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**From:** [Out of scope]  
**Sent:** Wednesday, 17 October 2018 6:45 PM  
**To:** OCES - Office Chief Environmental Scientist  
**Cc:** [Out of scope]  
**Subject:** RE: Emerging Contaminants summary documents  
**Attachments:** Briefing to CES - Emerging contaminants program.docx; Ambient and Biota Emerging Contaminants Program - brief summary FINAL.docx; Ambient and Biota Emerging Contaminants Program - extended summary FINAL.docx

Hi [Out of scope]

Great! Amended documents attached.

Cheers,

[Out of scope]

[Out of scope]  
[Out of scope]  
Environmental Solutions

**Environment Protection Authority Victoria**  
Ernest Jones Drive Macleod VIC 3085 | GPO Box 4395 Melbourne Vic 3001 | DX 210675  
[Out of scope] | [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

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---

**From:** OCES - Office Chief Environmental Scientist  
**Sent:** Wednesday, 17 October 2018 4:39 PM  
**To:** [Out of scope] <[Out of scope]@epa.vic.gov.au>  
**Cc:** [Out of scope] <[Out of scope]@epa.vic.gov.au>; [Out of scope] <[Out of scope]@epa.vic.gov.au>; [Out of scope] <[Out of scope]@epa.vic.gov.au>  
**Subject:** RE: Emerging Contaminants summary documents

Hi [Out of scope]

[Out of scope] says it can go straight to her so if you could please email the amended docs through, I'll pass them on 😊

Thanks,

[Out of scope]

[Out of scope]  
[Out of scope]  
Office Chief Environmental Scientist

**Environment Protection Authority Victoria**  
200 Victoria Street, Carlton VIC 3053 | GPO Box 4395, Melbourne VIC 3001 | DX 210082  
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**From:** Out of scope  
**Sent:** Wednesday, 17 October 2018 4:08 PM  
**To:** OCES - Office Chief Environmental Scientist <[OCES@epa.vic.gov.au](mailto:OCES@epa.vic.gov.au)>  
**Cc:** Out of scope <Out of scope@epa.vic.gov.au>; Out of scope <Out of scope@epa.vic.gov.au>; Out of scope <Out of scope@epa.vic.gov.au>  
**Subject:** RE: Emerging Contaminants summary documents

Hi Out of scope

I've now amended the three documents. I'll wait for you to advice on the next steps.

Cheers,

Out of scope

Out of scope

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---

**From:** OCES - Office Chief Environmental Scientist  
**Sent:** Wednesday, 17 October 2018 3:34 PM  
**To:** Out of scope <Out of scope@epa.vic.gov.au>; Out of scope <Out of scope@epa.vic.gov.au>  
**Cc:** Out of scope <Out of scope@epa.vic.gov.au>; Out of scope <Out of scope@epa.vic.gov.au>  
**Subject:** RE: Emerging Contaminants summary documents

I'll check with Out of scope about what reviews she would like when I see her in a minute and let you know.

Cheers,

Out of scope

Out of scope

Office Chief Environmental Scientist

**Environment Protection Authority Victoria**  
200 Victoria Street, Carlton VIC 3053 | GPO Box 4395, Melbourne VIC 3001 | DX 210082  
Out of scope <Out of scope@epa.vic.gov.au> | [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

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**From:** Out of scope  
**Sent:** Wednesday, 17 October 2018 3:27 PM  
**To:** OCES - Office Chief Environmental Scientist <[OCES@epa.vic.gov.au](mailto:OCES@epa.vic.gov.au)>; Out of scope  
Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>  
**Cc:** Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>; Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>  
**Subject:** RE: Emerging Contaminants summary documents

Hi Out of scope

I'm not sure what Out of scope amendment is but given the time, I'm not sure if we can afford the time for the additional reviews. That is the process though so if you want we'll try to push it through.

Cheers, Out of scope

Out of scope  
Environmental Solutions

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Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)> | [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

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**From:** OCES - Office Chief Environmental Scientist  
**Sent:** Wednesday, October 17, 2018 3:17 PM  
**To:** Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>  
**Cc:** Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>; Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>; Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>; Out of scope <[Out of scope@epa.vic.gov.au](mailto:Out of scope@epa.vic.gov.au)>  
**Subject:** RE: Emerging Contaminants summary documents

Hi Out of scope and all,

Out of scope has informed me that there is an amendment coming through to these papers so I'll hold off on providing these to Out of scope until then.

I wanted to check, do these papers need to go through review by a manager or Out of scope?

Cheers,  
Out of scope

Out of scope  
Office Chief Environmental Scientist

**Environment Protection Authority Victoria**

200 Victoria Street, Carlton VIC 3053 | GPO Box 4395, Melbourne VIC 3001 | DX 210082

Out of scope [redacted] [@epa.vic.gov.au](mailto:[redacted]@epa.vic.gov.au) | [www.epa.vic.gov.au](http://www.epa.vic.gov.au)

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**From:** Out of scope [redacted]

**Sent:** Wednesday, 17 October 2018 2:59 PM

**To:** OCES - Office Chief Environmental Scientist <[OCES@epa.vic.gov.au](mailto:OCES@epa.vic.gov.au)>

**Cc:** Out of scope [redacted] [@epa.vic.gov.au](mailto:[redacted]@epa.vic.gov.au); Out of scope [redacted] [@epa.vic.gov.au](mailto:[redacted]@epa.vic.gov.au); Out of scope [redacted]

Out of scope [redacted] [@epa.vic.gov.au](mailto:[redacted]@epa.vic.gov.au)

**Subject:** Emerging Contaminants summary documents

Hi Out of scope [redacted],

Please find attached two documents related to the emerging contaminants program, along with the briefing document for Out of scope [redacted].

