



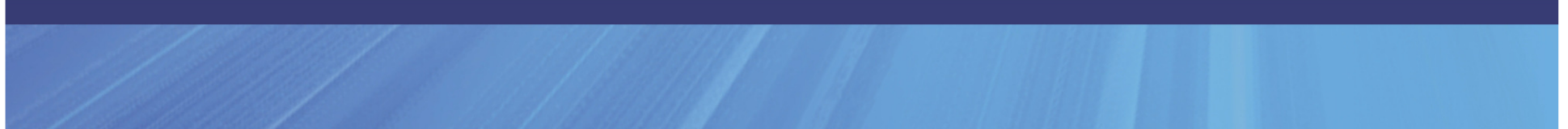
Australian Government

Department of Infrastructure and Regional Development

# Regulation of leased federal airports in Australia

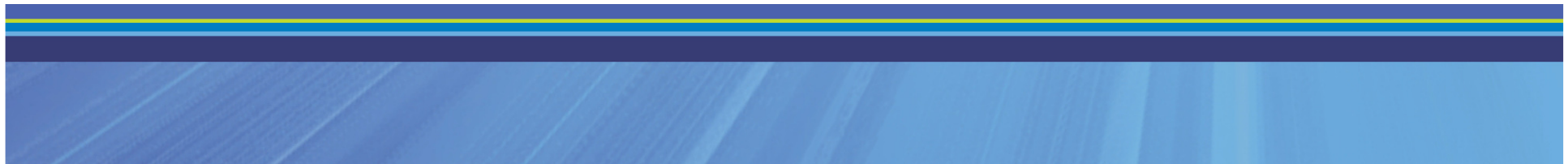
*With a focus on contaminated sites*

Presentation for International Committee On  
Contaminated Land



# History of Australian airports

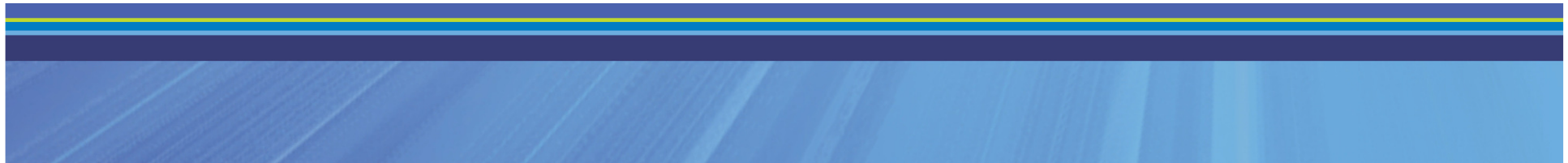
- 1996 decision to privatise Australian airports
- Leased 50yrs, option for a 49yr extension
- The *Airports Act 1996* on 9 October 1996
- Nineteen leased federal airport have an Airport Environment Officer (AEO)
- Airports (Environment Protection) Regulations 1997 commenced in December 1998



# *Airports Act 1996*

Section 71 Defines the contents of a Master Plan which includes a 5 year Airport Environmental Strategy (AES)

- Areas identified as environmentally significant
- Source of environmental impact of airport operations
- Measures to control or reduce the impact of operations
- Studies, reviews and monitoring of impacts
- Airport Lessee Company's Environmental Objectives



