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Shalika Walker
RTA Weipa Pty Ltd

(by email)

Dear Shalika

DES Notice Requesting Further Information (STAT1304)

1.0 Background

RTA Weipa Pty Ltd (RTAW) (ABN 54 137 266 285) engaged AECOM Australia Pty Ltd (AECOM) to conduct a detailed site investigation (DSI), specifically targeting per- and poly- fluoroalkyl substances (PFAS) in the Weipa and Andoom bauxite mining areas at mining lease 7024, 'the site', on Western Cape York Peninsula in Queensland. The DSI was completed to address Requirement 8 of a *Notice to Conduct or Commission an Environmental Evaluation* (STAT 1304) issued by the Department of Environment and Science (DES). AECOM issued a final DSI report on 29 April 2019. The DSI report characterised PFAS concentrations in soil, groundwater, surface water and sediment targeting six potential primary source areas identified in the preliminary site investigation (PSI) (Golder, 2018a). The areas under investigation consist of identified PFAS source areas on land used for operational purposes within the Andoom and East Weipa mining leases, the adjoining off-site land areas and the receiving environment that includes the Mission and Embley River catchments. In addition, the DSI report presented the results of aquatic biota sampling (83 samples) conducted by Golder (2018b) in the creeks and rivers of the Biota Sampling Investigation Area, which included:

- Andoom Creek.
- The tidal creeks, foreshore, mangrove and mudflats of the Mission River including Trunding Creek prior to it entering Albatross Bay.
- The lower Embley River in the Weipa Channel downstream of the confluence between the Hey and Embley Rivers and Beening Creek.

The DES issued a *Notice Requesting Further Information* for the site on 15 May 2019 (reference STAT 1304). The information requested included the following requirements (in Section C):

1. *Provide consideration of the diet of the Napranum community and calculate whether this population sub group may exceed the tolerable daily intake for all PFAS including PFOA and PFOS plus PFHxS. Consideration is to be given to whether the species included in the biota sampling undertaken are relevant and representative for assessing risk associated with seafood consumption from this community. If it is determined that further biota sampling is required to adequately determine these risks, provide results of the sampling undertaken and details of the relevant human health risk assessment in relation to this aspect.*
2. *Provide an assessment of whether the drinking water supply utilised by Napranum may be contaminated with PFAS, If drinking water is found to contain PFAS, the PFAS project team in the Department of Environment and Science (PFASProjectTeam@des.qld.gov.au) must be immediately advised.*
3. *Conduct a health risk assessment for the Napranum community subgroup. The risk assessment must consider the potential contribution of other sources such as PFAS contaminated drinking water, which may contribute to the PFAS intake in the area.*
4. *The Napranum water supply is to be included in the ongoing sampling program and considered in ongoing management measures.*
5. *Include information on the active engagement undertaken with the Napranum community in accordance with the principles for effective engagement within the NEMP.*

This letter has been prepared to provide further information requested for Requirements C1, C2 and C3. RTAW has prepared a separate document to provide responses for Requirements C4 and C5. Please refer to the separate document for these responses.

2.0 Response to Requirement C1

2.1 Further Assessment of Potential to Exceed the Tolerable Daily Intake

The DSI report identified that PFAS concentrations in all 83 biota samples analysed in 2018 were at least an order of magnitude below the Food Standards Australia New Zealand (FSANZ, 2017) trigger values for perfluorooctane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS) and perfluorooctanoic acid (PFOA) in food. Combined with the finding that the PFAS concentrations for all co-located surface water and sediment samples analysed were below the laboratory limit of reporting (LOR), it was concluded that PFAS contamination is not widespread in the receiving environment and there is negligible risk to human health from the consumption of aquatic biota.

Further assessment of the potential for aquatic food consumers in the Napranum community population sub-group to exceed the tolerable daily intake (TDI) has been requested by DES. The rationale for this further assessment is that the adopted biota screening guidelines are based on food consumption statistics for the general population and may not be relevant to traditional food consumption patterns. In the absence of information regarding the food consumption rates for seafood in the Napranum community population sub-group, consideration has been given to the quantities of seafood that would need to be consumed in order to exceed the TDI, and whether those levels of consumption are realistic for this community.

2.1.1 PFOS and PFHxS

Of the 83 samples of aquatic biota that have been analysed for PFAS as part of the investigation to date, PFOS and/or PFHxS were only detected in two samples (0.0004 and 0.0007 mg/kg). Taking a conservative approach and assuming that sum of PFOS and PFHxS could be present at the laboratory LOR (0.0005 mg/kg) in the remaining 81 samples, the mean concentration of sum of PFOS and PFHxS in these aquatic biota would be 0.0005 mg/kg.

- At this mean concentration, a 15 kg child would have to eat 0.6 kg of these seafood every day for a lifetime in order to exceed the TDI.
- At this mean concentration, a 70 kg adult would have to eat 2.8 kg of these seafood every day for a lifetime in order to exceed the TDI.

Both of these seafood consumption rates are considered unrealistic. Further, both of the above rates of seafood consumption are more than 10 times higher than the upper consumption rate recommended by Queensland Health to avoid excess mercury intakes (three serves per week). Therefore it is considered that it is unlikely that the TDI would be exceeded even at high levels of seafood consumption for the Napranum community, and if current Queensland Health advisories regarding limiting mercury intake via seafood consumption are followed, there would be low risk of exceeding the TDI for sum of PFOS and PFHxS.

2.1.2 PFOA

Of the 83 samples of aquatic biota that have been analysed for PFAS as part of the investigation to date, PFOA was only detected in a single sample, at a concentration of 0.0005 mg/kg. Taking a conservative approach and assuming that PFOA could be present at the laboratory LOR (0.0005 mg/kg) in the remaining 82 samples, the mean concentration of PFOA in these aquatic biota would be 0.0005 mg/kg.