Please let me know if you have any questions.

Regards,

Out of scope [redacted]

Out of scope [redacted]

Environmental Solutions



Environment Protection Authority Victoria



**Environment Protection Authority Victoria**

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## INTERNAL BRIEFING for Victoria's Chief Environmental Scientist

<b>Subject</b>	<b>Emerging contaminants program summary of findings</b>		
<b>Timing</b>	-		
<b>Previous briefs</b>	-		
<i>Organisational strategy</i>	<input checked="" type="checkbox"/> Prevent harm <input type="checkbox"/> Equip community and business <input checked="" type="checkbox"/> Be an influential authority <input checked="" type="checkbox"/> Respond to harm <input checked="" type="checkbox"/> Organisational excellence	<i>Applied Science Strategy</i>	<input type="checkbox"/> Enhance <input type="checkbox"/> Gather <input type="checkbox"/> Translate

### Core message

A summary of the progress and results of the ambient and biota emerging contaminants projects is presented in two documents: brief summary and extended summary. The brief summary contains the key information for each project, with a summary of the main results to date. The extended summary provides further information for each project, including a map and some figures. This extended summary is a broad overview of the whole program.

### Recommendation/s

a) That you note the attached documents.

- Approved
- Not approved
- Noted
- Review required
- Please Discuss

<p>.....</p> <p>Out of scope</p> <p>Out of scope</p> <p>Date:</p>	<p><b>Comments:</b></p>
---	-------------------------

	Name	Signature	Date	Position	Phone
<b>Endorsed</b>				Director	
<b>Endorsed</b>				Manager	
<b>Reviewed</b>				TL	
<b>Prepared</b>				Author	
<b>Copied</b>				Anyone cc'd	

## Key information/issues

---

- No need for additional consumption advice for carp caught from the Latrobe River as the levels observed are consistent (or slightly less) than those on which current advice is based. However, may have to consider rewording the advisory from “Do not consume more than one serve of carp per week caught from the Latrobe River bounded by Heart Morass.” to include the small section of the river that extends to Lake Wellington.
- Preliminary assessment suggests that consumption advice may be required for Pacific Black Duck and Pink Eared Duck sourced from Macleod Morass. Further testing would be helpful to better understand potential risks. Further testing may include the sampling of individual ducks (current results from composite samples) and or sampling more ducks from this location.
- Preliminary risk assessment suggests that consumption advice is unlikely to be required in relation to the level of lead in duck liver. Further testing of individual duck samples would be helpful to better understand potential risks.

## Background context

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Not applicable.

## Financial implications

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Not applicable.

## Consultation

---

The two documents were prepared by Out of scope  
Out of scope

## Attachments

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No.	Attachment name
1	Ambient and Biota summary for <span style="background-color: black; color: white;">Out of scope</span> - brief summary FINAL
2	Ambient and Biota summary for <span style="background-color: black; color: white;">Out of scope</span> - extended summary FINAL



Environment  
Protection  
Authority Victoria

Out of scope

EPA Victoria

## Emerging Contaminants Program: brief summary of progress and results up to October 2018.

### Ambient project

#### *What have we sampled?*

- Approximately 80 samples from 25 rivers in Victoria.
- Samples collected within ~30km of the five highest population centres: Melbourne, Geelong, Ballarat, Bendigo, and Traralgon.
- For each of these locations, five sites representing one of five land-use categories were identified and sampled: background (undeveloped), residential, industrial, low-intensity agriculture (grazing), and high-intensity agriculture (cropping).
- Surface water, sediment and soil samples were collected at each site.

#### *What chemicals have we analysed?*

- Biocides, per- and poly-fluoroalkyl substances (PFAS), polybrominated diphenyl ethers (PBDEs), short-chain chlorinated paraffins (SCCPs), and phthalates.

#### *Summary of results to date* (results for PBDEs and SCCPs are expected in the next days)

- A total of 28 chemicals from four major categories (*i.e.*, fungicides, herbicides, PFAS, and phthalates) were found in river samples across locations, land-use categories and sampled compartments (*i.e.*, surface water, sediment, and soil).
- PFAS substances were the most ubiquitous and diverse. When detected, they represented between 50% and 100% of all types of chemicals in a sample.
- In terms of concentration, pesticides had the highest in surface water samples and phthalates in sediment and soil samples.
- PFHxS and PFOS were the most frequently detected PFAS in surface water samples.
- 8:2 FTS and PFOS were the most frequently detected PFAS in sediment and soil samples.

### Biota project

#### *What have we sampled?*

- 23 wetlands/lakes across the state (including the Gippsland Lakes) (Figure 1).
- Ducks (four species, total n= 166).
- Fish (four species, total n= 40) – only from Lake Wellington, Gippsland Lakes. Carp were collected from Latrobe River near the mouth of Lake Wellington.
- Surface water, sediment, and soil.