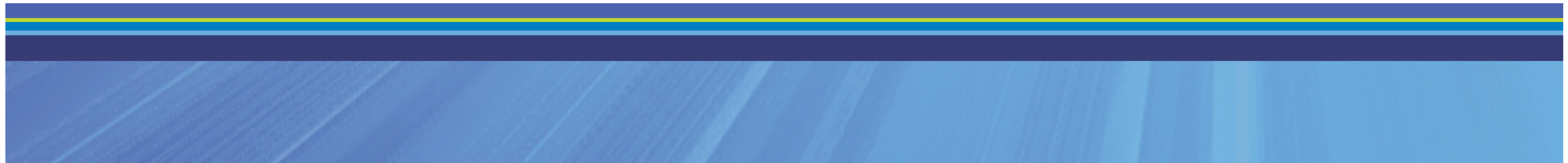


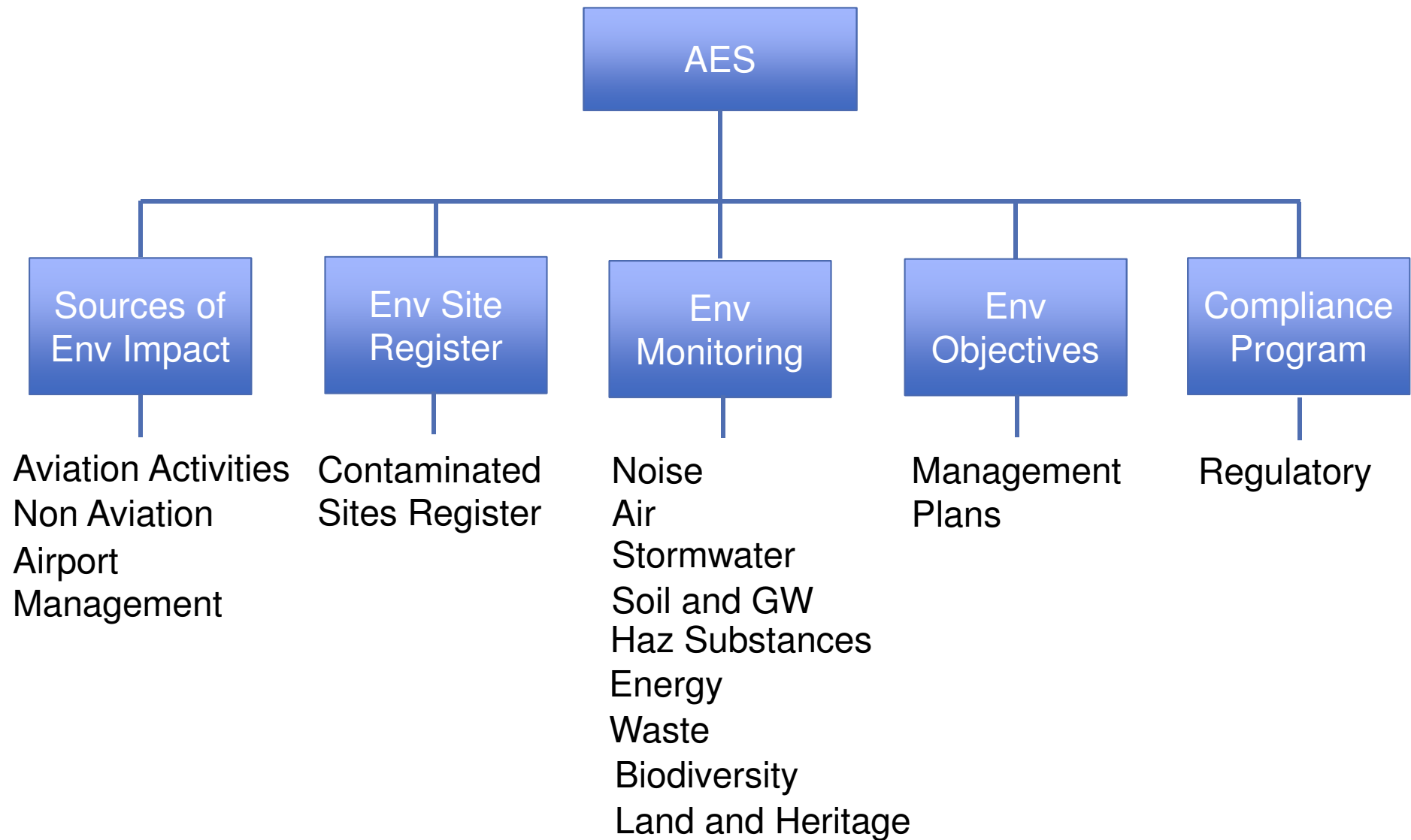




# Airports (Environment Protection) Regulations 1997

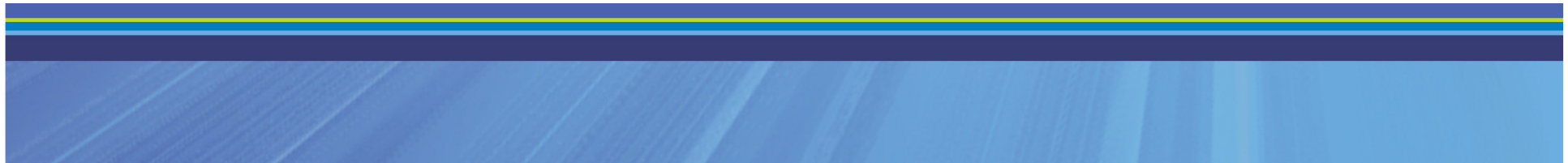
- 4.01 General Duty to Avoid Polluting
  - stormwater pollution control devices
- 6.01 All existing pollution to be reported
- 6.02 All pollution present in soil, air, or water is monitored
- 6.03 Annual environmental report
- 6.04 If monitoring discloses pollution, airport must provide a report within 14 days to the AEO
  - Airport must keep an environmental site register





# AEO role

- Develop a strong relationship with their airport
- Review the Airport Environment Strategy and oversee implementation
- Review Annual Environmental Report
- Review monitoring, site investigations and remedial reports



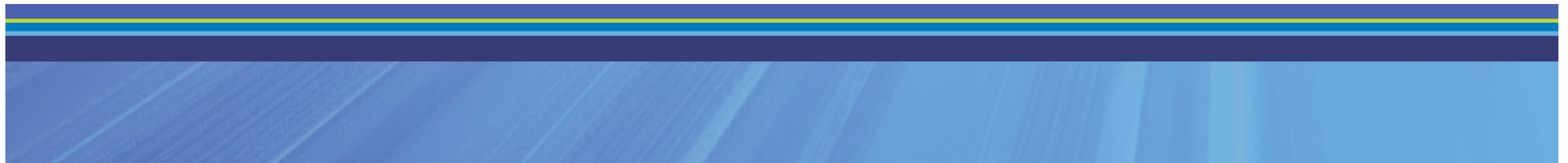






# AEO role cont..

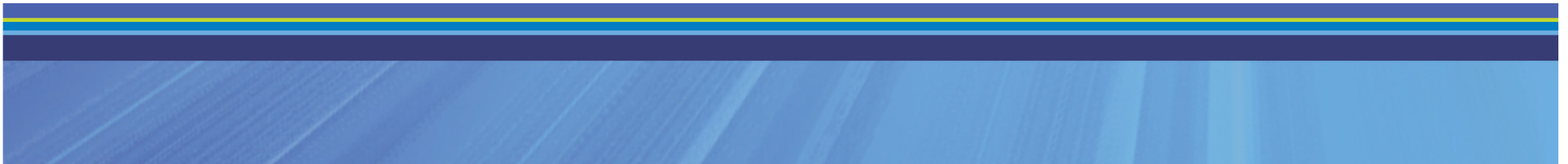
- Review strategies and management plans  
e.g. stormwater quality management plans
- Advise airport and Airport Building  
Controller on environmental aspects of  
building activities



