



Risk-based Industry Specific Guidelines

A review of MfE guideline values and current relevance

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Purpose

- MfE historically produced **industry specific risk based** site investigation guidelines
- Relevance in today's world

Table 2: Name, purpose,* number, and basis of protection of guideline value in reference documents listed in Table 1 and included in the EGV database

Country		Name	Purpose*	Basis#	No. of guideline values	Source
New Zealand	Timber treatment	Acceptance criteria	Site investigation	HH/P	7	MfE and MoH (1997)
	Gasworks	Acceptance criteria	Site investigation	HH	19	MfE (1997)
	Oil industry	Acceptance criteria	Site investigation	HH	10	MfE (1999)
	Sheep-dip	Soil guideline values	Site investigation	HH	19	MfE (2006)
	Drinking-water standards	Maximum acceptable values (MAV)	Drinking water	HH	~130	MoH (2008)

From: CLMG #2



The 'Methodology'

- Technical reference for the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS)
- Risk-based methodology soil contaminant standards' (SCSs_(health))
- SCSs_(health) developed for priority contaminants
- For soil only
- Human health only
- Inhalation of volatiles not considered in detail
- No standards for volatile contaminants set
- CLMG 2 sets out use preference



**Methodology for Deriving Standards
for Contaminants in Soil
to Protect Human Health**



Environmental Guideline Value Types

- Environmental guideline values can be risk-based or threshold values
 - Risk-based values -derived from a given exposure scenario (protection of human health) or the protection of a nominal proportion of species in an ecosystem
 - Threshold values are non risk-based values

Table 5B3a Preliminary Health Risk Based Acceptance Criteria - Groundwater - Commercial/Industrial Site use SAND Soil Type

Site Use: Commercial
 Receptor: Workers
 Exposure Frequency: 240 d/yr
 Averaging Time (carc): 70 yr
 (non carc): 20 yr
 Exposure Dur: 20 yr
 Body Weight: 70 kg
 Inhalation rate indoor: 10 m³/d
 Inhalation rate outdoor: 10 m³/d
 Target Risk: 0.00001
 Target HI: 1

Contaminant	SF (1/mg/kg/d) Inhalation	RfD (mg/kg/d) Inhalation	Acceptable CDI		Volatilisation factor (mg/m ³ /mg/L-H ₂ O)					
			Carcinogenic	Non-car.	Indoors			Outdoors		
			Inhalation	Inhalation	2m	4m	8m	2m	4m	8m
Alkanes										
C ₇ - C ₉		5		5	6.42E-01	6.18E-01	5.75E-01	7.78E-03	7.32E-03	6.55E-03
C ₁₀ - C ₁₄		0.3		0.3	5.99E-01	5.77E-01	5.37E-01	7.25E-03	6.83E-03	6.11E-03
C ₁₅ - C ₃₆		1.5		1.5	3.97E-01	3.82E-01	3.56E-01	4.81E-03	4.53E-03	4.05E-03
MAHs										
benzene	0.029		3.45E-04		2.46E-03	2.34E-03	2.13E-03	3.81E-05	3.44E-05	2.88E-05
toluene		0.11		0.11	2.54E-03	2.42E-03	2.21E-03	3.76E-05	3.43E-05	2.91E-05
ethylbenzene		0.029		0.029	2.71E-03	2.58E-03	2.37E-03	3.88E-05	3.56E-05	3.04E-05
xylene		0.09		0.09	2.38E-03	2.27E-03	2.08E-03	3.50E-05	3.19E-05	2.71E-05
Aromatics										
naphthalene		0.004		0.004	5.86E-04	5.47E-04	4.82E-04	1.53E-05	1.23E-05	8.75E-06
pyrene		0.03		0.03	2.35E-06	2.15E-06	1.84E-06	1.95E-07	9.68E-08	4.83E-08
benzo (a) pyrene	7.3		1.37E-06		3.05E-07	2.80E-07	2.40E-07	2.56E-08	1.26E-08	6.29E-09

MfE: Oil Industry Guidelines 2011



Risk Assessment Fundamentals - Human Health

- Source – pathway – receptor model
- Exposure scenarios through exposure pathways
 - Ingestion – soil/produce
 - Inhalation
 - Dermal absorption
- Scenarios run based on end land use – changing exposure rates
- No encumbrance on the end land use based on normal activities
- A risk level of 1×10^{-5} is used in New Zealand
 - one additional cancer in every 100,000 people in an exposed population