#### *What chemicals have we analysed?*

- Biocides, per- and poly-fluoroalkyl substances (PFAS), phthalates, and metals.
- Chemicals were analysed in duck composite samples (*i.e.*, from multiple individuals of a single species). Composites were comprised of breast and liver samples from each species sampled at a wetland.
- Chemicals were analysed in individual fish from Lake Wellington (no composites were used).

### What results have we received to date and what analysis have we done?

- To date, we've received results for all chemicals analysed in all surface water, sediment, soil, and fish samples.
- We have also received results for almost all chemicals in duck samples. We are still waiting for PFAS results for most liver composite samples.

### Results to date for the Gippsland Lakes and associated wetlands (Heart Morass, Macleod Morass, and Jones Bay)

Summary of sampling from the Gippsland Lakes and wetlands.

Wetland	Water	Sediment	Soil	Duck	Fish
Lake Wellington	✓	✓		✓	✓
Lake King North	✓	✓			
Lake King South	✓	✓			
Lake Victoria	✓	✓			
Shaving Point	✓	✓			
Macleod Morass	✓	✓	✓	✓	
Jones Bay	✓	✓	✓	✓	
Heart Morass				✓	

### Fish from Lake Wellington and lower Latrobe River

- Only PFAS substances and metals were detected in fish samples.
- PFAS were found in 90% of fish analysed, and metals in all fish analysed.
- PFOS was found in all species sampled and in almost all fish analysed (between 80 and 100% of samples depending on the species).
- Some individual fish (mainly carp) did not meet the FSANZ proposed PFOS trigger concentration for investigation of 5.2 µg/kg.
- **No need for additional consumption advice for carp caught from the Latrobe River as the levels observed are consistent (or slightly less) than those on which current advice is based. However, may have to consider rewording the advisory from “Do not consume more than one serve of carp per week caught from the Latrobe River bounded by Heart Morass.” to include the small section of the river that extends to Lake Wellington.**

### Ducks from the Gippsland Lakes and associated wetlands

- PFAS, pesticides, and metals were detected in duck samples.
- PFAS substances were found in all duck breast and liver composites analysed.
- PFOS and PFOS+PFHxS concentrations in breast composites in all duck species sampled from Macleod Morass, two of three species sampled from Lake Wellington, and the one species sampled from Heart Morass exceeded the mammalian trigger points.
- **Preliminary assessment suggests that consumption advice may be required for Pacific Black Duck and Pink Eared Duck sourced from Macleod Morass. Further testing would be helpful to better understand potential risks. Further testing may include the sampling of individual ducks (current results from composite samples) and or sampling more ducks from this location.**

- Lead was found in all liver samples but only two composite samples (*i.e.*, Grey Teal from Macleod Morass and Pacific Black Duck from Heart Morass) exceeded the FSANZ trigger value of 0.5 mg/kg.
- **Preliminary risk assessment suggests that consumption advice is unlikely to be required in relation to the level of lead in duck liver. Further testing of individual duck samples would be helpful to better understand potential risks.**

## Emerging Contaminants Program: summary of progress and results up to October 2018.

### Ambient project

#### *What have we sampled?*

- Approximately 80 samples from 25 rivers in Victoria (Figure 1).
- Samples collected within ~30km of the five highest population centres: Melbourne, Geelong, Ballarat, Bendigo, and Traralgon.
- For each of these locations, five sites representing one of five land-use categories were identified and sampled: background (undeveloped), residential, industrial, low-intensity agriculture (grazing), and high-intensity agriculture (cropping).
- Surface water, sediment and soil samples were collected at each site.

#### *What chemicals have we analysed?*

- Biocides, per- and poly-fluoroalkyl substances (PFAS), polybrominated diphenyl ethers (PBDEs), short-chain chlorinated paraffins (SCCPs), and phthalates.

#### *What results have we received to date and what analysis have we done?*

- To date, we've received results for all chemicals analysed (~190), **except** for PBDEs and SCCPs, in all surface water, sediment, and soil samples.
- We have used descriptive statistics to characterise locations, land-use categories, and environment compartments (*i.e.*, surface water, sediment, and soil) and parametric and non-parametric tests (ANOVA and Kruskal-Wallis tests) to compare land-use categories in terms of number of chemicals found and concentrations (note that ANOVA and Kruskal-Wallis test results are not included in this summary).
- For those chemicals with available national or state standards (*i.e.*, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality [ANZECC] and Food Standards Australia New Zealand [FSANZ]), we have assessed concentrations against their corresponding environmental and human health based standard value.
- We are developing a scientific report and a number of journal articles.

#### *Summary of results to date* (results for PBDEs and SCCPs are expected in the next days)

- A total of **28 chemicals** from four major categories (*i.e.*, fungicides, herbicides, PFAS, and phthalates) were found in river samples across locations, land-use categories and sampled compartments (*i.e.*, surface water, sediment, and soil).
- PFAS substances were the most ubiquitous and diverse. When detected, they represented between 50% and 100% of all types of chemicals in a sample.
- In terms of **concentration**, pesticides had the highest in surface water samples and phthalates in sediment and soil samples.
- **PFHxS and PFOS** were the most frequently detected PFAS in **surface water** samples.
- **8:2 FTS and PFOS** were the most frequently detected PFAS in **sediment** and **soil** samples.

