	440	426	460	430	440
	Geo mean	462	363	415	409	433	418	415
	Minimum	128	117	117	260	119	119	117
	Maximum	830	900	900	635	680	680	900
	10th %tile	320	208	260	300	244	300	260
	90th %tile	641	580	621	584	660	618	621
Estimated anthro-pogenic enrichment (mg/kg):	Mean	264	177	225	193	257	217	223
	Median	228	164	186	218	252	222	232
	Geo mean	261	166	215	183	229	201	213
	90th %ile	413	370	406	344	452	398	405
	Maximum	576	692	692	381	472	472	692
Enrichment ratios (observed/ estimated background)	Mean	2.2	1.8	2.0	1.8	2.2	2.0	2.0
	Median	1.9	1.8	1.7	2.0	2.2	2.1	2.1
	Geo mean	2.3	1.8	2.1	1.8	2.1	1.9	2.0
	90th %ile	2.8	2.8	2.9	2.4	3.2	2.8	2.9
	Maximum	3.3	4.3	4.3	2.5	3.3	3.3	4.3
Net accumulation rates (mg/kg/yr) assuming mean 50 yr of farming	Mean	5.3	3.5	4.5	3.9	5.1	4.3	4.5
	Median	4.6	3.3	3.7	4.4	5.0	4.4	4.6
	Geo mean	5.2	3.3	4.3	3.7	4.6	4.0	4.3
	90th %ile	8.3	7.4	8.1	6.9	9.0	8.0	8.1
	Maximum	11.5	13.8	13.8	7.6	9.4	9.4	13.8

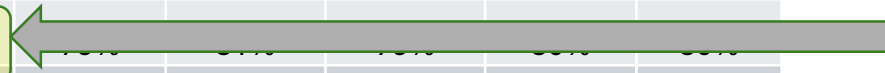
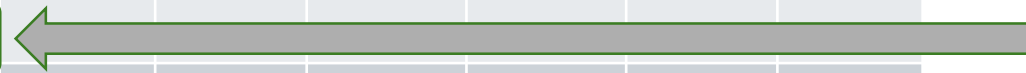
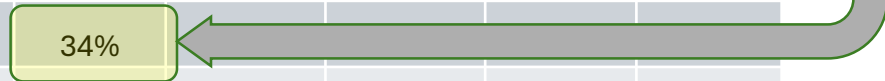


— Atmospheric CO2 — Soil F (mean) — Soil F (dairy) — Soil F (90th %ile)

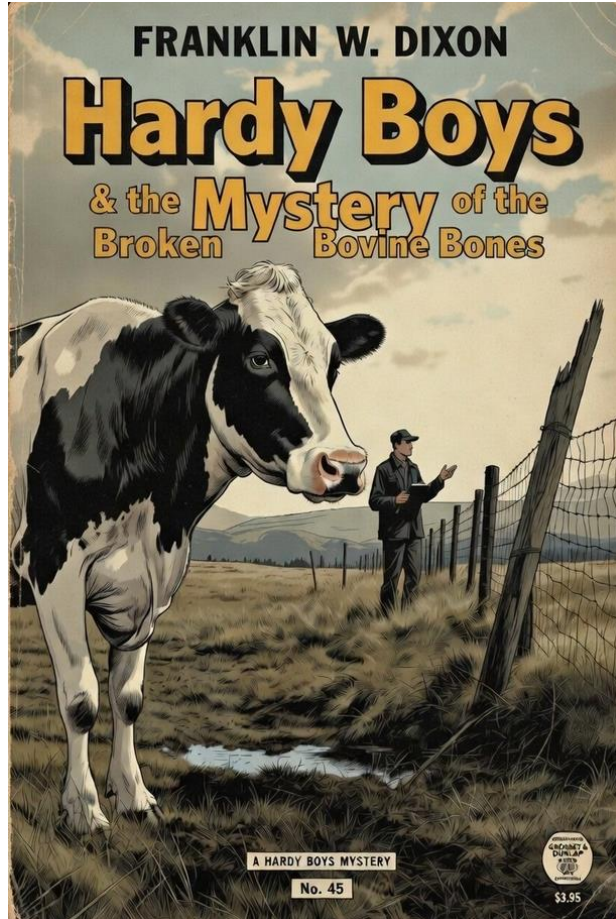
Total F concentration	Pastoral soils			Horticultural soils			All farmed soils (N=264)
	Dairy (N=120)	Drystock (N=90)	All Pastoral (N=214)	Arable (N=31)	Orchard (N=19)	All Hort (N=50)	
1000 mg/kg	0%	0%	0%	0%	0%	0%	0%
900 mg/kg	0%	1%	0%	0%	0%	0%	0%
800 mg/kg	1%	1%	1%	0%	0%	0%	1%
700 mg/kg	4%	2%	3%	0%	0%	0%	3%
650 mg/kg	10%	4%	7%	0%	16%	6%	7%
600 mg/kg	18%	7%	13%	3%	32%	14%	13%
550 mg/kg	28%	14%	22%	13%	42%	24%	23%
500 mg/kg	44%	21%	34%	39%	58%	46%	47%
450 mg/kg	62%	29%	47%	52%	63%	56%	58%
400 mg/kg	73%	41%	59%	71%	74%	72%	72%
372 mg/kg	80%	59%	72%	71%	74%	72%	72%
350 mg/kg	84%	59%	72%	71%	74%	72%	72%
326 mg/kg	89%	69%	85%	97%	84%	92%	86%
300 mg/kg	93%	76%	85%	97%	84%	92%	86%
200 mg/kg	98%	92%	96%	100%	95%	98%	96%
100 mg/kg	100%	100%	100%	100%	100%	100%	100%