- At this mean concentration, a 15 kg child would have to eat 4.8 kg of these seafood every day for a lifetime in order to exceed the TDI.
- At this mean concentration, a 70 kg adult would have to eat 22.4 kg of these seafood every day for a lifetime in order to exceed the TDI.

Similar to PFOS and PFHxS, these seafood consumption rates are considered unrealistic and it is therefore considered that it is unlikely that the TDI would be exceeded even at high levels of seafood consumption for the Napranum community. If current Queensland Health advisories regarding limiting mercury intake via seafood consumption are followed, there would be low risk of exceeding the TDI for PFOA.

2.2 Further Assessment of Aquatic Biota Species Sampled

The aquatic biota species sampled from the Biota Sampling Investigation Area were selected based on consideration of species targeted by commercial fishing, guided recreational fishing, recreational fishing and traditional owner community fisheries (Golder, 2018b), as summarised below:

- The off-shore commercial net fishery targets tropical sharks and pelagic mackerel more than 200 km off-shore from Weipa.
- The off-shore commercial line fishery targets mackerel and operates approximately 37 km from the coast.
- The in-shore commercial net and line fishery targets barramundi and threadfin and operates between 13 km and 5 km from shore within Albatross Bay and potentially within the Biota Sampling Investigation Area. The in-shore fishery is closed during the barramundi breeding season from 1 November to 1 February each year.
- Commercial mud crab fishery occurs within the mangrove and mud-flat areas of Albatross Bay and the Biota Sampling Investigation Area.
- Albatross Bay and the Weipa area are within the Northern Prawn Fishery, with the main species targeted being tiger, king and banana prawns. While the prawn fishery does not cover the Biota Sampling Investigation Area, the mud flats and mangroves within the Biota Sampling Investigation Area provide a nursery ground for juvenile prawns which may later migrate to the fishery grounds.
- Fishing tourism is an important local industry, including guided fishing charters and tournaments. The pelagic species most commonly targeted by these operators are tuna, mackerel, trevally, marlin and sailfish. These are typically catch-and-release fishing activities, with the possible exception of tuna and mackerel. Pelagic species can cover hundreds of kilometres along the coastline as they move from one foraging ground to another and are likely to only be infrequently present in the Biota Sampling Investigation Area.
- In-shore guided recreational fishing operators focus on barramundi and may also target mangrove jack, threadfin and cod.
- Recreational fishing is a common leisure activity in the local community. Species commonly targeted by recreational fishers are common coral trout, crimson snapper, barramundi, mangrove jack, golden snapper, and mud crab.
- Fishing is an important activity for many indigenous communities in terms of tradition, cultural identity and maintaining kinship linkages (Henry and Lyle, 2003). As an important subsistence activity, aquatic biota may be consumed at a higher rate by traditional owners compared to non-indigenous fishers (Cisneros-Montemayor et al., 2016). Golder (2018b) reported that indigenous communities in the Weipa area commonly target barramundi, threadfin salmon, queenfish, mullet, mud crab, oysters, cockles, and mud mussels.

A total of 18 species of finfish, four species of crustaceans, and four species of bivalves/gastropods were collected during July 2018, and a total of 83 samples were analysed for PFAS.

To further assess whether the species sampled and analysed to date are relevant and representative for assessing risk associated with seafood consumption from the Napranum community population sub-group, **Attachment A** has been prepared to summarise information on:

- Whether the aquatic species sampled to date are relevant to those caught for recreational fishing and/or traditional foods in the Biota Sampling Investigation Area.
- Whether there are other aquatic species commonly caught as traditional foods in the Biota Sampling Investigation Area that were not sampled.
- Whether the aquatic species that were sampled can be considered to be representative of likely PFAS concentrations in the tissues of other species that were not sampled, based on similarities in habitats and feeding habits which may influence PFAS intakes by these organisms from food, sediment and water.

Review of the information presented in **Attachment A** identified:

- All of the species that were previously analysed for PFAS are considered relevant to traditional food consumption by the Napranum community population sub-group.
- A smaller number of aquatic species were identified that are considered relevant to traditional food consumption by the Napranum community population sub-group, but were not sampled and analysed for PFAS in 2018:
  - Ten finfish species.
  - Two species of bivalves/gastropods.
  - Four species of reptiles.
  - One mammalian species.

The ten finfish species identified as relevant to traditional food consumption but not sampled and analysed for PFAS are all carnivorous species feeding on smaller fish, crustaceans and molluscs. It is expected that finfish species with similar diet and habitat would have similar potential to accumulate PFAS from water, sediment or through the food chain. PFAS were not detected in all except one of the 12 carnivorous finfish species that were sampled and that are considered to have similar diet and habitat and therefore similar potential to accumulate PFAS in their tissues, as summarised in **Table 1** below. Therefore it is expected that PFAS accumulation in the tissues of the species that weren't sampled would be low. On this basis, sampling other species of aquatic biota with similar diet or feeding habit to those above is not considered warranted at this time.