# Contaminated sites

Airports can have a number of contaminants

- TCEs, Hydrocarbons (DNAPL, LNAPL), heavy metals, PCBs , BTEX and PAHs
- Emerging contaminants such as perfluorinated chemicals (e.g. PFOS, PFOA)



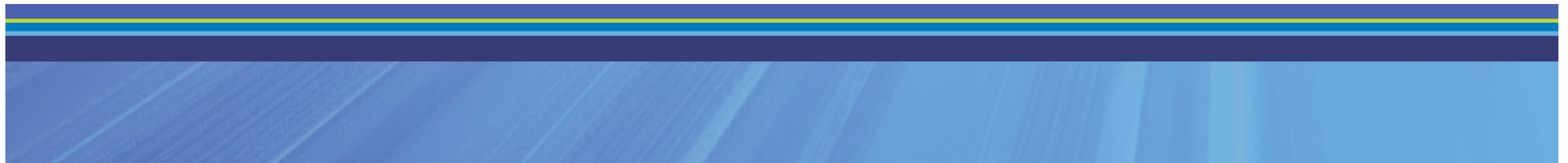






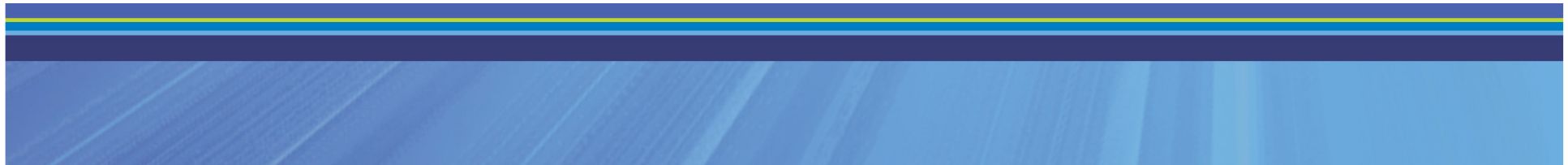
# Emerging contaminants

- PFOS is listed under the Stockholm Convention – not yet ratified by Australia
- DoIRD working with a number of stakeholders including Department of Defence, Airservices Australia, Department of Environment, and CRC Care to develop national guidelines



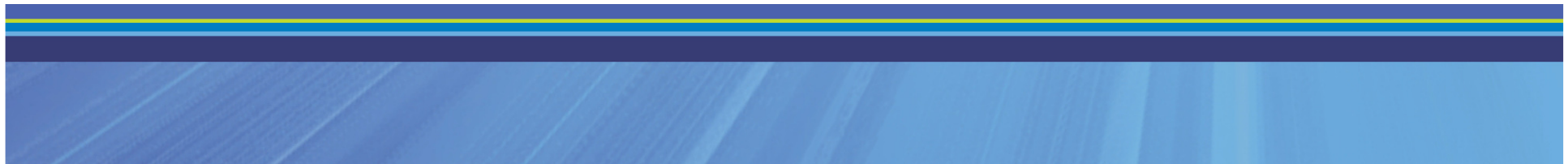
# Emerging contaminants cont.

- Interim standards for PFOS and PFOA are being developed by Department of Environment
- DoIRD has prepared advice for airports on the management of PFCs which may be encountered during building activities



# Emerging contaminants cont.

- Airservices Australia and DoIRD procured services of GHD to develop a PFC contamination strategy
- The strategy was developed to inform the Department of Environment's policy development process
- This document has been made available to leased federal airports for consideration
- The strategy can be used as a reference for the airports - it is not a guideline or policy



# PFCs Interim Contaminant Management Strategy and Decision Framework

*Peter Nadebaum  
Senior Principal – Environment  
GHD Pty Ltd*





# The problem

- Aqueous film-forming foams (AFFF) have been used for fire-fighting purposes at airports around Australia for decades. These contained perfluorinated or polyfluorinated compounds (PFCs), particularly PFOS and PFOA
- Use of products containing these compounds has now stopped
- Soil and groundwater contamination by PFCs remains present in the vicinity of fire training areas, and at low concentrations outside of fire training areas
- In the absence of guideline levels - ad hoc approach, difficult to make decision on what needs to be done even if trace levels – serious restriction on infrastructure works



# The response

- Develop an **Interim Contamination Management Strategy and Decision Framework for PFCs** as input to Department's development of policy for Federal airports for dealing with PFC contamination
- Provide practicable, risk-based contamination management solutions
- Take into account guidance being developed by CRC CARE



