

# Per- and poly-fluoroalkyl substances (PFAS)

## BACKGROUND

### What are per- and poly-fluorinated alkyl substances (PFAS)?

Per- and poly-fluoroalkyl substances (PFAS) are a class of manufactured chemicals that have been used since the 1950s to make products that resist heat, stains, grease and water.

Firefighting foams also used to contain PFAS, such as Aqueous Film Forming fire-fighting Foams (AFFF™) and Alcohol-Type Concentrate (ATC™) fire-fighting foams for extinguishing flammable fuel fires. They were primarily used due to their effectiveness in extinguishing fuel fires.

There are many types of PFAS, with the most well-known examples being perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS).

PFOS was also a component of the Scotchgard™ range of products, while Teflon® and other trademark products may contain trace amounts of PFOA and other related PFAS chemicals as impurities.

### Why are we talking about PFAS?

Firefighting foams containing PFAS were used by the NT Fire and Rescue Service up until the mid-2000s and according to the Australian Defence Force, until 2011.

These foams were used on RAAF Base Tindal and entered the environment through the ground and nearby waterways.

Sampling by Defence has found concentrations of PFAS in the Tindall aquifer which has required further investigation because of reliance of this aquifer as a water source.

### How is PFAS contamination being investigated?

As part of a detailed environmental investigation, Defence is currently undertaking Human Health Risk Assessments and Ecological Risk Assessments.

A Human Health Risk Assessment will assess the possible risks within the investigation area around RAAF Base Tindal, including the Katherine Township, associated with human exposure to PFAS, while the Ecological Risk Assessment will appraise the potential adverse effects on native wildlife and the wider environment as a result of exposure to PFAS.

The risk assessments inform future actions, such as advice provided by government agencies and authorities about the consumption of home grown produce, and the viability of voluntary blood testing. The risk assessments are completed in conjunction with government agencies, experts and the community. As part of these risk assessments, certain plants and animals will be tested to better understand the human and environmental food chains. Some samples have already been collected, and this will continue through to early 2018. Targeted produce surveys will also be used to understand the type and amount of locally sourced foods that are consumed by people.

Defence has contracted Coffey as their consultant to lead the environmental investigation around RAAF Base Tindal. Initially this starts with a detailed site investigation which is then followed by an Ecological Risk Assessment and Human Health Risk Assessment.

The final Human Health Risk and Ecological Risk Assessments are expected to be completed by April 2018. Both reports need to be reviewed by the technical authorities (auditors and Government agencies) before being approved for public release.

# EXPOSURE PATHWAYS

The main pathways for PFAS to enter the body are through drinking water and eating food.

For RAAF Base Tindal, exposure through drinking water, recreational water contact by bore or town water and consumption of key home-grown produce (i.e. eggs) could provide an early indication of any potential health risks. Other potential pathways are being investigated as part of the Defence investigations across Australia.

## Will PFAS levels in the body stay the same?

Currently, there are no medical interventions that will remove PFAS from the body. However, PFAS concentrations within the body are known to reduce over time if exposure to them is decreased.

## What are the latest guidelines?

The Australian Government released national health based guidance values for PFAS in April 2017, which includes a Tolerable Daily Intake (TDI) for PFAS. A TDI is a conservative estimate of the amount of a chemical in food or drinking water that can be consumed daily over a lifetime i.e. 80 years, without any appreciable health risk to the consumer, expressed on a body weight basis.

From the TDI, health based guidance values for measuring PFAS in drinking water and recreational water quality can be determined, measured in micrograms per litre (µg/L).

There are three types of PFAS chemicals that have health based guidance values assigned to them. These are shown in the table below.

	PFOS/PFHXs combined	PFOA
Tolerable daily intake (µg/kg bw/day)	0.02	0.16
Drinking water quality value (µg/L)	0.07	0.56
Recreational water quality value (µg/L)	0.7	5.6

The health based guidance values are protective of human health and are also a precautionary measure for use, when conducting site investigations and assist in providing advice to affected communities on how to minimise exposure to PFAS.

The health based guidance values will be used consistently in undertaking Human Health Risk Assessments across Australia and at the three sites in the Northern Territory (NT) i.e. RAAF Base Darwin; Robertson Barracks; and RAAF Base Tindal.