#### *Land-use analysis*

- When analysing land-use categories, residential sites had the highest number of detections overall (chemicals were detected in 12 out of 15 residential samples, 80%).

- Industrial sites had lower detections than residential sites (10 out of 15 industrial samples, 67%) but the total number of chemicals found across all samples (n=18) and the median number of chemicals per sample (median=5) were the highest of all land-use categories.
- Background sites had the lowest detections (7 out of 15 background sites, 47%) and the lowest total number of chemicals across samples (n=5) and median number of chemicals per sample (median=1).
- The most frequently detected chemicals varied with land-use categories, although **PFAS** substances were always within the most frequently detected in all of them, including in background sites.
- PFOS was the most frequently detected PFAS in residential and industrial sites, PFOS and PFHxS in high-intensity agriculture sites, 8:2 FTS in low-intensity agriculture sites, and 8:2 FTS and PFBA in background sites.
- Except for simazine, which was found in surface water samples in all land-use categories (including background), biocides were only found in samples from agriculture sites.
- Phthalates were only detected in residential and industrial sites.

#### *Location analysis*

- When analysing locations, Ballarat had the highest chemical diversity (*i.e.*, types of chemicals detected) in water samples when considering all land-use categories together (n=17), followed by Geelong (n=16), Bendigo (n=13), Melbourne (n=11), and Traralgon (n=9).
- In terms of concentration, Ballarat and Geelong had the highest total concentration in **surface waters** across land-use categories (5.71 µg/L and 3.34 µg/L, respectively), followed by Melbourne (1.69 µg/L), Traralgon (1.38 µg/L), and Bendigo (0.64 µg/L).
- Biocides comprised between 80-90% of the total concentration in surface waters in all locations.
- Traralgon had the highest total concentration in **sediments** when considering all land-use categories together (14.00 mg/kg), followed by Ballarat (4.02 mg/kg) and Melbourne (2.89 mg/kg).
- The phthalate Bis(2-ethylhexyl)phthalate comprised between 70% and 99% of the total concentration in sediments in these locations.
- Melbourne had the highest total concentration in **soils** when considering all land-use categories together (8.98 mg/kg).
- The phthalates Bis(2-ethylhexyl)phthalate and Benzyl butyl phthalate together comprised 96% of the total concentration in soils in Melbourne.
- When comparing land-uses within locations, residential and industrial sites had always the highest number of chemicals detected, while background sites had always the lowest.
- Traralgon was the only location of the five studied in which the background site didn't have any chemical detected.
- Chemicals with national or state standard values available, and which were detected in **sediment and soil samples**, were always within their corresponding standard, **except in Melbourne**.
- In Melbourne, the organochlorine pesticide pp-DDE was found in sediment and soil at concentrations that exceeded its sediment quality guideline value (ANZECC revised sediment guidelines 2013).

- Three chemicals with national or state standard values available, and which were detected in **surface water samples** exceeded their corresponding standard value **to protect aquatic ecosystems**, although they were always within human health based standard values.
- This was observed for **PFOS** in surface water samples from residential and industrial sites in all five locations (*i.e.*, Melbourne, Geelong, Ballarat, Bendigo, and Traralgon), and from agriculture sites in all locations **except** Bendigo.
- The other two chemicals were the urea herbicide **terbuthiuron** and the triazine herbicide **simazine** found in surface water samples from agriculture, residential, or industrial sites, depending on the location (Melbourne, Geelong, Ballarat, or Traralgon).