Table 1 Finfish considered relevant to traditional food consumption

Species relevant to traditional food consumption but not sampled in the investigation area	Species that were sampled and have similar diet and habitat, and are also relevant to traditional food consumption
Blacktip reef shark	Milk shark
Barramundi	Blackspotted rockcod, Hawaiian Giant Herring
Mangrove jack	Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Fingermark	Common silverbiddy, Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Queenfish	Spotted javelinfish, Pikey bream, Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Sweetlip	Spotted javelinfish, Common silverbiddy
Giant trevally	Spotted javelinfish, Common silverbiddy, Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Northern sand flathead	Spotted javelinfish, Common silverbiddy, Pikey bream, Blue threadfin, Longtail catfish
Black jewfish	Spotted javelinfish, Common silverbiddy, Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Grey mackerel	Spotted javelinfish, Common silverbiddy, Striped snapper, Moses snapper, Goldenspotted rockcod, Blackspotted rockcod
Stingray	Milk shark
Rifle fish	Silverbiddy

The two species of bivalves/gastropods that were identified as relevant to traditional food consumption but not sampled and analysed for PFAS were blacklip oyster and mangrove worm. However, *Crassostrea sp*. oysters were sampled and were not reported to have detectable PFAS in their tissue, and these would be expected to have similar potential for PFAS accumulation as blacklip oyster. Mangrove worms are different to the other bivalves that were sampled in that they burrow into the

dead wood of mangrove trees in the intertidal zones. However, Paalvast and Velde (2013) used stable isotope analysis to demonstrate that this species mainly feeds by filter feeding in contrast to wood consumption, and had a similar diet to *Mytilus edulis* and *Crassostrea gigas*, which species were attached to the wood instead of boring into it. Therefore the absence of detectable PFAS in *Crassostrea sp*. oysters indicates that it is likely that mangrove worm would also have negligible tissue concentrations of PFAS.

The review summarised in **Attachment A** identified that traditional foods could also include green turtle meat and eggs, flatback turtle eggs, hawksbill turtle eggs, saltwater crocodile eggs or dugong. Given the likely seasonal nature of the consumption of these traditional foods, combined with the general absence of detectable PFAS in the aquatic biota that have been sampled, it is considered unlikely that other higher order species such as marine mammals, reptiles, amphibians or birds that eat fish, crustaceans or bivalves could accumulate PFAS through the food chain to levels that would lead to the TDI being exceeded if these higher order animals were part of the diet of the Napranum community.

2.3 Conclusion

Based on the above, the risk of PFAS intakes exceeding the TDI is considered to be low for the Napranum community population sub-group and it is not suggested that additional aquatic biota sampling or surveys of the community on dietary habits is warranted at this time.

3.0 Response to Requirement C2

This requirement requests an assessment to consider whether the drinking water supply utilised by Napranum may be contaminated with PFAS.

AECOM understands DES conducted sampling on 16 November 2017 with three water supply bores M1, M2 and M3 sampled[1] (samples NASC01, NASC02 and NASC04, respectively) with a further water sample ('Bores Mixed', NASC03) collected from a tap at a residence in Napranum, which is representative of water quality following mixing of the water from the supply bores and post-treatment for chlorination. The sampling locations are shown on **Figure 1** below.



Figure 1 Locations of water supply bores and tap sampling point sampled by DES at Napranum in 2017

[1] Based on analytical results provided to RTAW (as permitted by Napranum Aboriginal Shire Council) on 29 May 2019

All four primary samples, plus four duplicate samples (one duplicate from each bore/tap) were analysed for PFAS at the Queensland Government Forensic and Scientific Services laboratory on 21 November 2017, certificate of analysis reference SSP0057626, see **Attachment B**. The analysis included 33 individual compounds and total fluorinated organics (sum of total oxidisable precursors (TOPA) for perfluoroalkyl carboxylic acids (C_4-C_{14}) and total (C_4-C_{10}) perfluoroalkyl sulfonic acids).

Review of the results indicated that one compound (PFOS) was detected above the laboratory limit of reporting (0.011 µg/L) in the primary sample from water supply bore M2 (sample NASC02, lab ID 17KE8666). No other compounds in this sample, or in the seven other samples, were detected at concentrations above the laboratory limit of reporting.

It is noted that the duplicate sample from water supply bore M2 (sample NASC02A, lab ID 17KE8670) had a higher detection limit (0.02 µg/L for PFOS) compared to the concentration detected in the primary sample.

The PFAS National Environmental Management Plan (NEMP) (HEPA, 2018) provides national health guideline values for drinking water for sum of PFHxS and PFOS (0.07 µg/L) and PFOA (0.56 µg/L). The PFAS concentrations detected in the water samples did not exceed these health guideline values.

These results indicated PFAS (specifically PFOS) was detected in one of the water supply bores (Bore M2), however, concentrations were below national guideline values for drinking water quality.

4.0 Response to Requirement C3

This requirement requests a health risk assessment for the Napranum community sub-group to be completed to consider the potential contribution of other sources such as PFAS contaminated drinking water, which may contribute to the PFAS intake in the area.

Requirements C1 and C2 reached the following conclusions:

- The risk of PFAS intakes in food exceeding the TDI was considered to be low for the Napranum community population sub-group.
- PFAS concentrations in groundwater from three water supply bores did not exceed national health guideline values for PFAS in drinking water.

Based on the findings of the health assessments responding to Requirements C1 and C2, the overall risk to the Napranum community sub-group from PFAS is considered to be acceptably low.

5.0 Closing

If you have any queries regarding the details presented in this letter, please contact the undersigned.