Activity/Hazard	Lifetime Risk	Annual risk (per million)
Death from cancer (all causes)	~ 0.2	
Leukemia	0.004	50
Voluntary activity		
Smoking (20 cigarettes/day)	0.35	5000
Drinking (1 bottle wine/day)	0.005	75
Taking contraceptive pill	0.001	20
Involuntary Activity		
Run over by road vehicle- NSW	0.005	80
- USA	0.004	50
- UK	0.004	50
Flood (USA)	0.0002	2.2
Bushfire (Australia)	0.00007	1.0
Lightning (UK)	0.000007	0.1
Typical acceptable cancer risk for contaminated land	0.0001 to 0.000001	



Environmental Risk Assessment

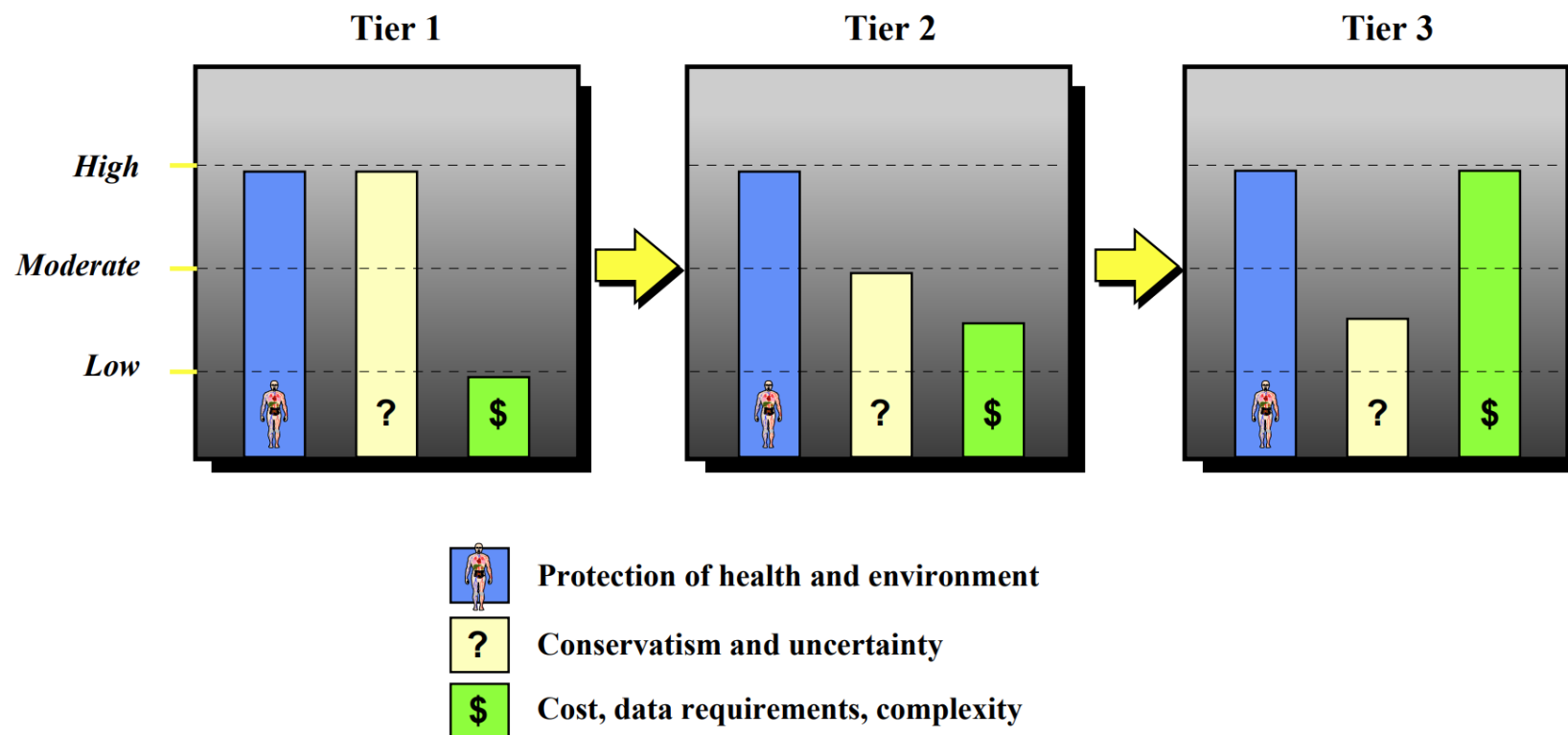


Figure 1.2 Comparison of cost, uncertainty and conservatism for tiered approach

Source: 'Guidance Manual for Risk-Based Corrective Action Tier 2 RBCA' June, 1995