# HEALTH EFFECTS

## **Are there health effects from exposure to these chemicals?**

National health authorities, including the Australian Health Protection Principal Committee; the Environmental Health Standing Committee (enHealth); and Food Standards Australia New Zealand advise that there is currently no consistent evidence that exposure to PFAS causes any diseases or adverse human health effects.

Whether PFOS or PFOA cause health problems in humans is currently unknown and further national and international research is being conducted. On current evidence from studies in animals however, the potential for adverse health effects while not currently proven, cannot be excluded. Because the elimination of PFAS from the human body is slow there is a potential risk that continued exposure to PFOS and PFOA could cause adverse health effects. This is why the Northern Territory Government is taking a cautionary approach to managing these chemicals in the Northern Territory.

Adverse health effects have been demonstrated in animal studies, but at higher levels than are found in people. As well, the applicability of the effects in animals to humans is not well established. The existing limited studies on PFHxS suggest that this chemical can cause effects in laboratory test animals similar to the effects caused by PFOS. However, based on available studies, PFHxS appears to be less of an issue in animal studies than PFOS.

Much of the research on humans has been done with people who were exposed to relatively high levels of PFAS through their work. Workers involved in the manufacture or use of PFAS usually have higher blood PFAS levels than the general public. Overseas studies on PFAS workers have looked for effects on cholesterol levels, male hormones, heart disease, liver changes and other effects, including cancer. These studies have not consistently shown that PFAS exposure is linked to health problems.

## **Should people concerned about exposures to PFAS get themselves tested?**

The Australian Department of Health is offering blood tests for people who live or work, or have lived or worked in the Investigation Area as part of a package of measures to support the Katherine community.

In addition to voluntary free blood testing and counselling services, the Australian Government will also be funding an epidemiological study looking at the potential causes and patterns of the health effects of PFAS in the Katherine community. The Australian Department of Health will be providing more information on these services early in 2018.

## **Are there any risks to pregnant women?**

There is currently no consistent evidence that exposure to PFOS or PFOA causes adverse human health outcomes in pregnant women or their babies. It is recommended however as a precautionary measure that pregnant women minimise their exposure to PFAS.

## **Can I breastfeed my child?**

The significant health benefits of breast feeding are well established and far outweigh any potential health risks to an infant from any PFOS or PFOA transferred through breast milk.

It is recommended that mothers living in or around sites contaminated with PFOS or PFOA continue breast feeding.

# DRINKING WATER

## **What is the current situation with the Katherine drinking water supply?**

Power and Water is undertaking regular sampling of drinking water in Katherine. The rolling average results of the public water supply remain well below the health based guidance value for PFAS.

Due to water conservation measures, Power and Water is less reliant upon the use of ground water for blending with river water to supply Katherine customers. This has resulted in undetectable levels of PFAS in the drinking water supply as there are negligible concentrations of PFAS in Katherine River water.

To reduce the probability of PFAS concentrations from occurring, Defence has engaged an international environmental company, Emerging Compounds Treatment Technologies, known as ECT2, to provide a water treatment plant that is capable of removing PFAS from water.

The plant is designed to treat 1,000,000 litres of groundwater per day. Although historically the Katherine Water Treatment Plant has relied on a quantity of groundwater greater than this to meet demand, Power and Water and Defence anticipate that treating this portion of groundwater, in conjunction with reduced daily demand through the water conservation measures, will result in undetectable levels of PFAS in the public water supply.

Current test results show undetectable levels of PFAS in the treated ground water.

The NT Government and the Department of Defence are working on longer term strategies for the future water supply requirements of Katherine.

## **Is the water safe to drink?**

The NT Chief Health Officer has advised that the Katherine drinking water supply is safe for consumption.

Residents living in the Katherine rural area near RAAF Base Tindal who rely solely on bore water and don't have access to the town water supply are advised to contact the Department of Defence national hotline on **1800 365 414**.

## **Should I filter my tap water before drinking?**

There is no recommended specific point-of-use filters for drinking water because the effectiveness and proper use of these devices has not been established.

## **How about taking a shower or bath?**

The Australian Government Department of Health has stated that routine showering or bathing will not likely cause a significant exposure to PFAS.