Yours faithfully

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Attachment A: Aquatic Biota Relevant to Human Consumption

Attachment B: Laboratory Analytical Report SSP0057626

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ATTACHMENT A: Aquatic Biota Relevant to Human Consumption

Attachment A: Aquatic Biota Relevant to Human Consumption

Aquatic Biota Type	Species Name	Scientific Name	Samples Collected by Golder?	Samples Analysed for PFAS?	Recreational Fishing Species?	Traditional Food Species?	Habitat	Diet	References
Finfish	Pikey bream	*Acanthopagrus berda*	Yes	Yes	Yes*	Yes	Adult pikey bream are mostly found in the brackish water of estuaries, inlets, coastal rivers and tidal creeks. Have also been found in the lower sections of freshwater streams. Juveniles occur in protected bays and estuaries.	Benthic. Feeds on polychaete worms, molluscs, small crustaceans, insect larvae and bony fishes; also consume macrophytic algae.	http://fishesofaustralia.net.au/home/species/673#moreinfo https://www.daf.qld.gov.au/fish-identification-information/fish-species-guide/fish-species-id-info/profile?fish-id=pikey-bream
Finfish	Yellowtail grunter	*Amniataba caudavittata*	Yes	Yes	Yes	Likely bycatch species.	Yellowtail grunter mostly inhabit coastal marine habitats, but are also found in brackish estuaries, the lower sections of freshwater rivers and hypersaline waters. Habitats have a range of substrates and aquatic vegetation types.	Benthic omnivore, preying mainly on algae, crustaceans, and polychaetes.	http://fishesofaustralia.net.au/home/species/686#moreinfo
Finfish	Milkfish	*Chanos chanos*	Yes	Yes	No	Likely bycatch species.	Milkfish are found in a variety of aquatic habitats, including freshwater, estuarine, inshore tropical and subtropical waters. Breeding occurs only in fully saline habitats, returning to inshore habitats once complete (Sulu et al., 2016).	Toothless. Feeds on diatoms, zooplankton (including fish eggs and larvae), algae, detritus, and small amounts of sand particles.	https://australianmuseum.net.au/learn/animals/fishes/milkfish-chanos-chanos/ http://pubs.iclarm.net/resource_centre/2016-07.pdf
Finfish	Blue threadfin	*Eleutheronema tetradactylum*	Yes	Yes	Yes	Yes	Adult blue threadfin are mostly found in marine coastal waters, estuaries and freshwater river mouths. Juveniles mainly inhabit shallow inshore waters.	Benthic. Carnivorous, feeding on worms, prawns and crabs hiding in mud and sand.	http://www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_threadfin.pdf
Finfish	Hawaiian giant herring	*Elops hawaiensis*	Yes	Yes	Yes	Yes**	Hawaiian giant herring inhabit coastal and estuarine waters, generally found in the lower depths especially around mangroves.	Benthopelagic. Carnivorous, feeding on small fishes and crustaceans.	http://fishesofaustralia.net.au/home/species/3294#moreinfo https://australianmuseum.net.au/learn/animals/fishes/hawaiian-giant-herring-elops-hawaiensis/
Finfish	Goldenspotted rockcod	*Epinephelus coioides*	Yes	Yes	Yes*	Yes**	Adult goldenspotted rock cod are found in the brackish waters of estuaries and turbid coastal reefs, recorded at depths of up to 100m. Juveniles occur in shallow waters of estuaries.	Benthic. Carnivorous, feeding on small fishes, shrimp, and crabs.	http://fishesofaustralia.net.au/home/species/4512#moreinfo https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/636198/Estuary-cod-Primefact-167-final.pdf https://biodiversity.org.au/afd/taxa/Epinephelus_coioides
Finfish	Blackspotted rockcod	*Epinephelus malabaricus*	Yes	Yes	Yes*	Yes**	Adult blackspotted rock cod are found in a range of aquatic habitats, including reefs, tidal pools, estuaries, mangrove swamps and shallow inshore waters. Found at depths ranging from 1 to 150m. Juveniles occur nearshore and in estuaries.	Benthic. Carnivorous, feeding on small fishes, shrimp, and crabs.	http://fishesofaustralia.net.au/home/species/4675#moreinfo https://nt.gov.au/marine/recreational-fishing/types-of-fish/fish-species/blackspotted-rockcod
Finfish	Longtail catfish	*Euristhmus lepturus*	Yes	Yes	No	Yes**	Longtail catfish are found in estuarine and near-coastal waters.	Benthic. Feeds on shrimps, crayfish in the warmer months and midge larvae in winter.	https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/375867/Catfish.pdf http://fishesofaustralia.net.au/home/species/2759#moreinfo https://biodiversity.org.au/afd/taxa/Euristhmus_lepturus