Percentages of properties above given F concentrations



'very large'











Possible relevance to this problem?



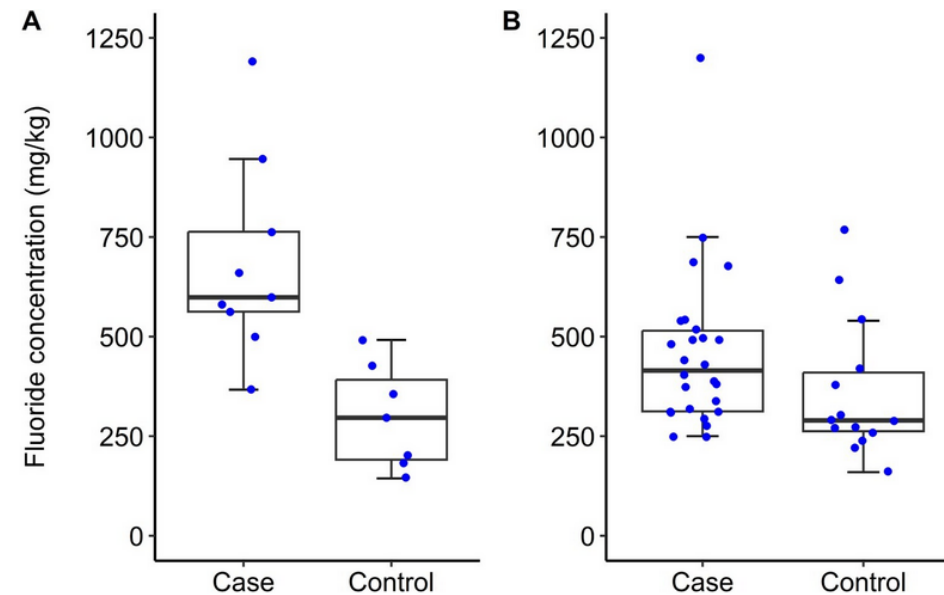
BRIEF REPORT

 OPEN ACCESS  Check for updates

The association between fluoride concentrations and spontaneous humeral fracture in first-lactation dairy cows: results from two New Zealand studies

A Wehrle-Martinez ^a, KE Dittmer ^a, PJ Back ^{a,b}, CW Rogers ^{a,b}, JF Weston ^a, P Jeyakumar ^b, RV Pereira ^c, R Poppenga ^d, HS Taylor ^e and KE Lawrence ^a