# Observations

- Typical concentrations at fire training grounds:
  - Soil: PFOS <LOR - 450 mg/kg, PFOA <LOR – 3 mg/kg
  - Groundwater: PFOS up to 900 µg/L, PFOA up to 150 µg/L
  - Also can be detected elsewhere outside fire training grounds, but at low concentrations, eg generally soil PFOS < 1 mg/kg
  - Also present in sediments in drainage lines and receiving water
- Moderately soluble, long half lives in water (PFOS >41 years, PFOA >92 years, at 25°C)
- Readily partition between water and organic rich sediments/soils
- Bioaccumulation a particular issue (e.g. fish in receiving waters)



# Guidance particularly required for managing Federal airports

- Construction activities requiring excavation and management of PFC contaminated soil
- PFC impacted water that may result from interception/extraction of PFC contaminated groundwater, or from surface runoff from contaminated infrastructure
- Maintenance activities where PFC contaminated sludge is generated (e.g. waterway dredging, groundwater well installation, etc.)





# Interim Screening Levels for Federal airports

(subject to revision)

Exposure scenario	PFOS	PFOA/8:2FtS	6:2FtS	Source and Comments
<b>Soil</b>				
Human health – residential (direct contact only)	6 mg/kg	18 mg/kg	60 mg/kg	US EPA Region 4, 2009, Jarman et al, 2014
Human health – industrial (direct contact only)	90 mg/kg	240 mg/kg	900 mg/kg	US EPA, 2009b
Ecological (terrestrial)	0.373 mg/kg (95% protection), 0.91 mg/kg (80% protection), 4.71 mg/kg (60% protection)	3.73 mg/kg	NA	UK EA, 2009
Clean fill	0.373 mg/kg	3.73 mg/kg	60 mg/kg	Based on Vic EPA IWRG621
Landfill acceptance (contaminated soil and sediment)	90 mg/kg (soil) 20 µg/L (ASLP)	240 mg/kg (soil) 40 µg/L (ASLP)	900 mg/kg (soil) 500 µg/L (ASLP)	Based on Vic EPA IWRG621
<b>Groundwater</b>				
Human health (drinking water)	0.2 µg/L	0.4 µg/L	5.0 µg/L	US EPA Jarman et al, 2014
Ecological	Refer surface water			
<b>Surface water</b>				
Ecological (tox effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA	Qi et al 2011) Giesy 2010
Human health (consumption of fish)	0.65 ng/L	300 ng/L	6.5 ng/L	RIVM 2010
Recreational use	2 µg/L	4 µg/L	50 µg/L	Drinking water x 10

# Soil and sediment management approach – for Federal airports

- **Key principles for decision making:**
  - Protection of human health is paramount
  - Actions should not increase the extent of contamination, or the risk posed by the contamination
  - Effort/resources prioritised to more heavily contaminated areas
  - Actions should not preclude remediation where residual contamination poses unacceptable risk
- **Management options must account for exposure/transport pathways** (direct contact, stormwater runoff, vertical percolation to groundwater), and receptors (site workers, offsite users of groundwater, consumers of fish, ecosystem)
- **Soil classified into three categories**, based on PFOS and PFOA concentrations

