



Session 3: Emerging Contaminants

Emerging Contaminants: National Guidance for Australia

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Outline

- ◆ CRC CARE
- ◆ CRC CARE and guidance development
- ◆ Priority contaminants at CRC CARE

Cooperative Research Centre Contamination Assessment and Remediation of the Environment

Site owners/ industry



Government



Research providers



Service providers



CRC CARE

Goals include

- remediation that is cost effective and sustainable

Research programs

- policy [guidance development]
- measurement, risk assessment, cleaning up, demonstration

Guidance development

- emerging/priority contaminants
- flux-based criteria for management of groundwater
- National Remediation Framework
- title blight
- community engagement

What are CECs?

Contaminants which are new, or for which there are new or emerging concerns

- new pathways of exposure to humans or ecosystems
- newly discovered understanding of effects
- example: perfluorinated chemicals
 - *the severity of adverse effects often only discovered after years of exposure*

Regulatory challenges

Uncertainties

- occurrence
- source(s)
- transport
- persistence
- precursors and breakdown or transformed products
- extent of impacts on health and the environment

Management

- using human and environmental risk assessment
- reduce uncertainties
- management of uncertainties

Prioritisation

- which CECs?

CRC CARE priority contaminants

- priority contaminants identified via stakeholder forum
- end-user suggestions for screening level guidance

PFOS/PFOA	Soil and groundwater HSLs Soil, fresh (marine) water ESLs Sediment criteria
MTBE	Odour thresholds – groundwater Fresh and marine water ESLs
Benzo[a]pyrene	[Soil HILs, GILs, ESLs available]
Weathered hydrocarbons	First stage: Protocol for Silica Gel Clean-up
PBDE	[Soil HILs available]

CRC CARE priority contaminants

- guidance availability
- [guidance for assessment and remediation also required]

	Soil health investigation level	Groundwater investigation level	Ecological investigation level
PFOS (perfluorooctane sulfonate)	X	X	X
PFOA (perfluorooctane sulfonic acid)	X	X	X
MTBE (methyl <i>t</i> -butyl ether)	X	X	X
B[a]P (benzo[a]pyrene)	NEPM	Australian Water Guidelines	NEPM
PBDEs (polybrominated diphenylethers)	NEPM	X	X
Weathered hydrocarbons	<i>Guidance to take account of complex mixtures</i>		

PFOS, PFOA

polyfluorinated compounds

- highly persistent
- bioaccumulative
- toxic

PFOS/PFOA phased out

- legacy sites
- legacy stockpiles
- need for guidance



PFOS/PFOA developments — Australia

- **Defence Department**
 - released *interim internal* criteria (May 2015) – from CRC CARE draft report

- **AirServices Australia**
 - developing own criteria

- **Queensland *Management of Firefighting Foam, 2014 [draft]***
 - handling, transport, storage, use, release, waste treatment, disposal and environmental protection
 - environmental acceptability of foams must be assessed
 - Queensland has transitioned to non-persistent foams

- **Department of Environment (Commonwealth)**
 - developing guidance values for *marine water* – 2015

- **CRC CARE** guidance development

CRC CARE guidance development

Health and ecological screening criteria

- soil
- groundwater – drinking, recreational, irrigation
- fresh waters – ecological, consumption of fish (NB marine GVs – DoE)
- sediments

Include: CSM development

- contaminant source(s) / potential receptors
- potential exposure pathways; complete/not complete
- site specific factors - bioavailability / bioaccumulation

Remediation and Management

- practicable approaches to mitigate risks

Draft Interim Criteria — CRC CARE

Soil

	PFOS	PFOA	6:2 FTS	Source
Human health (direct contact only)				
residential	6 mg/kg	16 mg/kg	60 mg/kg	US EPA [CRC CARE]
industrial	90 mg/kg	240 mg/kg	900 mg/kg	US EPA [CRC CARE]
Ecological (terrestrial)				
95% species protection	0.373 mg/kg	3.73 mg/kg	NA	UK earthworm [CRC CARE]