^aTāwharau Ora – School of Veterinary Science, Massey University, Palmerston North, New Zealand; ^bSchool of Agriculture and Environmental Sciences, Massey University, Palmerston North, New Zealand; ^cDepartment of Population Health and Reproduction, School of Veterinary Medicine, University of California-Davis, Davis, CA, USA; ^dCalifornia Animal Health and Food Safety Laboratory System, School of Veterinary Medicine, University of California-Davis, Davis, CA, USA; ^eDiagnostic and Surveillance Services, Biosecurity New Zealand, Ministry for Primary Industries, Upper Hutt, New Zealand



Soil contaminants in farming - things a limit **could** be designed to accommodate

On-farm

- Toxicity to soil organisms – microbes, invertebrates, plants
- Toxicity to grazing animals
- Induced deficiency of another essential element
- Alteration of soil chemistry
- Contamination of groundwater

*Main concern
for fluorine*

(also going on)

Wider ecosystem

- Toxicity to wildlife (e.g. insectivorous birds)
- Off-site migration; accumulation in freshwater sediments

Food production, human health & regulatory issues

- Non-compliance with food standards
- Increased dietary intakes
- Contaminated land; reduction of land-use flexibility
- Decreased intakes of a competing essential element

*Main concerns
for cadmium*

Professional recommendation..?

Every limit should have its own
lifetime mission statement

** Why? Issues are often contaminant-specific. Before setting each limit– it would be great if we could put some more thought into exactly what we'd like it to achieve. And during the limit's operational lifetime, we need to know whether it's achieving its purpose.*

... and also, wouldn't it be great if every limit had its very own ...

specified review timeline !

Part 4. A purposeful approach to the new limits

Two aspects:

1. What are the priority problems?

Which known or anticipated problems genuinely **call** for environmental limits?

2. How would we go about developing each limit?

What would a methodology look like?



What are the priority problems?

Context: thousands of contaminants, limited resources, finite money pit

- Which are possible game-changers?
- Which are essentially irreversible, causing one-way degradation?
- Which can trigger (tip) an ecosystem collapse and hysteresis?
- Which really **need** environmental standards?

Prioritising diffuse contamination issues

Resources:

Approach developed for WRC - summary paper: Kim, ND, Taylor MD, Caldwell JP, Rumsby A, Champeau O, and Tremblay LA, **2020**. Development and deployment of a framework to prioritize environmental contamination issues. *Sustainability*, 12(22). doi: <https://doi.org/10.3390/su12229393>