Many PFAS chemicals including PFOS and PFOA are essentially non-volatile, such that inhalation while bathing or showering is unlikely to be a major exposure pathway.

Studies have shown very limited absorption of PFAS through the skin, such as showering or swimming.

## **Can I do laundry and wash dishes with tap water?**

Yes. Doing laundry or washing dishes is not likely to pose any significant exposure to PFAS.

## **Will boiling water get rid of any PFAS?**

No.

## EATING FOOD

### **Why are we being advised not to eat aquatic species from Tindal Creek and Katherine River?**

The concern relates to frequent consumption of aquatic species taken from the river.

There are no conclusive results available yet. As a precautionary measure, the NT Department of Health has recommended that people avoid eating fish, shellfish and cherabin from the Katherine River and Tindal Creek.

The NT Department of Health will be in a better position to provide advice on safe levels of consumption of various aquatic species from these waterways once the results of the final HHRA are known.

### **How will visitors and locals know about the health warning not to eat fish from this area?**

Signage has been erected along the Katherine River and Tindal Creek in the affected areas to directly inform people.

Information and fact sheets will be made available around Katherine in service stations, the visitor centre and in tackle shops.

### **What about fish caught for commercial purposes?**

There is no commercial fishing in the Katherine area.

### **What about fish downstream from Katherine?**

The NT Government has collected a small number of fish samples downstream from the Daly River for initial PFAS testing.

Food Standards Australia New Zealand has reviewed results for the fish samples caught in the Daly River and analysed this data against the Health Based Guidance Values (HBGVs), the report was provided in December 2017. This initial analysis is based on a small number of samples.

The report found that consumption of barramundi, catfish and mullet species caught in the Daly River are unlikely to present a public health and safety concern.

Results indicate that under normal patterns of consumption the HBGV is unlikely to be exceeded for overall consumption of a range of fish species over time.

These PFAS test results do not alter the recommended maximum fish consumption for a healthy diet (an average of 3 x 150 gram serves per week for an adult and two or less serves per week for an expectant or pregnant woman or a child, depending on the fish type). People are reminded to adhere to the fish consumption advice published by Food Standards Australia New Zealand on its website at:

<http://www.foodstandards.gov.au/consumer/chemicals/mercury/documents/mif%20brochure.pdf>

As part of its detailed environmental evaluation, the Australian Defence Department will ensure sufficient further wet season testing is conducted to provide Katherine residents with a complete picture of potential impacts on aquatic life downstream from the PFAS contamination at Tindal.

### **Will this impact my visit to the Katherine region?**

The region has a variety of attractions for visitors and locals to enjoy, including gorges and waterfalls, thermal springs and ancient cultural experiences. Visitors can go on self-drive adventures or fishing, camping, kayaking and trekking.

### **Will I be able to eat fish from Tindal Creek and the Katherine River again?**

It must be stressed that this is purely a precautionary measure as we await further wet season sampling results and the release of the final Human Health Risk Assessment by Defence in April 2018.

The NT Department of Health will be in a better position to provide advice on safe levels of consumption of various aquatic species from Tindal Creek and the Katherine River once the results of the final HHRA are known.

**Does it apply to turtles as well?**

Results received from Defence focused on fish, shellfish and cherabin, so there are no results available for turtles or other aquatic species.

People looking to limit their exposure to PFAS should consider avoiding consumption of aquatic species from the affected area in the Katherine River and Tindal Creek. This is just as a precaution to limit potential exposure as there is no conclusive evidence available about potential PFAS levels.

Coffey are currently seeking ethics approval for a number of other aquatic species.

**How long will this arrangement be in place?**

The NT Department of Health advice will remain in place until more information is available from the final Human Health Risk Assessment anticipated to be released by Defence in April 2018.

**What is the risk if someone inadvertently eats fish from the river?**

There is no consistent evidence of human health effects related to PFAS exposure; however the possibility cannot be excluded. As a result the NT Government is taking a cautionary approach to safeguard the health of Territorians.

The potential risk increases if aquatic life, including fish and shellfish, are frequently consumed. The risk to tourists and visitors who may occasionally eat fish from the affected area of the river is considered to be very low.