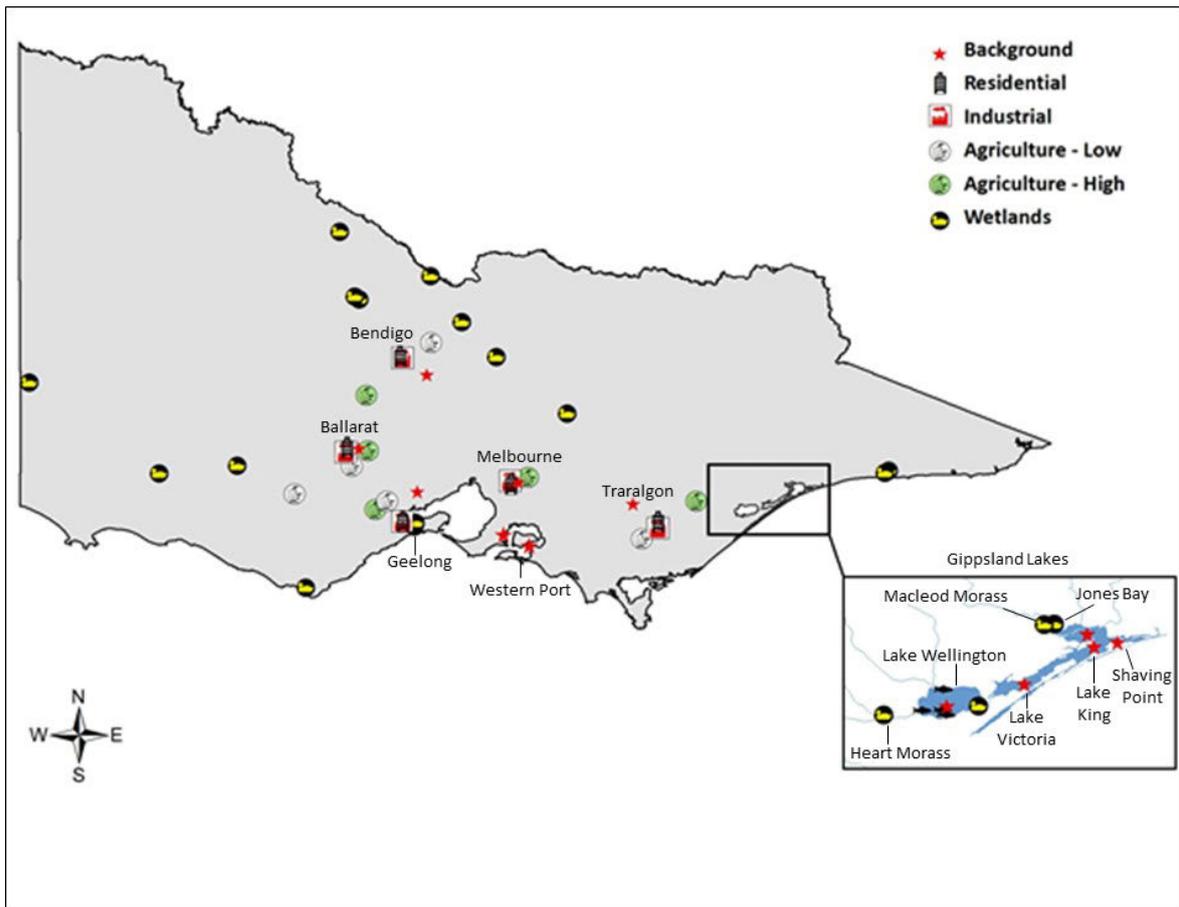


Figure 1. Sampling sites in Victoria, south-east Australia. Both ambient and biota projects sites are shown. Agriculture - Low = low-intensity agriculture (grazing), Agriculture - High = high-intensity agriculture (cropping).

## Biota project

### What have we sampled?

- 23 wetlands/lakes across the state (including the Gippsland Lakes) (Figure 1).
- Ducks (four species, total n= 166).
- Fish (four species, total n= 40) – only from Lake Wellington, Gippsland Lakes. Carp were collected from Latrobe River near the mouth of Lake Wellington.
- Surface water, sediment, and soil.

### What chemicals have we analysed?

- Biocides, per- and poly-fluoroalkyl substances (PFAS), phthalates, and metals.
- Chemicals were analysed in duck composite samples (*i.e.*, from multiple individuals of a single species). Composites were comprised of breast and liver samples from each species sampled at a wetland.
- Chemicals were analysed in individual fish from Lake Wellington (no composites were used).

### What results have we received to date and what analysis have we done?

- To date, we've received results for all chemicals analysed in all surface water, sediment, soil, and fish samples.
- We have also received results for almost all chemicals in duck samples. We are still waiting for PFAS results for most liver composite samples (only 35% of liver composite results were received to date).
- Results were analysed using descriptive statistics.
- For those chemicals with available national or state standards (ANZECC and FSANZ), we have assessed concentrations against their corresponding environmental and human health based standard value.
- We are developing a scientific report and a number of journal articles.

### Results to date for the *Gippsland Lakes and associated wetlands (Heart Morass, Macleod Morass, and Jones Bay)*

Summary of sampling in the Gippsland Lakes and wetlands.

Wetland	Water	Sediment	Soil	Duck	Fish
Lake Wellington	✓	✓		✓	✓
Lake King North	✓	✓			
Lake King South	✓	✓			
Lake Victoria	✓	✓			
Shaving Point	✓	✓			
Macleod Morass	✓	✓	✓	✓	
Jones Bay	✓	✓	✓	✓	
Heart Morass				✓	

*Surface water, sediment, and soil from Gippsland Lakes and associated wetlands*

- Only **PFAS and metals** were found in surface water, sediment, and soil samples.
- PFAS substances were detected in surface waters from Lake Wellington, Lake King North, Lake Victoria, and Macleod Morass, and in sediments from Lake Wellington and Shaving Point (Metung).
- **PFOS** was detected in **surface water** samples from Lake Wellington, Lake King North, and Macleod Morass at concentrations that were 18 to 78X higher than the ANZECC draft freshwater 99% level of protection default guideline value of 0.00023 µg/L (Figure 2).
- PFOS and PFOS+PFHxS concentrations in the three wetlands were always within human health based guidance values for drinking and recreational water.