Finfish	Common silverbiddy	*Gerres subfasciatus*	Yes	Yes	Yes	Likely bycatch species.	Common silverbiddy inhabit estuaries and coastal reefs or waters, often over sandy substrates. Juveniles are found in sheltered shallow water habitats where vegetation cover is high.	Benthic. Carnivorous, feeding on benthic invertebrates including polychaete worms.	http://fishesofaustralia.net.au/home/species/2435#moreinfo https://australianmuseum.net.au/learn/animals/fishes/silver-biddy-gerres-subfasciatus-cuvier-1830/ https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/375871/Common-Silverbiddy.pdf
Finfish	Diamondscale mullet	*Liza vaigiensis*	Yes	Yes	Yes*	Yes	Diamondscale mullet generally occur in shallow coastal areas, such as lagoons, marshes, estuaries and the lower sections of rivers. Individuals have also been found considerably upstream in major rivers of northern Australia.	Pelagic. Feeds on phytoplankton, algae and detritus	http://fishesofaustralia.net.au/home/species/4537#moreinfo https://www.daf.qld.gov.au/fish-identification-information/fish-species-guide/fish-species-id-info/profile?fish-id=diamondscale-mullet https://biodiversity.org.au/afd/taxa/Liza_vaigiensis
Finfish	Striped snapper	*Lutjanus carponotatus*	Yes	Yes	Yes	Yes	Striped snapper generally occur in turbid coastal reefs, in both sheltered lagoons and outer reef slopes.	Reef. Feeds mostly on fishes, and also consumes a variety of crustaceans	http://fishesofaustralia.net.au/home/species/552#moreinfo https://www.fishbase.se/summary/Lutjanus-carponotatus.html https://biodiversity.org.au/afd/taxa/Lutjanus_carponotatus
Finfish	Moses snapper	*Lutjanus russellii*	Yes	Yes	Yes	Yes	Moses' snapper inhabit coastal and offshore reefs, rocky areas and sometimes estuaries (Bray, D.J., 2019). Juveniles are often found in mangrove estuaries and the lower depths of freshwater streams.	Benthic. Feeds on benthic invertebrates and fishes.	http://fishesofaustralia.net.au/home/species/566#summary https://australianmuseum.net.au/learn/animals/fishes/moses-perch-lutjanus-russelli-bleeker-1849/
Finfish	Sea mullet	*Mugil cephalus*	Yes	Yes	Yes	Yes	Sea mullet are found in a variety of aquatic habitats, including offshore and inshore marine, estuaries, lagoons and the lower sections of freshwater rivers (Gomon and Bray, 2019).	Generally a bottom feeding detritivore. Juveniles feed on zooplankton and benthic amphipods and copepods. Adults often feed on algae covered rocks	http://fishesofaustralia.net.au/home/species/3880#summary
Finfish	Blue catfish	*Neoarius graeffei*	Yes	Yes	No	Likely bycatch species.	Blue catfish are found in a variety of habitats, including clear or turbid freshwaters, estuaries and inshore coastal marine waters (Gomon and Bray, 2017).	Feeds opportunistically on small fishes, prawns, insects, worms, plant material, detritus and small mammals	http://fishesofaustralia.net.au/home/species/2141#moreinfo
Finfish	Fourline striped grunter	*Pelates quadrilineatus*	Yes	Yes	No	Likely bycatch species.	Fourline striped grunter are often found in brackish waters along the coast and in estuaries. Juveniles inhabit more sheltered waters, such as seagrass beds and mangrove bays.	Omnivorous, but usually prey on small fish and invertebrates.	http://fishesofaustralia.net.au/home/species/697#moreinfo https://www.fishbase.se/summary/Pelates-quadrilineatus
Finfish	Spotted javelinfish	*Pomadasys kaakan*	Yes	Yes	Yes	Yes**	Spotted javelinfish inhabit turbid inshore waters and estuaries, with substrates usually sandy or muddy.	Carnivorous, feeding on fish and crustaceans.	https://www.fishbase.org/summary/6006
Finfish	Milk shark	*Rhizoprionodon acutus*	Yes	Yes	Yes*	Likely bycatch species.	Milk shark are usually found in marine habitats, from inshore waters to continental shelfs.	Carnivorous, feeding primarily on small pelagic and benthic fish, cephalopods and other invertebrates.	https://www.fishbase.se/summary/899 https://biodiversity.org.au/afd/taxa/Rhizoprionodon_acutus
Finfish	Striped scat	*Selenotoca multifasciata*	Yes	Yes	Yes*	Likely bycatch species.	Striped scat inhabit bays, estuaries, mangrove creeks and the lower sections of freshwater rivers and streams.	Carnivorous, feeding mostly on benthic invertebrates such as crustaceans, molluscs, polychaete worms - and the occasional fish. Individuals search for food in sandy bottoms	http://fishesofaustralia.net.au/home/species/2213#moreinfo