**Can I eat food grown in the Northern Territory?**

Consumers should have confidence in the integrity of commercial agricultural produce grown in the Northern Territory.

A dietary exposure assessment conducted by Food Standards Australia New Zealand (FSANZ) has indicated that the risk posed by PFAS chemicals to consumers in the general population is likely to be very low. Food safety regulators have assessed that exposure through food does not need to be managed through setting maximum limits.

Health-Based Guidance Values (HBGV) have been released to help people living in and around PFAS contaminated areas to manage their exposure. The HBGVs are primarily expressed as a Tolerable Daily Intake (TDI), which is the amount of a chemical in food or drinking water than can be ingested over a lifetime without appreciable risk to the consumer.

Commonwealth health based guidance values for PFAS developed by Food Standards Australia New Zealand are a precautionary measure for use in site investigations in Australia. The values are most relevant for people living and working within investigation areas. These values indicate the PFAS limits in drinking water or food that can be consumed on a regular basis over a lifetime without any significant risk to health.

Agricultural businesses in the Katherine area are primarily out of the known affected area. All produce tested from commercial businesses, both within and outside the investigative area have been below levels of concern.

**Should I eat my home-grown produce from PFAS-affected areas?**

Health-Based Guidance Values (HBGV) for PFAS have been released to help people living in and around PFAS contaminated areas to manage their exposure. The HBGVs are primarily expressed as a Tolerable Daily Intake (TDI), which is the amount of a chemical in food or drinking water than can be ingested over a lifetime without appreciable risk to the consumer.

There is the potential that some produce produced in the investigative area may contain levels of PFOS. It is recommended that home grown food should be balanced with broader sourced fruit and vegetables.

As a precaution, consumption of eggs in the investigation area, where the chickens are drinking bore water, should be avoided until the final Human Health Risk Assessment is available in April 2018 and further advice can be provided.

The Tolerable Daily Intake value is important for people living in the investigation area and eating a lot of home-grown produce. The Human Health Risk Assessment being undertaken by Defence will look at produce in the investigation area surrounding RAAF Base Tindal, including the Katherine Township.

The Interim Human Health Risk Assessment report from the Department of Defence found that home-produce of fruit, vegetables and eggs in the investigation zones contained levels of PFAS. These and further wet season test results should be provided to FSANZ to provide expert analysis and advice on how these home-produce results align with the HBGVs for consumption by local residents.

Until further advice is available, residents in the investigation area may wish to manage their consumption of home-grown produce irrigated with bore water to ensure it is balanced with fruit and vegetables from broader sources to manage potential exposure, particularly for young children.

## SWIMMING

### Can I swim at the Katherine Town Swimming Pool?

Yes, recent results have identified PFAS levels below the recreational water quality health based guidance value.

### Can I swim at the Katherine Hot springs?

Yes. Recent results have identified PFAS levels below the recreational water quality health based guidance value.

### Can I swim in my backyard pool?

Yes. If your pool or spa has been filled with town water then it will be safe to use.

If your property is in the investigation area and you rely solely on bore water, then contact Defence about obtaining testing of your pool or spa, as tanked water may be required to ensure your pool remains below the national recreational water health based guidance value.

## GOVERNMENT RESPONSE

### What is the Government's response?

The NT government has formed a PFAS Interagency Steering Committee that is responsible for a co-ordinated approach to the investigation and response to potential environmental and health issues related to PFAS.

Various investigations are underway into the presence of PFAS in water and soils at locations where they may have been used in large quantities in the NT, including airports, firefighting training facilities and some industrial sites.

The NT response has included input to national guidelines and fact sheets, as well as local testing of drinking water supplies, sediment and aquatic foods in natural waterways around the NT.

## FURTHER INFORMATION

### Where can I get more information?

[www.ntepa.nt.gov.au](http://www.ntepa.nt.gov.au)

[www.defence.gov.au/ID/PFOSPFOA](http://www.defence.gov.au/ID/PFOSPFOA)

<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm>

<https://www.facebook.com/KatherineTownCouncil/>

[http://www.powerwater.com.au/sustainability\\_and\\_environment/katherine\\_water](http://www.powerwater.com.au/sustainability_and_environment/katherine_water)