

Investigation of PFAS contamination at Fire and Emergency sites

Updated May 2022

The issue of PFAS contamination in New Zealand was first highlighted at NZ Defence Force sites in late 2017. In early 2018, Fire and Emergency engaged an independent environmental consultancy, Pattle Delamore Partners (PDP), to assess the potential for residual soil and groundwater contamination from any past use of firefighting foam on our sites.

They developed the three-stage structured programme that we have used for our assessments and investigations which follows the established New Zealand Guidance for investigation of contaminated land. This programme has three steps:

1. Identification (initial screening and prioritisation);
2. Preliminary Site Investigation (PSI);
3. Detailed Site Investigation (DSI).

The first step identified 115 locations (out of a total of over 650 operational sites across the country) for initial assessment and prioritised them using the Ministry for the Environment's PFAS prioritisation tool.

The outcome of that process was to carry out Preliminary Site Investigations (PSIs) for the following 8 sites (the 2nd step):

- Woolston Fire Training Centre and Fire Station
- Silverdale
- Feilding
- Masterton
- Dunedin
- Washdyke
- Napier
- Hastings

The results of the PSI (which is a desk-top analysis) would determine the necessity and scope of any further investigation that was necessary to characterise potential contamination, either preliminary soil sampling or a Detailed Site investigation (DSI) (the 3rd step).

The PSIs included the development of a risk-based Conceptual Site Model (CSM) for each of the eight sites, identifying potential sources of contamination, potential receptors and pathways between them. The focus was on risks to human health from possible exposure to PFAS through soil, groundwater or surface water. For those sites where the CSM identified complete pathways, further investigation in the form of either preliminary sampling or a DSI was then undertaken in line with the consultant's recommendations.

Where sampling has been undertaken to confirm the presence or absence of contamination, the results of the analyses have been compared to the applicable guideline values (see Appendix 2).

Note: while we have yet to complete one investigation, all sampling at all sites to date has found either:

- no evidence of PFAS, or
- PFAS at levels below, or well below, guideline levels.

At each stage of investigation for each site, Fire and Emergency has discussed the scope and the outcomes with the regional council and territorial authority before determining how to proceed.

The table below summarises the status and outcome of our investigations for the 8 sites.

Appendix 1 Summary of site investigations

Site	Investigation	Date completed	Outcome
Woolston Fire Station and Training Centre Investigations ongoing	Preliminary site investigation (PSI)	June 2019	Identified complete pathways. Recommended Detailed Site Investigation (DSI).
	Detailed site investigation (DSI) – Phase 1 <i>Soil samples</i> at 21 locations on the site <i>Water and sediment samples</i> at 3 locations on the adjacent Heathcote River	Dec 2019	<i>Soil</i> : PFOS, PFHxS and PFOA detected in all soil samples but all below guidelines levels for industrial/commercial sites. <i>Surface water</i> : results below guideline levels for recreational water and freshwater guideline levels at the 95% species protection level. <i>Sediment</i> : detections at low levels in one sample only. Discussed and agreed with ECan to sample groundwater on the site and determine groundwater flow; no further soil, surface water or sediment sampling required.
	Detailed site investigation (DSI) – Phase 2 Installation and sampling of groundwater wells on the site	Mar – May 2020	Five groundwater monitoring wells installed between March and May 2020, and initial sampling of groundwater.
	Detailed site investigation (DSI) – Phase 3 Installation and sampling of groundwater wells on the site	Ongoing Oct 2020 – current	Quarterly sampling of groundwater from five site wells continuing through to October 2022. Also measurement of groundwater levels and hydraulic conductivity to determine extent of tidal influence, sampling of stormwater and site soil/rubble pile.
	Detailed site investigation (DSI) – Phase 4 Installation and sampling of sentinel wells on adjacent property (Waterman Place)	Ongoing (May 2022)	Five sentinel wells installed in March 2022 to delineate the extent of the groundwater plume and whether it extends beyond the site boundary. These will be sampled quarterly (from April 2022) as part of the ongoing groundwater monitoring programme.
Silverdale Fire Station Investigations completed	Preliminary site investigation (PSI)	July 2019	Recommended some preliminary shallow soil sampling.
	Preliminary soil sampling Five locations on site	Aug 2019	PFOS, PFHxS and PFOA detected in soil samples but all well below guidelines levels for industrial/commercial sites.
		Aug 2019	Agreed with Auckland Council that no further investigation required.
Feilding Fire Station Investigations completed	Preliminary site investigation (PSI)	Oct 2019	Recommended some preliminary shallow soil sampling.
	Preliminary soil sampling Five locations on site	Sept 2019	PFOS, PFHxS and PFOA detected in soil samples but all well below guidelines levels for industrial/commercial sites.
		Nov 2019	Agreed with Horizons Regional Council and Manawatu District Council that no further investigation required.
Masterton Fire Station Investigations completed	Preliminary site investigation (PSI)	Sept 2019	Identified complete pathways. Recommended Detailed Site Investigation (DSI).
	Detailed site investigation (DSI) <i>Soil samples</i> at 8 locations on the site <i>Water samples</i> at 3 locations in adjacent Waipoua River <i>Water samples</i> in stormwater channel (1 location) and locations around the Lake of Remembrance (2 locations) <i>Sediment samples</i> in the Waipoua River (2 locations), the stormwater channel (1 location) and around the lake (2 locations).	Feb 2020	<i>Soil</i> : PFOS, PFHxS and PFOA detected in soil but all well below guidelines levels for industrial/commercial sites. <i>Surface water and sediment</i> : No PFAS was detected in any of the samples.
		Mar 2020	Agreed with Greater Wellington Regional Council and Masterton District Council that no further investigation required
Napier Fire Station Investigations completed	Preliminary site investigation (PSI)	Nov 2019	Identified complete pathways. Recommended Detailed Site Investigation (DSI)
	Detailed site investigation (DSI) <i>Soil samples</i> at 16 locations on the site <i>Soil samples</i> at 8 locations on the adjacent Council reserve land <i>Water and sediment samples</i> at 3 locations on the adjacent Georges Drive Stream	July 2020	<i>Soil</i> : PFOS, PFHxS and PFOA detected in soil but all below guidelines levels for industrial/commercial sites <i>Surface water</i> : No PFAS was detected in any of the samples. <i>Sediment</i> : Detections at low levels in one sample only. Discussed and agreed with Hawkes Bay Regional Council and Napier City Council that no further investigation required.
Hastings Fire Station Investigations completed	Preliminary site investigation (PSI)	Nov 2019	Recommended some preliminary shallow soil sampling
	Preliminary soil sampling <i>Soil samples</i> at 13 locations on the site	July 2020	PFOS, PFHxS and PFOA detected in soil but all below guidelines levels for industrial/commercial sites. Agreed with Hawkes Bay Regional Council and Hastings District Council that no further investigation required. Note: Sampling of groundwater in bores in the deep aquifer in Hastings by Hawkes Bay Regional Council in May 2019 did not detect any PFAS.
Dunedin Fire Station Investigations completed	Preliminary site investigation (PSI)	Dec 2019	Recommended some preliminary sampling at the harbour outfall to which the site stormwater drains.
		Mar 2020	Discussions with Otago Regional Council concluded there was no suitable location for sampling stormwater or sediment for PFAS that could be directly attributed to the Fire Station site given the extent of the municipal stormwater network in the area and potential other PFAS sources nearby. It was subsequently confirmed that the stormwater sumps on the station had been cleaned out twice per annum over the last 10 years, so sampling of stormwater or sediment on the site itself would be unlikely to find any residual contamination. Therefore there was no complete pathway. Agreed with Otago Regional Council to close out the investigation without sampling; Dunedin City Council advised and concurred.