Draft Interim Criteria — CRC CARE

Water

	PFOS	PFOA	6:2 FTS	Source
Human health (direct contact only)				
Drinking water	0.2 µg/L	0.4 µg/L	5.0 µg/L	US EPA [CRC CARE]
Surface water				
Ecological	6.66 µg/L	2900 µg/L	NA	[CRC CARE] UK
Consumption of fish	0.65 ng/L	300 ng/L	6.5 ng/L	NL
Recreational use	2 µg/L	4 µg/L	50 µg/L	[CRC CARE - based on NWQMS]

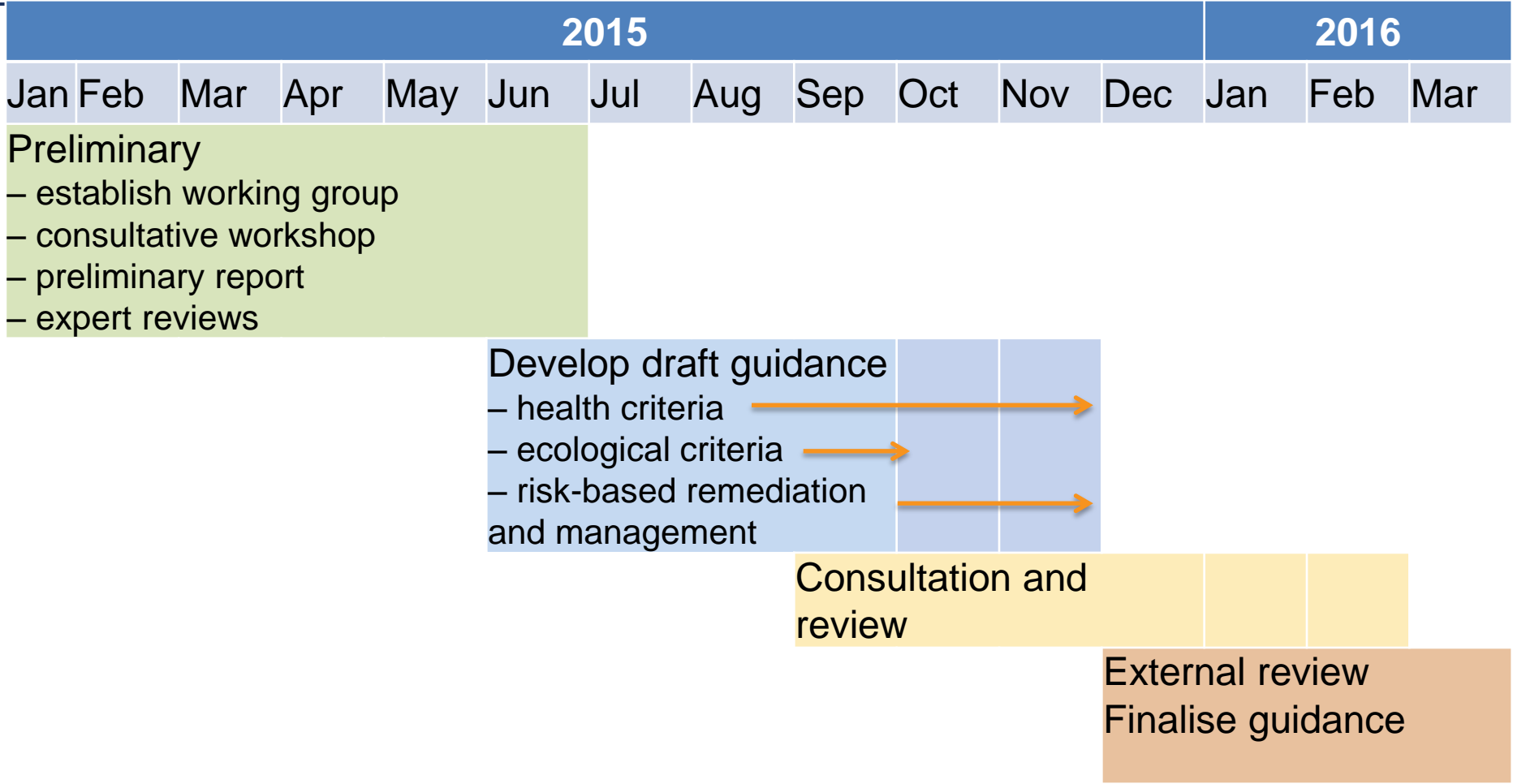
CRC CARE/GHD Report, March 2015

Criteria development

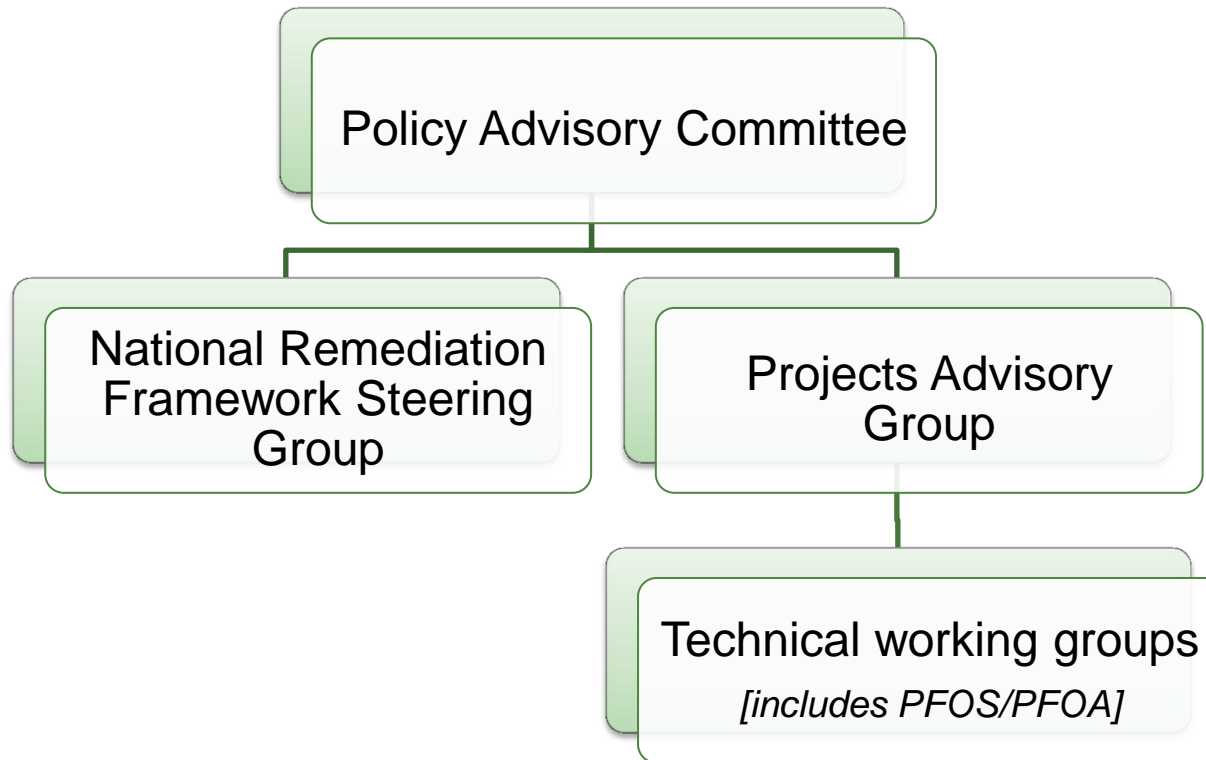
Draft interim values in the CRC CARE/GHD Report

- based on a survey of international values
- have no status at this stage
- [NB Defence Department]
- are currently being reviewed in light of
 - new ecotox and human toxicity research results
 - DK EPA (2015): Perfluoroalkylated substances
 - US ATSDR (2015): Draft Toxicological Profile for Perfluoroalkyls

PFOS/PFOA Project Timeline



Consultation with end users



PFOS/PFOA TWG membership

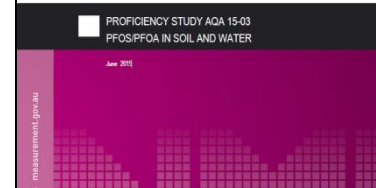
- governments
- petroleum
- aviation
- Defence
- health sector
- researchers