In the Beginning - ANZECC



- The New Zealand policy goals for contaminated site assessment and clean-up established set out in the ANZECC Guidelines were:
 - to render a site acceptable and safe for the long-term continuation of its existing use
 - to minimise environmental and health risks both on-site and off-site
 - where site clean-up is required,
 - to achieve a standard that minimises risks to human health and the environment consistent with the existing and likely future use of the site,
 - and that the clean-up has been conducted to an extent consistent with particular land uses
- Presented a risk assessment approach to develop **generic acceptance criteria** for human health and the environment
 - sufficient to guide clean-up actions
 - obviate need (and cost) to generate site specific criteria

AUSTRALIAN AND NEW ZEALAND GUIDELINES

FOR THE ASSESSMENT AND MANAGEMENT OF

CONTAMINATED SITES

Australian and New Zealand Environment and Conservation Council
National Health and Medical Research Council

January 1992





Industry Specific Guidance

- Risk based criteria
- Exposure scenario specific assessment
- Different media reviewed
 - Soil
 - Groundwater
 - Soil gas



MODULES

Identifying, Investigating and Managing Risks Associated with Former Sheep-dip Sites

A guide for local authorities

Published in November 2006 by the
Ministry for the Environment
Manatū Mō Te Taiao
PO Box 10-362, Wellington, New Zealand

ISBN 0-478-30106-5
ME number: 775

This document is available on the Ministry for the Environment's website:
www.mfe.govt.nz



June 1999

Guidelines for Assessing and Managing Contaminated Gasworks Sites in New Zealand

Part One: Users' Guide
Part Two: Supporting Technical Information (on disk)

August 1997



Health and Environmental Guidelines for Selected Timber Treatment Chemicals



June 1997 Wellington



Industry Specific Guidance

- Background to industry processes
- Layout of sites
- Decision flow charts
- Risk assessment models
- Specific chemicals of concern set out
- CoC fate and transport
- DQO
- Geology/site conditions specific