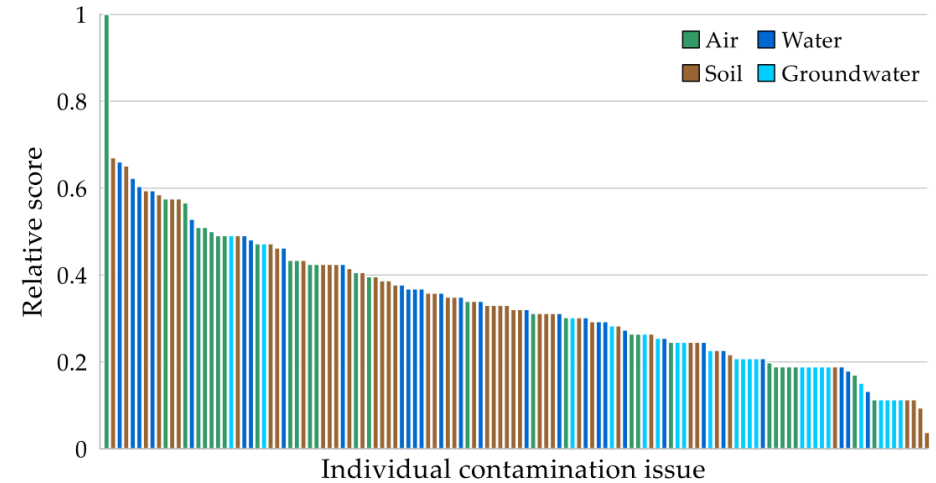
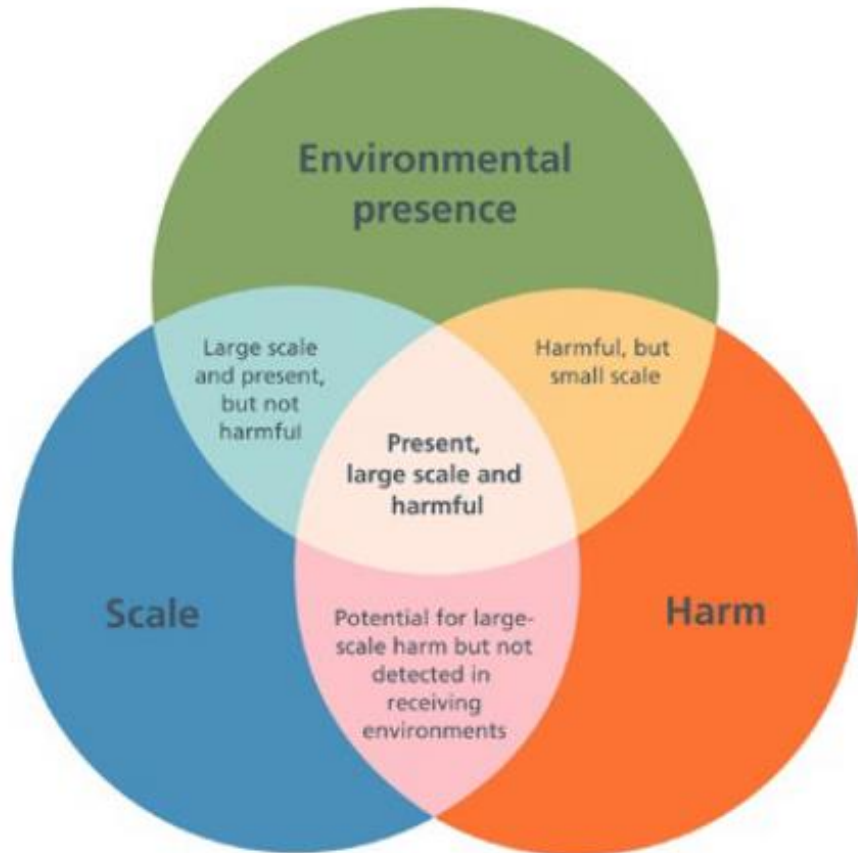


Figure 1. Relative scores for 117 individual environmental contamination issues affecting air, soil, groundwater, and aquatic ecosystems. The highest score overall score (53 out of 80, scaled to 1.0) was achieved by issue AA12.2 Regional impact of greenhouse gases generated globally.



Parliamentary Commissioner for the Environment, **2022**. *Knowing what's out there: regulating the environmental fate of chemicals*. Available from: <https://pce.parliament.nz/publications/regulating-the-environmental-fate-of-chemicals/>

(10 April)