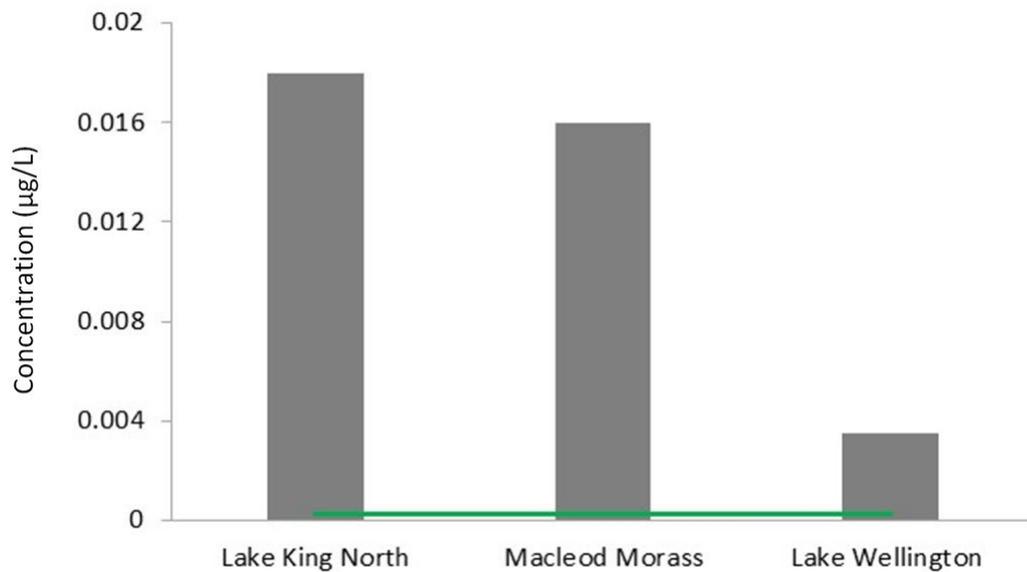


Figure 2. PFOS in water samples from three wetlands in the Gippsland Lakes region. Concentration for Lake Wellington is the average of two samples. The green line shows the ANZECC draft freshwater 99% level of protection default guideline value.

- Metals were assessed for Macleod Morass and Jones Bay only.
- Arsenic, chromium, copper, lead, selenium, and zinc were detected in both wetlands, mainly in sediment and soil samples.
- Copper and zinc concentrations in **surface water** samples from Macleod Morass exceeded the ANZECC freshwater 99% and 95% levels of protection default guideline values (Figure 3)

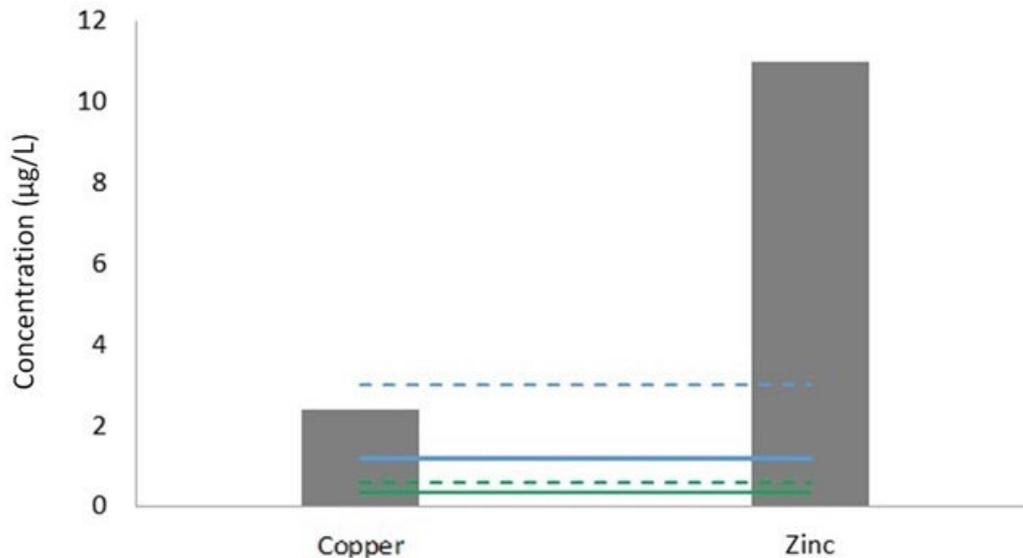


Figure 3. Copper and zinc in water samples from Macleod Morass. Lines show the ANZECC freshwater 99% (full line) and 95% (dotted line) levels of protection default guideline values for copper (green line) and zinc (blue line).

*Fish from Lake Wellington and lower Latrobe River*

- Only PFAS substances and metals were detected in fish samples. PFAS were found in 90% of fish analysed, and metals in all fish analysed.
- PFOS was found in all species sampled and in almost all fish analysed (between 80 and 100% of samples depending on the species).
- Some individual fish did not meet the FSANZ proposed PFOS trigger concentration for investigation of 5.2 µg/kg (Figure 4).
- **No need for additional consumption advice for carp caught from the Latrobe River as the levels observed are consistent (or slightly less) than those on which current advice is based. However, may have to consider rewording the advisory from “Do not consume more than one serve of carp per week caught from the Latrobe River bounded by Heart Morass.” to include the small section of the river that extends to Lake Wellington.**