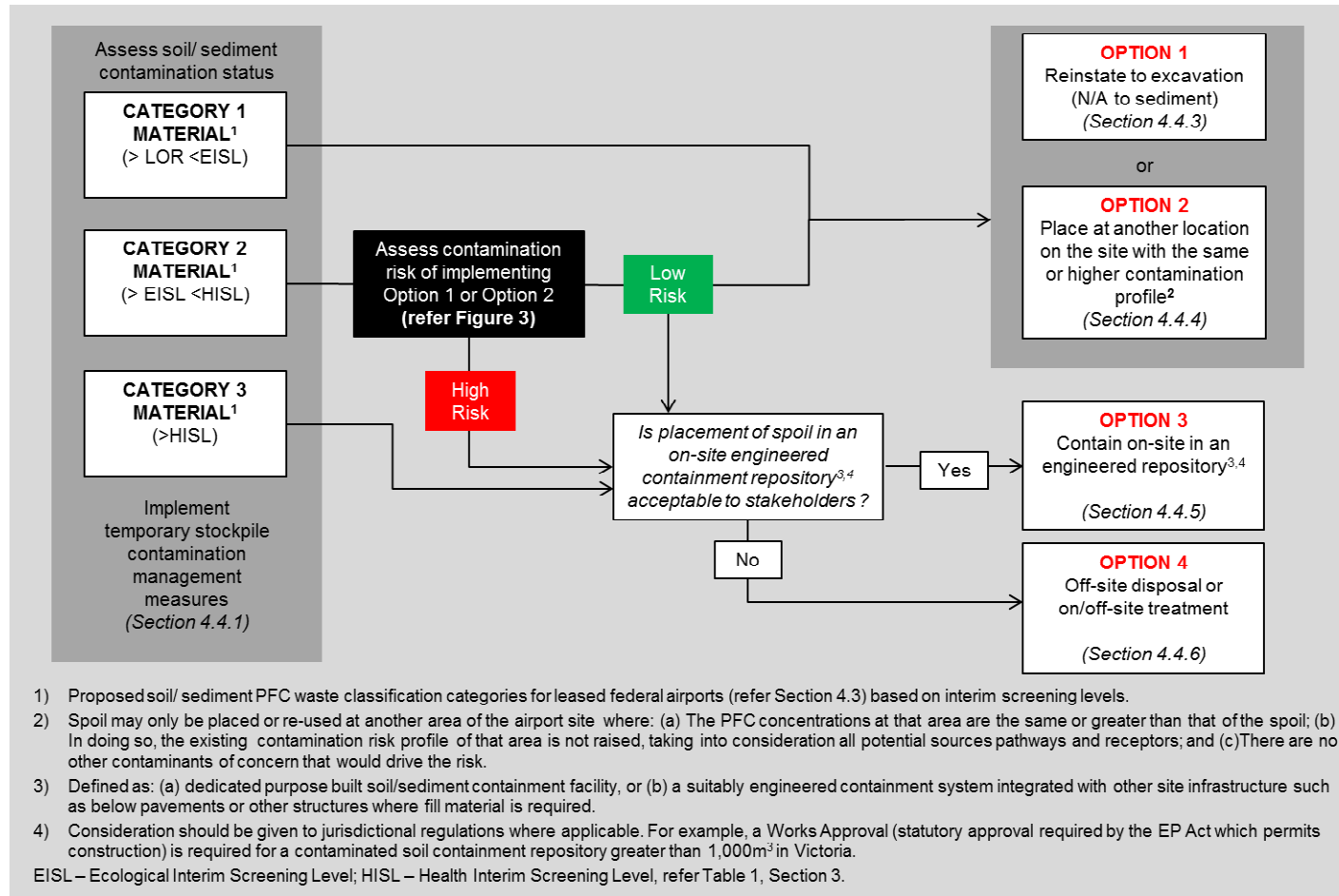


# Interim soil and sediment management categories

PFC soil and sediment waste interim categories		Upper Limits
Category 1 Material (generally low risk material)	Concentration (mg/kg)	ASLP (µg/L) <sup>3</sup>
PFOS	0.373 <sup>1</sup>	-
PFOA	3.73 <sup>1</sup>	-
Category 2 Material (Low risk to human health, potential risk to ecology and waters)		
PFOS	90 <sup>2</sup>	20 <sup>4</sup>
PFOA	240 <sup>2</sup>	40 <sup>4</sup>
Category 3 Material (careful management)		
PFOS	>90 <sup>2</sup>	-
PFOA	>240 <sup>2</sup>	-
NOTES: 1. UK Environmental Agency 2009 ecological investigation level. 2. USEPA Region 4 health screening level for a commercial/industrial land use. 3. Australian Standard Leaching Procedure. 4. Based on USEPA Region 4 2009 drinking water criteria with 100 fold attenuation factor applied.		



# Soil and sediment decision support framework



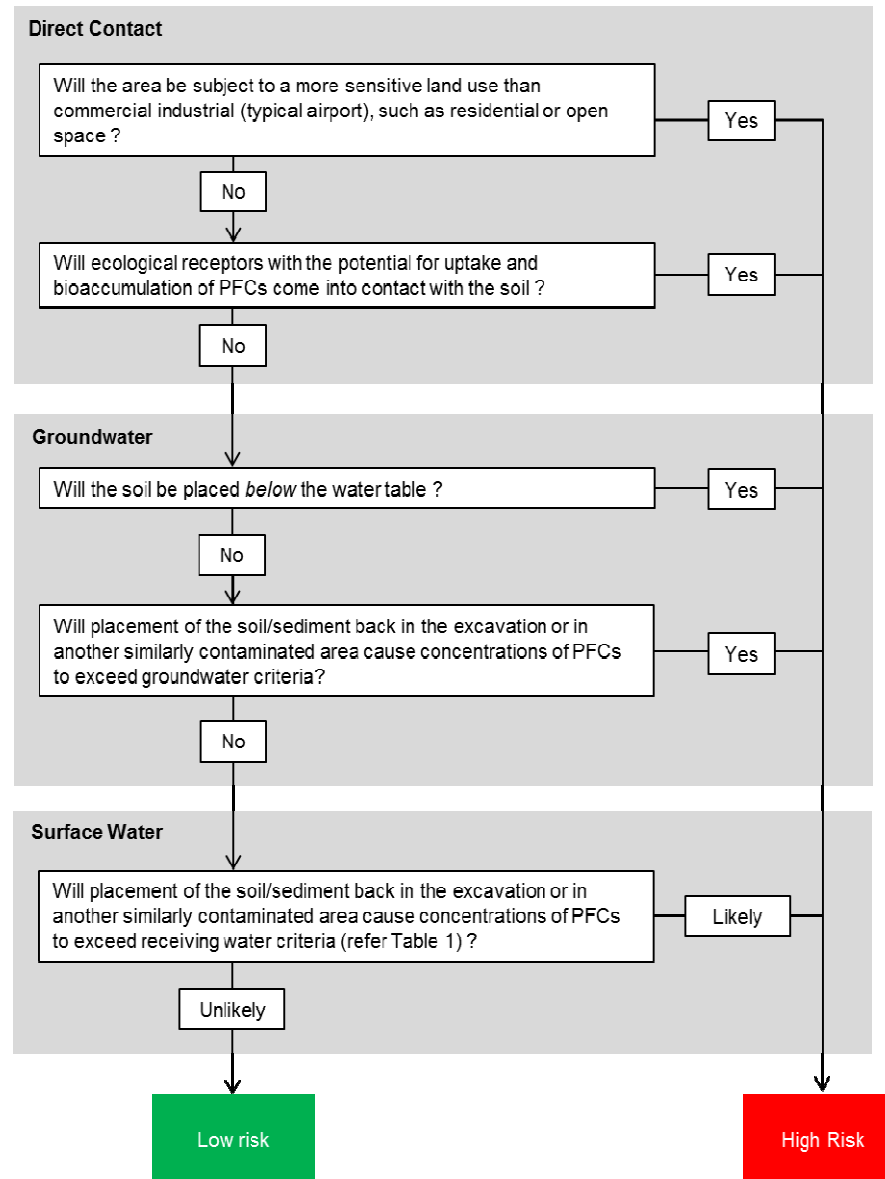
# PFC contaminated soil and sediment - management of excavation work