CRC CARE PFOS/PFOA — other activities

Proficiency study: PFOS/PFOA in soil and water

- laboratories – 9 Australia; 2 overseas
- pilot testing phase
- some large deviations due to systematic errors in measurement related to calibration standard used – total/linear PFOS/PFOA
- National Measurement Institute (CRC CARE – funded)
- Full report available online

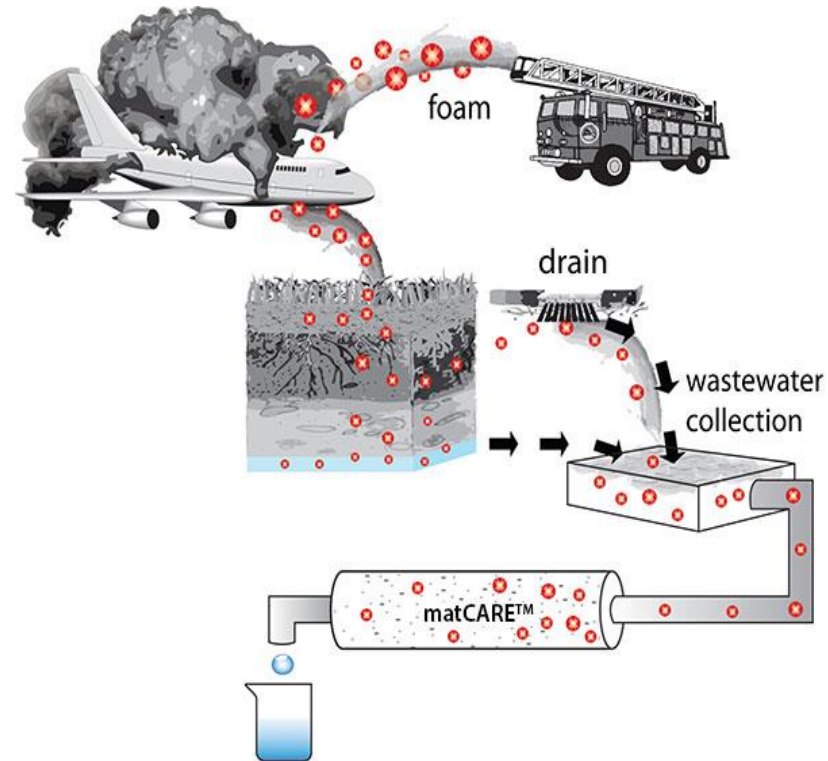
<http://www.measurement.gov.au/Publications/ProficiencyStudy/Reports/Documents/AQA15-03.pdf>



CRC CARE PFOS/PFOA — other activities

MatCARE remediation technology

- adsorbent (proprietary product)
- Defence project
 - 1 ML wastewater
 - PFOS/PFOA removal < LOR
- Adelaide Airport project underway



Benzo[a]pyrene — existing guidance

Medium	Australian screening levels
Drinking water	0.01 µg/L
Fresh/marine	0.2 µg/L
Recreation/agriculture	0.1 µg/L
Soil - health	Residential A & C: 3 mg/kg HIL Residential B: 4 mg/kg HIL Commercial: 40 mg/kg HIL
Soil - ecological	Eco significance: 0.7 mg/kg ESL Residential & POS: 0.7 mg/kg ESL Commercial/Industrial: 1.4 mg/kg ESL

Benzo[a]pyrene — guidance development

Existing screening levels - being reviewed

- from a risk based perspective
- in light of new information

Remediation and Management – risk based

CSM development

- source(s) / potential receptors / pathways
- bioavailability / bioaccessibility
 - application in site specific risk assessment

Practicable approaches to mitigate risks in soil and groundwater

Due October 2015

Methyl t-butyl ether — guidance development

Legacy sites

- related to leaking underground storage tanks

Screening criteria

- odour-based threshold for groundwater
- ecological criteria – fresh, marine, soil
- currently under review by TWG