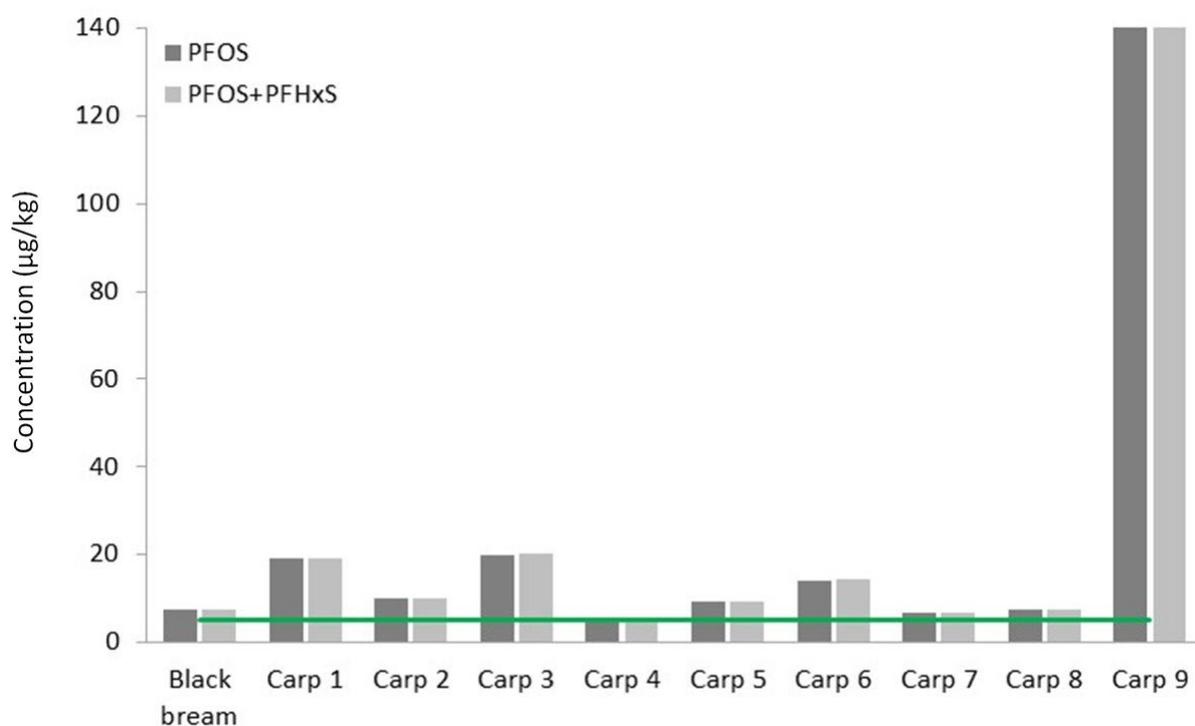


Figure 4. PFOS and PFOS+PFHxS in fish samples from Lake Wellington. The green line shows FSANZ proposed PFOS trigger concentration for investigation in finfish.

- Arsenic, chromium, copper, lead, mercury, selenium, and zinc were found in fish samples.
- For those metals with standard values in FSANZ, **arsenic** was the most ubiquitous, found in all fish analysed (n=40).
- Mercury was found in all species except for sea mullets, and lead was only found in one black bream and one yellow-eyed mullet.
- Concentrations of these metals were always below their corresponding FSANZ levels in fish food.

#### *Ducks from Gippsland Lakes and associated wetlands*

- **PFAS, pesticides, and metals** were detected in duck samples.
- PFAS substances were found in all duck breast and liver composites analysed.
- Ducks from **Macleod Morass** had the highest number of PFAS substances detected and the highest total concentrations in breast composites compared to the other wetlands.
- **PFOS** was the most ubiquitous PFAS detected in all breast composites in all wetlands, followed by PFHxS.
- PFOS, PFOS+PFHxS, and PFOA concentrations were compared against FSANZ trigger points for investigation for mammalian meat and offal. These were used as there are no PFAS standards for duck or poultry food.
- PFOS and PFOS+PFHxS concentrations in breast composites in all duck species sampled from **Macleod Morass**, two of three species sampled from **Lake Wellington**, and the one species sampled from **Heart Morass** exceeded the mammalian trigger points (Figure 5).