- **Option 1 – reinstate to excavated area**
  - Category 1, and potentially Category 2 soil and sediment
- **Option 2 – place at another location on the site** with the same or higher contamination risk profile
  - Category 1 and Category 2 soil and sediment
- **Option 3 – onsite containment**
  - Category 1, 2 and 3 soil and sediment
- **Option 4 – offsite disposal** or on/offsite treatment
  - Category 3

A range of considerations apply to all options



# Soil and sediment decision-based risk assessment



# PFC contaminated water management of disposal at airports

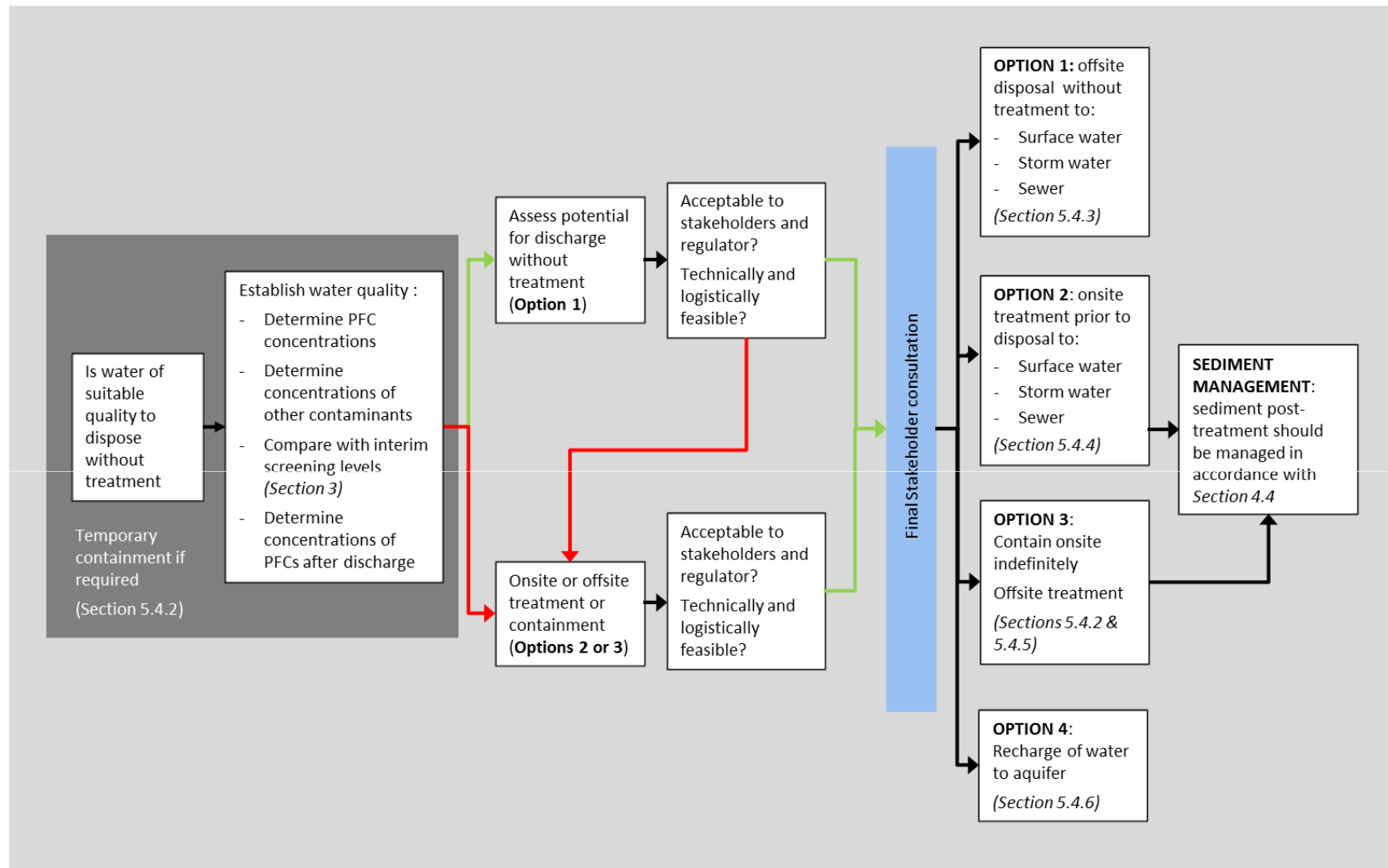
- **Conceptual site model** considers:
  - Contaminant transport pathways (direct contact, surface water discharge, sewer discharge, vertical percolation to groundwater)
  - Receptors (site workers, consumers of fish, sewerage/stormwater workers, ecosystems)
- **Management options:**
  - Option 1 – disposal without treatment to surface water, stormwater or sewer
  - Option 2 – on-site treatment, prior to discharge to surface water, stormwater or sewer
  - Option 3 – onsite containment or offsite treatment
  - Option 4 – recharge of water to aquifer

Guidance and commentary on considerations provided for each option.