Finfish	Blacktip reef shark	*Carcharhinus melanopterus*	No	No	No	Yes - smaller specimens only.	The blacktip reef shark is found in shallow marine habitats and is associated with coral reefs.	Carnivorous, feeding on small fish, molluscs and crustaceans.	http://fishesofaustralia.net.au/home/species/1952#moreinfo
Finfish	Barramundi	*Lates calcarifer*	No	No	Yes	Yes	Barramundi are found in a variety of aquatic habitats, including freshwater streams, rivers, lakes, billabongs, estuaries and coastal waters.	Carnivorous, feeding mainly on smaller fish, including other barramundi, and crustaceans.	https://www.fish.wa.gov.au/Species/Barramundi/Pages/default.aspx https://www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_barramundi.pdf
Finfish	Mangrove Jack	*Lutjanus argentimaculatus*	No	No	Yes	Yes	Adult mangrove jack are primarily found in groups, in the deep waters around coral reefs. Juveniles and young adults are found closer to the coast, in tidal creeks, mangrove estuaries and the lower sections of freshwater streams.	Carnivorous, feeding at night on fishes, crustaceans, gastropods and cephalopod molluscs.	https://www.fishbase.se/summary/1407 http://fishesofaustralia.net.au/home/species/548#moreinfo
Finfish	Fingermark	*Lutjanus johnii*	No	No	Yes	Yes	Adult fingermark bream are generally found in coral reefs, while juveniles occur in mangrove estuaries.	Carnivorous, feeding on fish and benthic invertebrates such as prawns, crabs and cephalopods.	https://www.fishbase.de/Summary/SpeciesSummary.php?ID=264&AT=Khadharcha
Finfish	Queenfish	*Scomberoides commersonnianus*	Yes	No	Yes	Likely target species.	Queensfish are generally found in slightly turbid marine waters, including inshore and offshore reefs, and sometimes estuaries.	Pelagic. Carnivorous, feeding on bony fishes, cephalopods and crustaceans.	http://fishesofaustralia.net.au/home/species/1660#moreinfo https://biodiversity.org.au/afd/taxa/Scomberoides_commersonnianus
Finfish	Sweetlip	*Lethrinus miniatus*	No	No	Yes	Yes	Adult sweetlip inhabit brackish waters of coral reefs, moving out to open sea with sandy substrates during night. Juveniles inhabit more sheltered waters, such as seagrass and mangrove areas.	Reef. Carnivorous, feeding primarily on crabs and sea urchins but also molluscs and fish.	https://www.fishbase.se/summary/1858
Finfish	Giant Trevally	*Caranx ignobilis*	No	No	Yes	Yes	Adult giant trevally are found in a variety of marine habitats, including rocky areas, coral reef channels, reefs, and over inshore sand flats. Juveniles occur in estuaries.	Pelagic. Carnivorous, feeding on crustaceans and fish at night.	http://fishesofaustralia.net.au/home/species/4268#moreinfo https://www.fishbase.se/summary/Caranx-ignobilis
Finfish	Northern Sand Flathead	*Platycephalus endrachtensis*	No	No	Yes	Yes**	Northern sand flathead are typically found on sandy bottoms in estuarine and coastal waters.	Benthic. Carnivorous, feeding on small fish, molluscs and crustaceans.	https://australianmuseum.net.au/learn/animals/fishes/northern-sand-flathead-platycephalus-endrachtensis/ https://biodiversity.org.au/afd/taxa/Platycephalus_endrachtensis;Platycephalus https://www.fishbase.se/trophiceco/DietCompoSummary.php?dietcode=2937&genusname=Platycephalus&speciesname=endrachtensis
Finfish	Black jewfish	*Protonibea diacanthus*	No	No	Yes	Yes	Black jewfish inhabit estuarine and coastal waters mostly over muddy substrates. Also known to rocky reefs and other structures.	Carnivorous, feeding mainly on small fish and crustaceans.	http://fishesofaustralia.net.au/Home/species/671#moreinfo http://era.daf.qld.gov.au/id/eprint/952/
Finfish	Grey Mackerel	*Scomberomorus semifasciatus*	No	No	Yes	Yes**	Adult grey mackerel are found in turbid tropical and sub-tropical waters, usually in the vicinity of rocky headlands and reefs with sandy or muddy substrates. Juveniles occur inshore, typically in estuaries.	Pelagic. Carnivorous, feeding almost exclusively on small fish such as sardines and herrings.	http://www.gbrmpa.gov.au/__data/assets/pdf_file/0016/21733/gbrmpa-VA-GreyMackerel-11-7-12.pdf http://fishesofaustralia.net.au/home/species/729#moreinfo
Crustaceans	Mud crab	*Scyla serrata*	Yes	Yes	Yes	Yes	Mud crabs inhabit sheltered waters such as estuaries, mangrove areas and tidal flats.	Omnivorous scavengers, mainly consuming bottom-dwelling animals such as molluscs, smaller crabs, dead fish and worms.	https://www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_mud_crab.pdf https://www.environment.gov.au/system/files/pages/ad595593-a4d0-41e2-b132-f214cf63f259/files/submission.pdf