NEW ZEALAND / CONSERVATION

Conservationists alarmed by new report into New Zealand's freshwater

7:39 am today

Share this     

Keiller MacDuff, Senior reporter
✉ keiller.macduff@rnz.co.nz



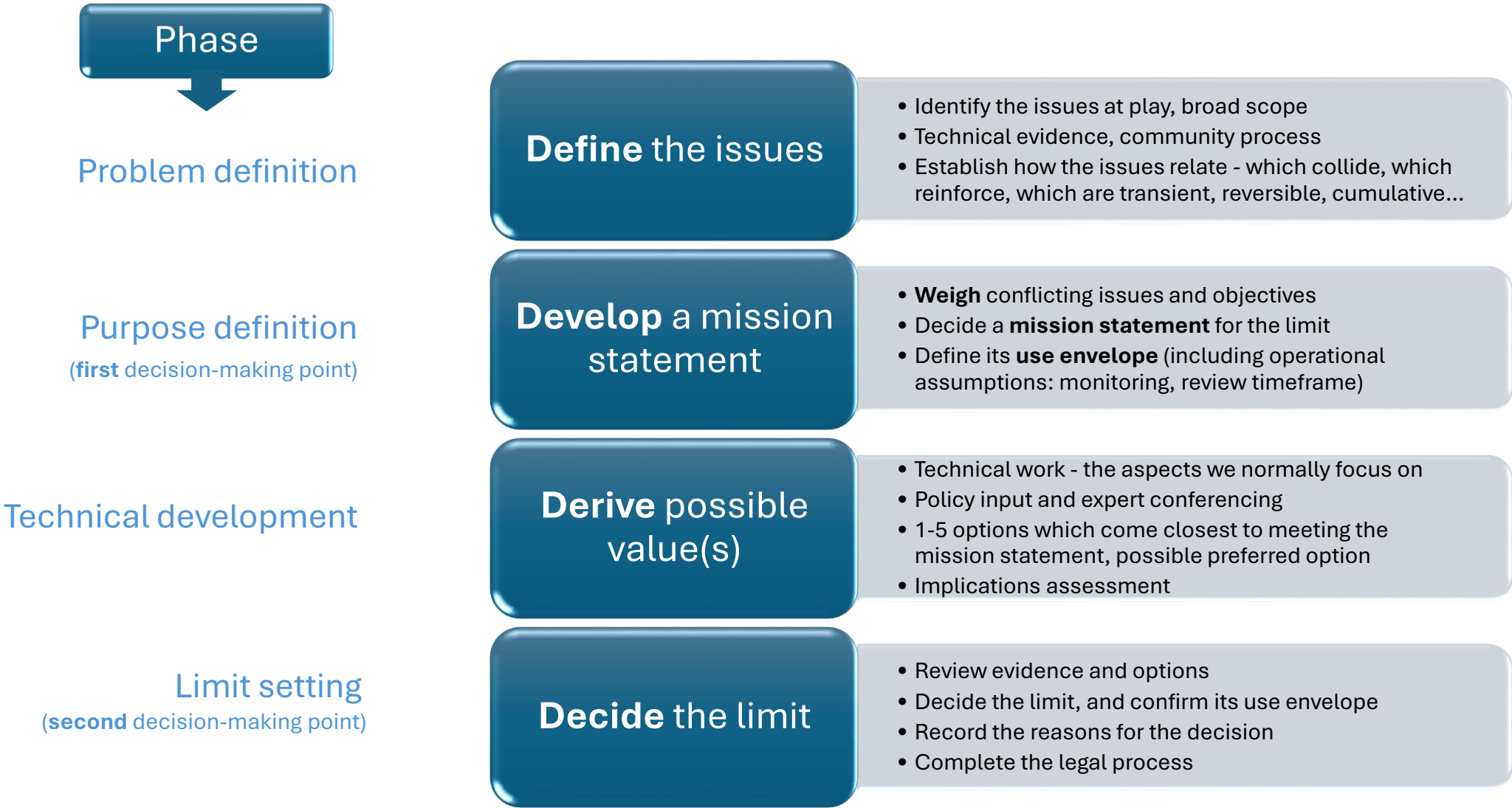
Modelling estimated 44 percent of New Zealand's total river length was unsuitable for activities like swimming due to faecal contamination. Photo: RNZ / Tess Brunton

“The ...report highlighted the worsening quality of groundwater, rivers and lakes, including increasing levels of nitrates, *E.coli* levels breaching the legal limit, and nearly half [44%] of the country's river network being unsafe for swimming...”

“Over the longer term, **nitrogen** was one of the biggest pressures, Collins said.”



Developing those new limits – how a best-practice approach *could* work ...



Proviso

One thing:

- the limit

Another:

- its implementation, including how adherence will be achieved



Summary

We're on a new path with standards for human and ecological health –

– but it's not
entirely new

- Policy choices have always been there, but are often mistaken for science
- National direction and 'balanced judgement' in decision-making are both features of the RMA
- People commonly ascribe magical properties to limits

New aspects are:

- **acknowledgement** of policy trade-offs in limit-setting;
- the **breadth** of these – community needs or aspirations for environment, economy and society all in-scope; and
- a **shift** in where much of the 'balanced judgement' is applied – by being embodied into each limit.

For further detail on most aspects of this talk see Nick's submission on the Planning and Natural Environment Bills – digitally buried here: https://www3.parliament.nz/mi/pb/sc/submissions-and-advice/document/54SCENV_EVI_ba467863-d6b0-4968-1027-08de369d9192_ENV85993/nicholas-kim



And now... introducing our expert panel!