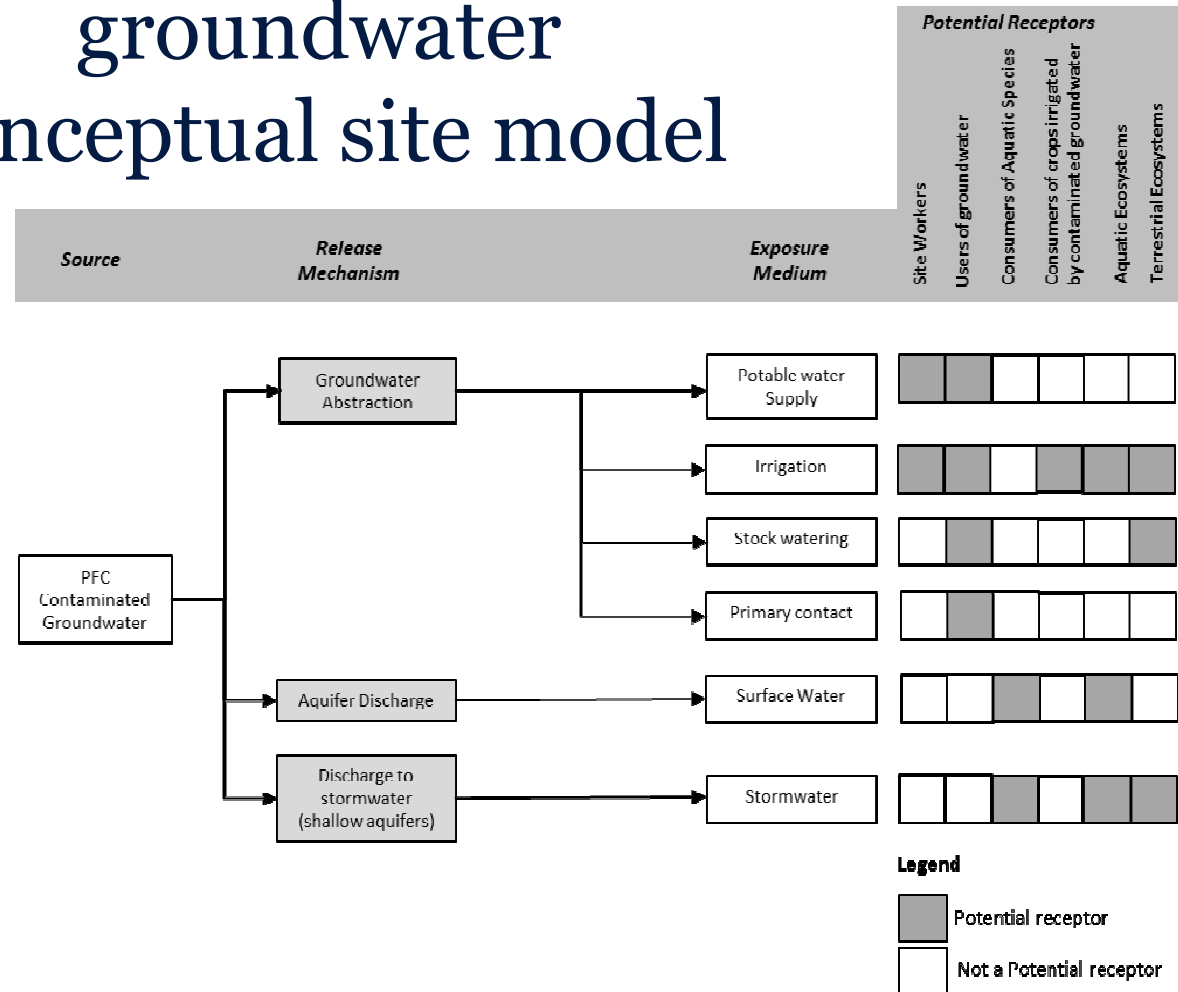


# PFC contaminated water management options



# Management of PFC contaminated groundwater conceptual site model

- Developing a CSM is important to understanding the risks
- Considers contaminants of concern, sources, transport pathways, receptors and exposure pathway linkages



# PFC contaminated groundwater management decision process

Define risk profile based on:

- Facility risk (AFFF use)
- Setting risk (geology, hydrogeology, land and groundwater beneficial uses, natural resource value, sensitive receptors, etc.)
- Beneficial use risk (impacts of contamination to on and off-site beneficial uses of groundwater)