Attachment A: Aquatic Biota Relevant to Human Consumption

Aquatic Biota Type	Species Name	Scientific Name	Samples Collected by Golder?	Samples Analysed for PFAS?	Recreational Fishing Species?	Traditional Food Species?	Habitat	Diet	References
Crustaceans	Endeavour prawn	*Metapenaeus endeavouri*	Yes	Yes	Yes*	Likely bycatch species.	Adult endeavour prawns are typically inhabit inshore reef lagoons, over sandy or mu-sand substrates. Juveniles are found in seagrass beds in shallow estuaries.	Small crustaceans, molluscs, polychaete worms and foraminifera.	https://www.afma.gov.au/fisheries-management/species/prawns
Crustaceans	Brown tiger prawn	*Penaeus esculentus*	Yes	Yes	Yes*	Likely bycatch species.	Adult brown tiger prawns inhabit inshore coastal waters, with mud, sand or silty substrates. Juveniles are found in seagrass beds in shallow estuaries.	Plant material, decaying organic matter, micro-organisms, small shellfish and worms.	https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/375865/Brown-Tiger-Prawn.pdf https://www.fish.wa.gov.au/Species/Prawn/Pages/default.aspx
Crustaceans	Blue swimmer crab	*Portunus armatus*	Yes	Yes	Yes	Yes**	Blue swimmer crabs inhabit estuaries, sheltered bays and offshore waters.	Omnivorous, feeding primarily on molluscs, small crustaceans and polychaetes.	https://www.fish.wa.gov.au/Documents/recreational_fishing/fact_sheets/fact_sheet_blue_swimmer.pdf https://pdfs.semanticscholar.org/624d/cf64cadc171533aef47a4ede6a3bb1bb426e.pdf
Bivalve and Gastropods	Mud whelk	*Batillaria spp.*	Yes	Yes	Yes	Likely - Queensland Museum.	Mud whelks are typically found on intertidal mudflats in estuarine waters.	Predatory snails, feeding on tube worms, small barnacles, bivalves and sometimes other gastropods.	https://www.qm.qld.gov.au/Find+out+about/Animals+of+Queensland/Molluscs/Gastropods/Marine+snails/Mud+Whelks#.XRyqGiIzaUk Underwood and Chapman,1995. Coastal Marine Ecology of Temperate Australia. Published by the University of New South Wales.
Bivalve and Gastropods	Oyster	*Crassostrea sp.*	Yes	Yes	Yes	Yes - Anecdotal evidence collected by Golder 2018	Oysters generally occur on the lower shore and shallow sublittoral to a depth of around 80 m.	Filter feeder	https://link.springer.com/article/10.1007/s10531-016-1209-4 https://www.marlin.ac.uk/species/detail/1676
Bivalve and Gastropods	Blacklip oyster	*Pinctada margaritifera*	No	No	Yes	Yes	Typically inhabits the oligotrophic waters of atoll lagoons and coral reefs.	Suspension feeder	https://researchonline.jcu.edu.au/27184/1/27184_Yukihira_et_al_1998.pdf https://researchonline.jcu.edu.au/27184/1/27184_Yukihira_et_al_1998.pdf
Bivalve and Gastropods	Pipi	*Plebidonax deltoides*	Yes	Yes	Yes	Yes - Coleman et al. 2003 in Phelan 2005.	Pipi are frequently found on beaches in the intertidal zone. They are not normally found in estuaries.	Suspension feeder	https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/375924/Pipi.pdf https://www.gbri.org.au/SpeciesList/Plebidonaxdeltoides%7CAshleighMoy.aspx?PageContentID=4901
Bivalve and Gastropods	Blood cockle	*Tegillarca granosa*	Yes	Yes	Yes	Yes	Blood cockles inhabit intertidal and shallow subtidal waters, generally with muddy substrates, such as protected bays, estuaries and mangroves.	Filter feeder	https://www.sealifebase.ca/summary/Tegillarca-granosa.html http://www.fao.org/fishery/species/3503/en
Bivalve and Gastropods	Mangrove Worm/Shipwo	*Teredo navalis*	No	No	No	Likely	Mangrove worms are found burrowing into pieces of wood, typically in mangrove areas or intertidal zones.	Filter feeder	Note - According to ALA this species which is not native to Australia, has not been recorded in the gulf of carpentaria https://naturalhistory2.si.edu/smsfp/irlspec/Teredo_navalis.htm https://fuse.education.vic.gov.au/Resource/LandingPage?ObjectId=a2049222-c86e-4e9d-999d-6cb96240dfa9 https://www.researchgate.net/publication/236346671_What_is_the_main_food_source_of_the_shipworm_Teredo_navalis_A_stable_isotope_approach
Reptiles	Green Turtle	*Chelonia mydas*	No	No	No	Yes - Meat and eggs.	Green turtles are found in tropical and subtropical waters, typically among seaweed-rich coral reefs and inshore seagrass pastures.	Immature turtles are carnivorous, while adults feed mostly on seagrasses and algae.	https://www.environment.gov.au/marine/marine-species/marine-turtles/green http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1765
Reptiles	Flatback Turtle	*Natator depressus*	No	No	No	Yes - Likely eggs only	Flatback turtles are found in the tropical waters of northern Australia, and inhabit shallow, soft-bottomed sea bed habitats away from reefs. The largest nesting concentration of flatback turtles is in the north-eastern Gulf of Carpentaria and western Torres Strait.	Carnivorous, feeding mostly on soft bodied prey such as sea cucumbers, coral and jellyfish in the subtidal environments.	https://www.environment.gov.au/marine/marine-species/marine-turtles/flatback http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59257
Reptiles	Hawksbill Turtle	*Eretmochelys imbricata*	No	No	No	Yes - Likely eggs only	Hawksbill turtles drift in ocean currents for the first portion of their lives (5-10 years), before then inhabiting tidal and sub-tidal tropical waters, as well as rocky reef habitats. In Queensland, Milman Island and the inner Great Barrier Reef north from Cape Grenville are important foraging grounds and juvenile habitat.	Pelagic. Feed primarily on sponges, but also seagrasses, algae, soft corals and shellfish.	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1766
Reptiles	Saltwater crocodile	*Crocodylus porosus*	No	No	No	Potential - Likely eggs only	In Queensland, saltwater crocodiles inhabits reef, coastal and inland waterways on the east coast, throughout the Cape York Peninsula and west to the Queensland-Northern Territory border. Nesting occurs in the wet season, preferably near tall vegetation and permanent freshwater.	Carnivorous, feeding primarily on crustaceans, insects and mammals.	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1774
Mammals	Dugong	*Dugong dugon*	No	No	No	Yes	Dugongs inhabit tropical and subtropical waters, usually in shallow areas protected from large waves and storms.	Herbivorous, feeding primarily on seagrass.	https://www.environment.gov.au/marine/marine-species/dugongs

* indicates species is not target, but by-product that would still be sold/used commercially OR species likely to only be caught with trawler (commercial vessel)
** indicates that there is evidence supporting the genus, and not specifically the species, may be a traditional food species.

AECOM Imagine it. Delivered.

ATTACHMENT B: Laboratory Analytical Report SSP0057626

AMENDED CERTIFICATE OF ANALYSIS

CLIENT:

John Dearlove
TPHS EH Cairns
5B Sheridan street
Cairns QLD 4870

ATTN: John Dearlove

Laboratory Reference	: SSP0057626
Client Order Number	:
Quote Number	:
Client Project	:
Client Batch Reference	: Batch 0197PFAS
Date Received	: 21/11/2017
Date Commenced	: 21/11/2017
Laboratory Number/s	: 17KE8665-17KE8672

CC:

Number of Samples : 8

Reason for Analysis : PFAS monitoring

Method/s of Analysis : QIS 32403 – Perfluorinated Compounds in Water

Remarks :Total Fluorinated Organics is the sum of the total oxidisable precursors (TOPA C4-C14) perfluoroalkyl carboxylic acids plus (C4-C10) perfluoroalkyl sulfonic acids