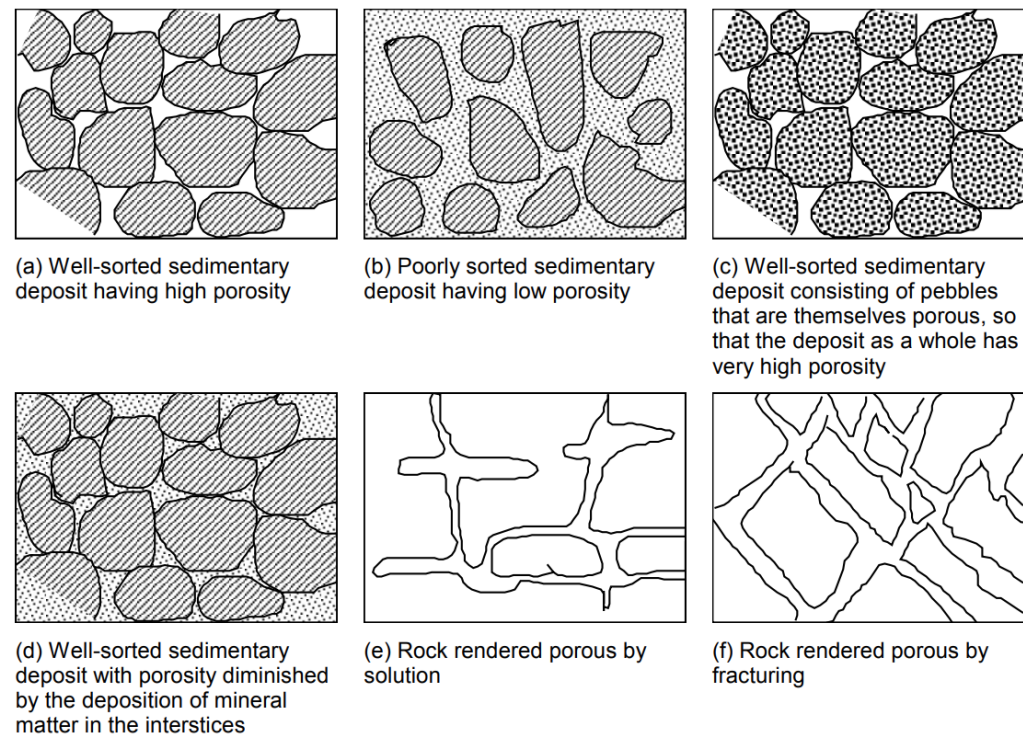


Figure 2.4 Relationship between texture and porosity

Source: Domenico and Schwartz, 1990

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Industry Specific Guidance

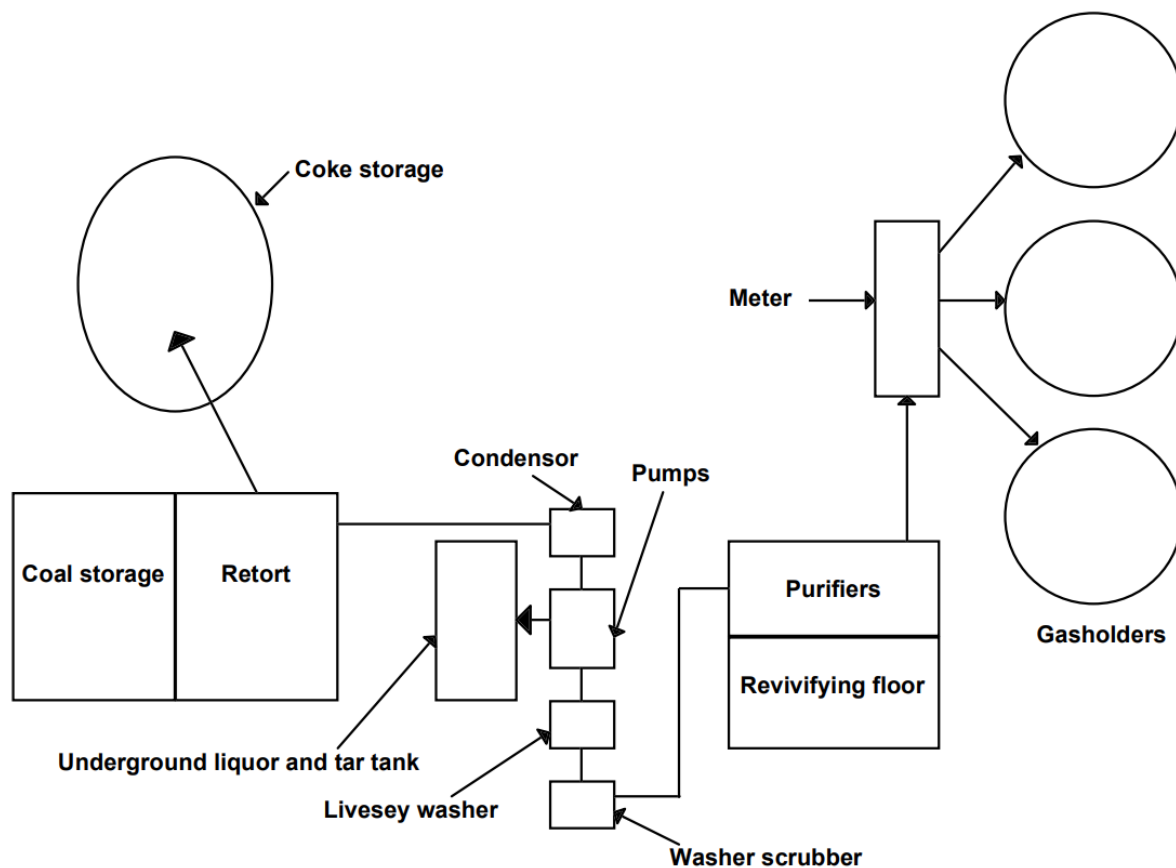


Figure 1.1 Common layout for a gasworks (adapted from Meade 1934)

Module 1 An introduction to gasworks sites

- 1.1 Introduction
- 1.2 Gasworks processes
- 1.3 Major process units
- 1.4 Fate and transport of gasworks contaminants

Module 4 Generic soil acceptance criteria

- 4.1 Introduction
- 4.2 Development of generic health-based soil acceptance criteria
- 4.3 Ecological considerations
- 4.4 Aesthetic considerations
- 4.5 References

Appendices

- 4A Health effect summaries for selected gasworks contaminants
- 4B Ecologically-based investigation thresholds