Risk-based remediation and management

- groundwater and soils
- due February 2016

Weathered hydrocarbons — challenges

Composition

- complex
- polar and non-polar compounds
- aliphatics, aromatics and transformed products
- variable (origin, time)

Medium - long term research

- characterisation
- eco-toxicology

Weathered hydrocarbons — possible ways ahead

Silica Gel Clean-up

- standardised protocol

Guidance - screening levels

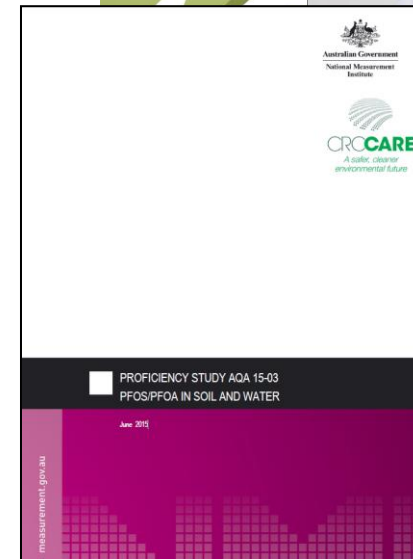
- indicative markers or groups of compounds?
 - polar versus non-polar compounds?
 - utilise most toxic components?
- need for screening levels, or concentrate on management?

Guidance - remediation and management

- reduction of overall risk via reduction of hydrocarbon loading?
- depends on assessment outcomes

CRC CARE Publications

- Analytical methods for priority and emerging contaminants: A literature review
- Environmental impact of priority contaminants: A literature review
- Development of guidance for contaminants of emerging concern
- *Proficiency study
PFOS/PFOA in soil and water*



REPORT No.32
Development of guidance for
contaminants of emerging concern

Available: <http://www.crccare.com>

Feedback

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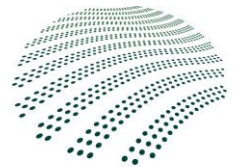
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PFOS/PFOA concentration ranges - Australia

Location	Soil/sediment/biosolids (mg/kg)		Waters (µg/L)	
	PFOS	PFOA	PFOS	PFOA
Fire training grounds	Soil <0.01 – 460	Soil <LOR – 3.2	Groundwater 0.07 – 870	Groundwater <LOR – 160
Brisbane: Moreton Bay	NA	NA	Surface water 0.00018 – 0.015 (mean)	Surface water 0.00013 – 0.0062 (mean)
Sydney Harbour: Homebush Bay	Sediment 0.0008 – 0.0062	Sediment <LOR – 0.00016	Surface water 0.0075 – 21	Surface water 0.0042 – 0.0064

Source: Preliminary Report: Risk-based assessment, management and remediation of PFOS/PFOA (CRC CARE/GHD 2015)

PFOS/PFOA concentration ranges - Australia

Location	Soil/sediment/biosolids (mg/kg)		Waters (µg/L)	
	PFOS	PFOA	PFOS	PFOA
Landfills (leachates/ evaporation/ aeration pond)	NA	NA	>LOR - 1.87	>LOR – 0.88
Sewage treatment plants biosolids	Biosolids <LOR – 0.19	Biosolids <LOR – 0.016	Leachate <LOR – 1.10	Leachate 0.016 – 2.1

Source: Preliminary Report: Risk-based assessment, management and remediation of PFOS/PFOA (CRC CARE/GHD 2015)

Benzo[a]pyrene concentration ranges

Environmental Matrix	B(a)P Concentration	Locations
Air	0.0001 – 4.32 ng/m ³	Europe, Russia, UK, USA
	0.038 – 2.02 ng/m ³	Australia
Soil	14 – 536 mg/kg	Superfund sites USA
	2.9 – 90.3 mg/kg (median 17.6 mg/kg)	Australia
	0.5-5 mg/kg	Australia older urban areas with a history of industrial use
	0.5 – 1000 mg/kg	Australia – former gasworks sites
Sediment	<0.1 – 1,100 mg/kg	Canada, Europe, USA
	<0.01 – 6,800 µg/kg	Australia