M du Plessis
Chemist, Organics Laboratory
30/11/2017

17KE8665-17KE8672

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

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Client Reference				NASC01	NASC02	NASC03	NASC04
Sample Type				Raw Water	Water Raw	Treated Water	Raw Water
Sampling Time / Date				11:30 16/11/17	11:40 16/11/17	12:15 16/11/17	11:45 16/11/17
Sample Description				Bore M1	Bore M2	Bores Mixed	Bore M4 storage
Method	Free Perfluoroalkyl Compounds (PFAS)	Unit	Reporting Limit	17KE8665	17KE8666	17KE8667	17KE8668
32403	Perfluorobutanoic acid (PFBA)	ug/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Perfluoropentanoic acid (PFPeA)	ug/L	0.007	< 0.007	< 0.007	< 0.007	< 0.007
	Perfluorohexanoic acid (PFHxA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluoroheptanoic acid (PFHpA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluorooctanoic acid (PFOA)	ug/L	0.007	< 0.007	< 0.007	< 0.007	< 0.007
	Perfluorononanoic acid (PFNA)	ug/L	0.007	< 0.007	< 0.007	< 0.007	< 0.007
	Perfluorodecanoic acid (PFDA)	ug/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Perfluoroundecanoic acid (PFUDA)	ug/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Perfluorododecanoic acid (PFDoA)	ug/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorotridecanoic acid (PFTrDA)	ug/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Perfluorotetradecanoic acid (PFTeDA)	ug/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorohexadecanoic acid (PFHxDA)	ug/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
	Perfluorooctanesulfonamide (FOSA)	ug/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Perfluorobutanesulfonic acid (PFBS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluoropentanesulfonic acid (PFPeS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluorohexanesulfonic acid (PFHxS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluoroheptanesulfonic acid (PFHpS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluorooctanesulfonic acid (PFOS)	ug/L	0.005	< 0.005	0.011	< 0.005	< 0.005
	Perfluorononanesulfonic acid (PFNS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Perfluorodecanesulfonic acid (PFDS)	ug/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorododecanesulfonic acid (PFDoS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	2-Perfluoroocty ethanoic acid (FOEA)	ug/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
	2-Perfluorodecyl ethanoic acid (FDEA)	ug/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ug/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	N-Ethylperfluorooctanesulfonamide (N-EtFOSA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	N-Ethylperfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	N-Ethylperfluorooctanesulfonamidoethanol (N-EtFOSE)	ug/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02
	N-Methylperfluorooctanesulfonamide (N-MeFOSA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	N-Methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	ug/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Total C4-C14 Free PA Carboxylic Acids	ug/L	0.15	< 0.15	< 0.15	< 0.15	< 0.15
	Total C4-C10 Free PA Sulfonic Acids	ug/L	0.05	< 0.15	< 0.15	< 0.15	< 0.15

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

Client Reference				NASC01 A	NASC02 A	NASC03 A	NASC04 A
Sample Type				Raw Water	Water Raw	Treated Water	Raw Water
Sampling Time / Date				11:30 16/11/17	11:40 16/11/17	12:15 16/11/17	11:45 16/11/17
Sample Description				Bore M1	Bore M2	Bores Mixed	Bore M4
Method	Free Perfluoroalkyl Compounds (PFAS)	Unit	Reporting Limit	17KE8669	17KE8670	17KE8671	17KE8672
32403	Perfluorobutanoic acid (PFBA)	ug/L	0.01	< 0.04	< 0.04	< 0.04	< 0.04
	Perfluoropentanoic acid (PFPeA)	ug/L	0.007	< 0.03	< 0.03	< 0.03	< 0.03
	Perfluorohexanoic acid (PFHxA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluoroheptanoic acid (PFHpA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorooctanoic acid (PFOA)	ug/L	0.007	< 0.03	< 0.03	< 0.03	< 0.03
	Perfluorononanoic acid (PFNA)	ug/L	0.007	< 0.03	< 0.03	< 0.03	< 0.03
	Perfluorodecanoic acid (PFDA)	ug/L	0.01	< 0.04	< 0.04	< 0.04	< 0.04
	Perfluoroundecanoic acid (PFUDA)	ug/L	0.01	< 0.04	< 0.04	< 0.04	< 0.04
	Perfluorododecanoic acid (PFDoA)	ug/L	0.02	< 0.08	< 0.08	< 0.08	< 0.07
	Perfluorotridecanoic acid (PFTrDA)	ug/L	0.05	< 0.19	< 0.19	< 0.20	< 0.19
	Perfluorotetradecanoic acid (PFTeDA)	ug/L	0.02	< 0.08	< 0.08	< 0.08	< 0.07
	Perfluorohexadecanoic acid (PFHxDA)	ug/L	0.05	< 0.19	< 0.19	< 0.20	< 0.19
	Perfluorooctanesulfonamide (FOSA)	ug/L	0.01	< 0.15	< 0.16	< 0.15	< 0.15
	Perfluorobutanesulfonic acid (PFBS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluoropentanesulfonic acid (PFPeS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorohexanesulfonic acid (PFHxS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluoroheptanesulfonic acid (PFHpS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorooctanesulfonic acid (PFOS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorononanesulfonic acid (PFNS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Perfluorodecanesulfonic acid (PFDS)	ug/L	0.02	< 0.08	< 0.08	< 0.07	< 0.08
	Perfluorododecanesulfonic acid (PFDoS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	2-Perfluoroocty ethanoic acid (FOEA)	ug/L	0.05	< 0.19	< 0.20	< 0.19	< 0.19
	2-Perfluorodecyl ethanoic acid (FDEA)	ug/L	0.05	< 0.19	< 0.20	< 0.19	< 0.19
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ug/L	0.01	< 0.04	< 0.04	< 0.04	< 0.04
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	N-Ethylperfluorooctanesulfonamide (N-EtFOSA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	N-Ethylperfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	N-Ethylperfluorooctanesulfonamidoethanol (N-EtFOSE)	ug/L	0.02	< 0.08	< 0.08	< 0.07	< 0.08
	N-Methylperfluorooctanesulfonamide (N-MeFOSA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	N-Methylperfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	N-Methylperfluorooctanesulfonamidoethanol (N-MeFOSE)	ug/L	0.005	< 0.02	< 0.02	< 0.02	< 0.02
	Total C4-C14 Free PA Carboxylic Acids	ug/L	0.15	< 0.57	< 0.60	< 0.56	< 0.57
	Total C4-C10 Free PA Sulfonic Acids	ug/L	0.05	< 0.19	< 0.20	< 0.19	< 0.19

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).