4C Exposure equations

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Module 5 Generic acceptance criteria for groundwater and surface water

- 5.1 Introduction
- 5.2 Groundwater uses
- 5.3 Potable use
- 5.4 Stock watering
- 5.5 Irrigation use
- 5.6 Aquatic ecosystem protection
- 5.7 Primary contact recreation
- 5.8 References

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Appendices

- 5A Calculation of criteria for stock water use
- 5B Calculation of criteria for irrigation use
- 5C Calculation of criteria for primary contact recreation

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Industry Specific Guidance

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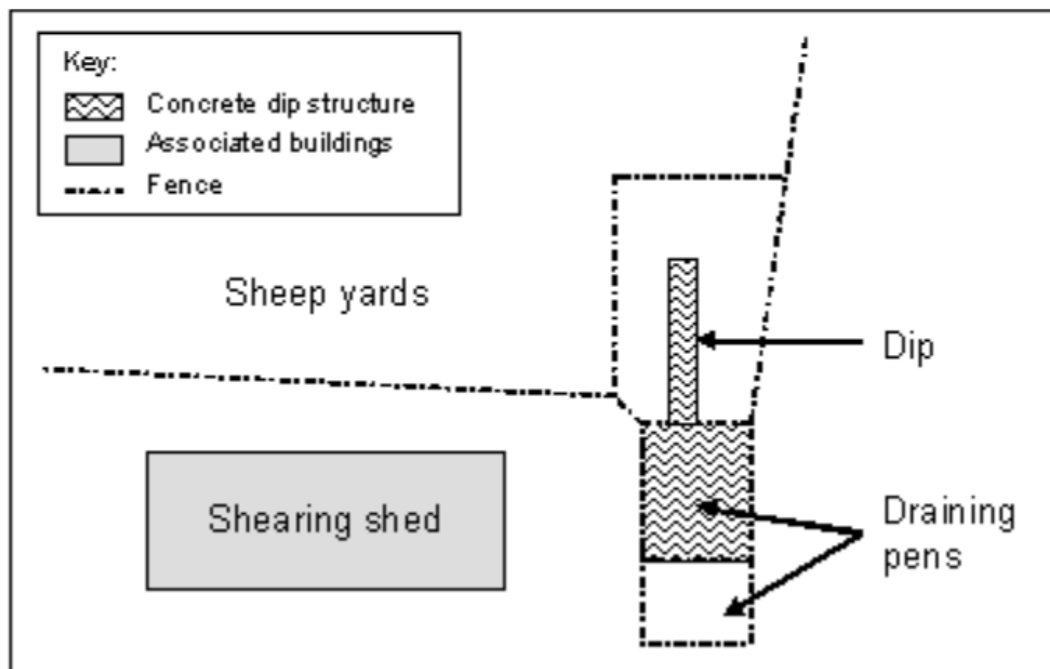
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Industry Specific Guidance

Figure 3: Sketch of sheep-dip site with associated structures and buildings



2 Characteristics of Sheep-dip Contamination

- 2.1 Dipping practices
- 2.2 Likely pattern of contamination
- 2.3 Chemicals used for sheep dipping
- 2.4 Exposure pathways and risks
 - Exposure pathways
 - Health risks
 - Ecological concerns
 - Summary of most common concerns for local authorities

MfE: Sheep dip Guidelines 2006

Groundwater

- Not assessed in NESCS
- Forgotten media
- Data required to assess discharges
- Specific MfE criteria provided