Site	Investigation	Date completed	Outcome
Washdyke Fire station	Preliminary site investigation (PSI)	Dec 2019	No complete pathways, no further investigation recommended.
Investigations completed		Mar 2019	Agreed with ECan and Timaru District Council that no further investigation required

Appendix 2 Guideline values for PFAS

The source of the guidance is the [Ministry for the Environment's PFAS Investigation, Response and Funding Guidance April 2019 \(Appendix\)](#) which in turn references the Heads of Environment Protection Agencies, (Australia and New Zealand), [National Environmental Management Plan](#).

Human health based guidance for water

Reference item	PFOS	PFOA
Drinking water (Note 1)	0.07µg/L (micrograms per litre)	0.56 µg/L
Recreational water	0.7 µg/L	5.6 µg/L

Human health screening values for soil

Reference item	PFOS/PFHxS	PFOA
Residential with garden/accessible soil	0.009 mg/kg(milligrams per kg)	0.1 mg/kg
Residential with minimal opportunities for soil access	2 mg/kg	20 mg/kg
Public open space	1 mg/kg	10 mg/kg
Industrial/commercial	20 mg/kg	50 mg/kg

Where samples of surface water have been collected for analysis (such as from rivers) the results have also been compared to Freshwater Guideline Values for aquatic ecosystems with the scenario of "95% species protection – slightly to moderately disturbed systems". These values are also noted in the MfE guidelines.

Reference item	PFOS	PFOA
Aquatic ecosystems	0.13µg/L (micrograms per litre)	220 µg/L

1 mg/L (for water) and 1 mg/kg (for soil) is equivalent to 1 ppm (part per million)

1 µg/L (for water) is equivalent to 1 ppb (part per billion) = 1000 ppt (parts per trillion)

As there are no established guideline levels for PFAS in sediments, the results of sediment testing where undertaken, have been discussed with the local regional council, to determine the next steps.

Limits of reporting

Where results for samples are noted as "PFAS not detected" that means that PFAS was not present above the limits of reporting (LOR). The LORs are determined by the test method and the laboratory equipment, and the LOR may be higher than the limit of detection, but is the level at which the analysis gives a reliable and repeatable result.

For water samples, the LOR is 0.025 µg/L (part per billion) (high level) or 0.001 µg/L (low level).

For soil samples, the LOR is 0.001 mg/kg (part per million).

Document information

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Record of amendments

Date	Brief description of amendment
July 2020	Initial version
April 2022	Updated to reflect current state of investigations