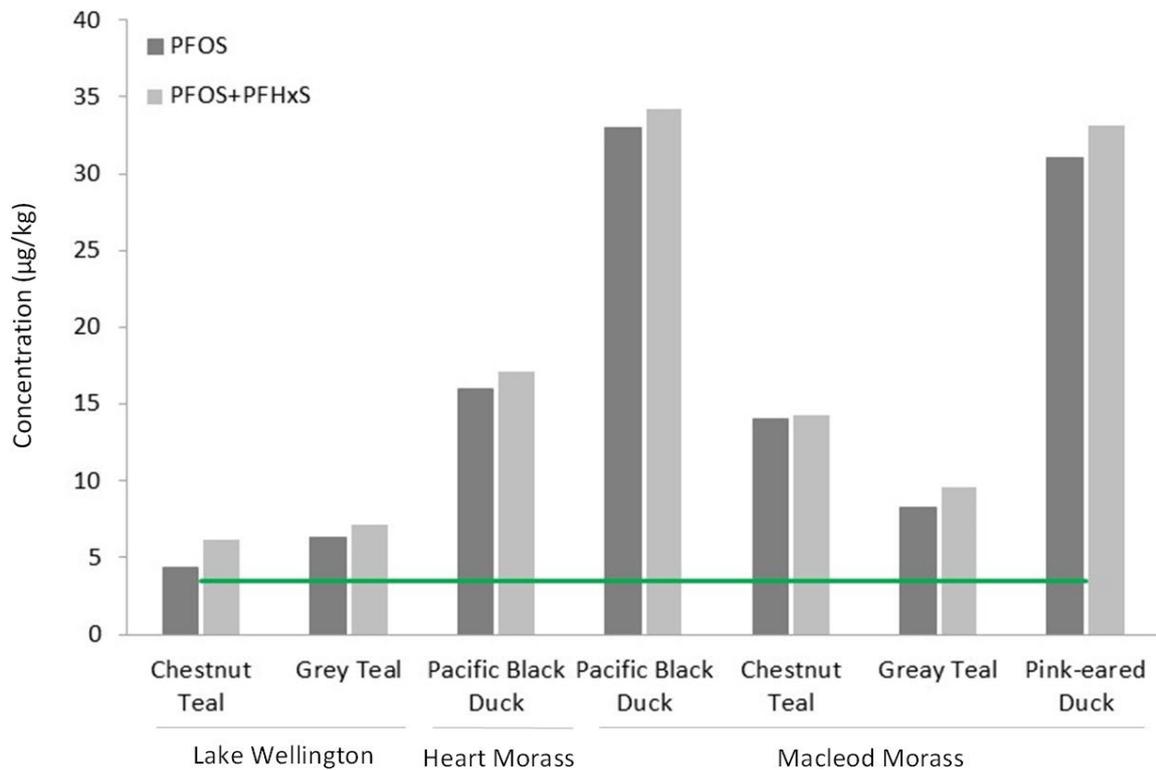


Figure 5. PFOS and PFOS+PFHxS in duck samples from Lake Wellington, Heart Morass, and Macleod Morass. The green line shows the FSANZ proposed PFOS trigger concentration for mammalian meat.

- **Preliminary assessment suggests that consumption advice may be required for Pacific Black Duck and Pink Eared Duck sourced from Macleod Morass. Further testing would be helpful to better understand potential risks. Further testing may include the sampling of individual ducks (current results from composite samples) and or sampling more ducks from this location.**
- Two **organochlorine pesticides** (*i.e.*, pp-DDE and dieldrin) were found in only one species (Pink-eared Duck, n=2 ducks) from Macleod Morass.
- The concentrations found were below FSANZ extraneous residue limits in edible offal and poultry meat for pp-DDE (5 mg/kg) and dieldrin (0.2 mg/kg).
- Arsenic, cadmium, chromium, copper, lead, mercury, selenium, and zinc were found in duck samples, mainly in liver.
- Of these metals, only lead has trigger point values listed in FSANZ for edible offal (0.5 mg/kg) and meat (0.1 mg/kg) of poultry.
- **Lead was found in all liver samples but only two composite samples (*i.e.*, Grey Teal from Macleod Morass and Pacific Black Duck from Heart Morass) exceeded the FSANZ trigger value of 0.5 mg/kg (Figure 6).**
- **Preliminary risk assessment suggests that consumption advice is unlikely to be required in relation to the level of lead in duck liver. Further testing of individual duck samples would be helpful to better understand potential risks.**

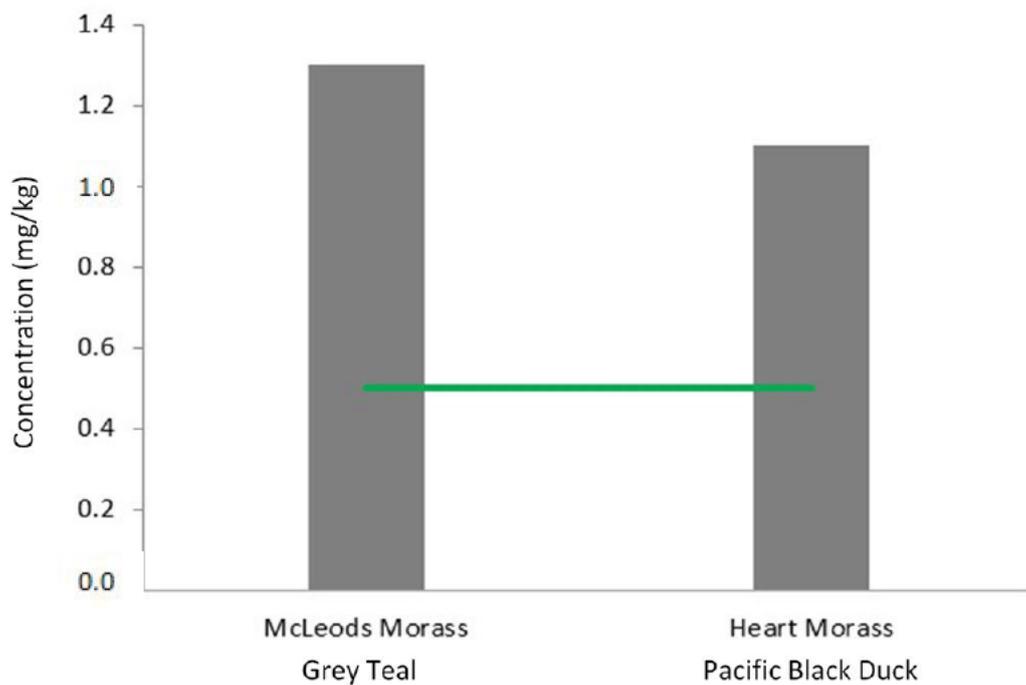


Figure 6. Lead in Grey Teal and Pacific Black Duck liver composite samples from Macleod Morass and Heart Morass. Green line shows the FSANZ lead trigger concentration for edible offal of poultry.