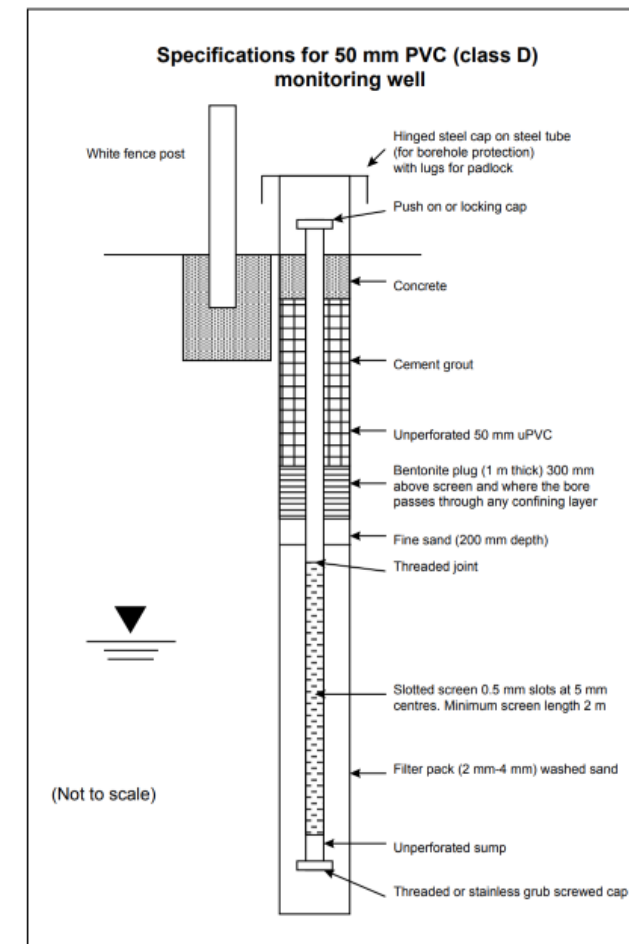


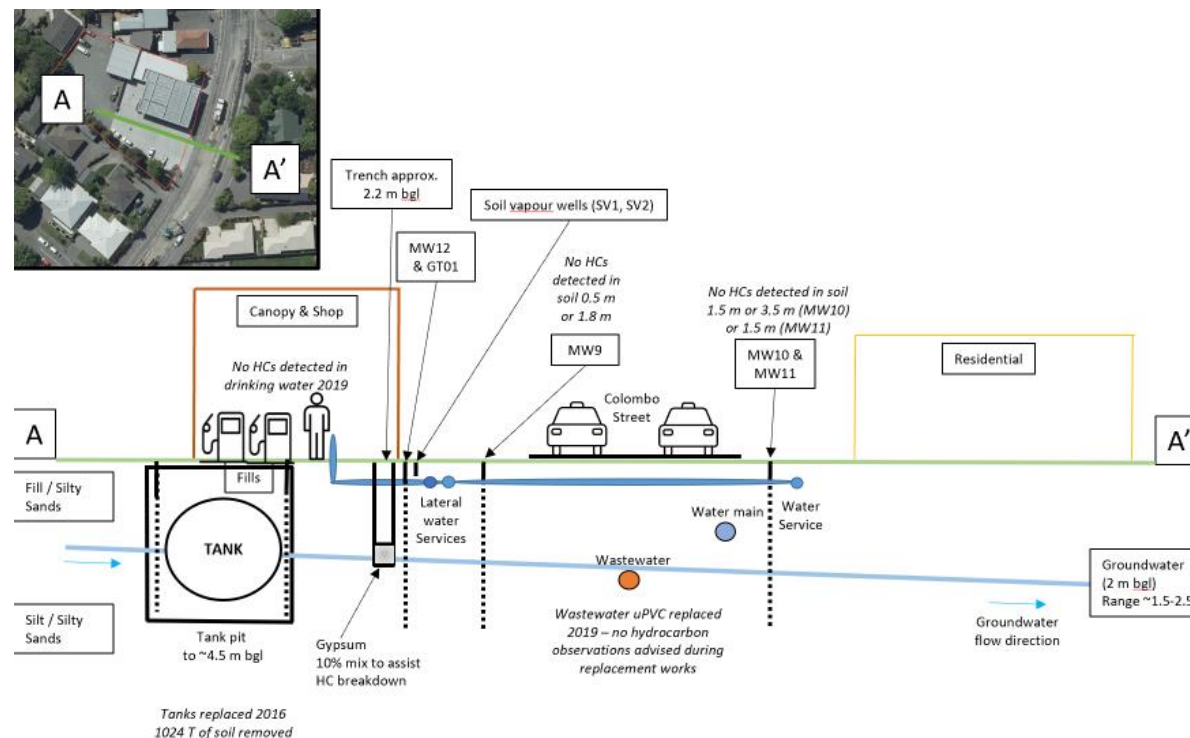
Figure 3.2 Details of monitoring well

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CSM thinking

- Consider each exposure pathway
- Complete risk assessment
- Identify gaps in investigation
- Tiered approach to investigation
- Complete further media sampling
- Activity decisions based on risk





Relevance today

- NES SGV priority contaminants only
- Other media than just soils
- CSM thinking
- Source – pathway - receptor
- Industry process background
- Investigation design
- Greater overall understanding
- Essential reading for all!



Thank you