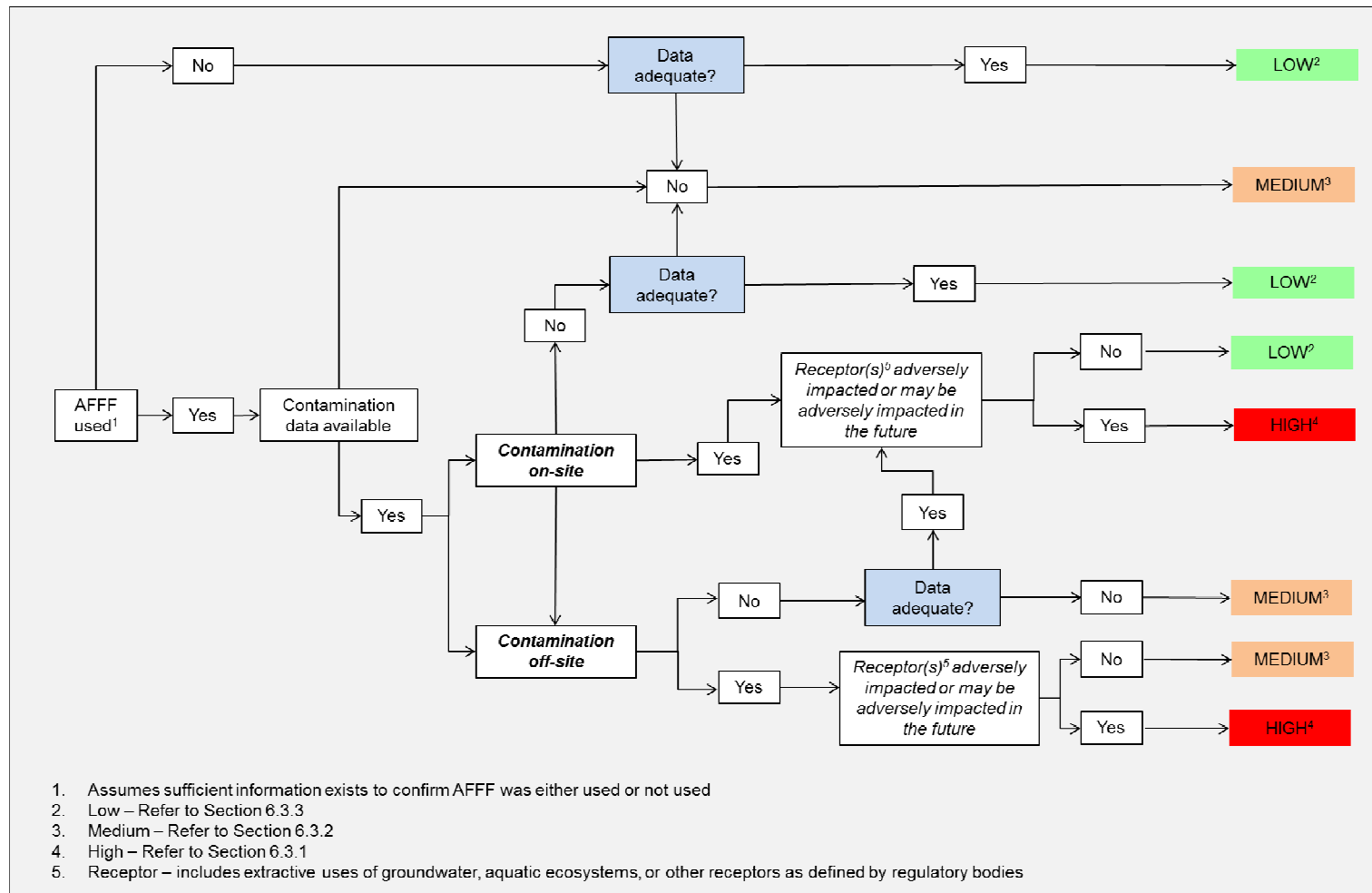
# PFC contaminated groundwater management decision process

Groundwater management regimes defined by likely impact and risk:

- High – actual impact has occurred (concentrations above interim investigation levels, onsite receptor controlled by third party (e.g. water authority) impacted, onsite and offsite groundwater impacted and beneficial use precluded
- Medium – impacts observed but do not exceed guidelines, offsite receptors not impacted, incomplete data
- Low – no unacceptable risk to on/offsite receptors through absence of source, or as demonstrated by adequate site contamination data



# PFC contaminated groundwater management decision process



# PFC groundwater management monitoring response by risk level

RISK LEVEL	ON-SITE / OFF-SITE	WELL NETWORK	ANALYTICAL DETAILS	TRIGGER	CONTINGENCY
HIGH	ON-SITE	<ul style="list-style-type: none"><li>• Sources</li><li>• Boundaries</li><li>• Along plume length</li><li>• Sufficient to assess flow direction and gradient and plume stability</li></ul>	<ul style="list-style-type: none"><li>• PFOS, PFOA</li><li>• 6:2 FtS</li><li>• 8:2 FtS</li><li>• TOC</li><li>• TDS, pH</li></ul>	Actual harm identified → Implement remedial action Impacted on-site receptor controlled by a third party → Implement remedial action Beneficial uses precluded → Assess need for further GMEs. Re-assess risk and need for remedial action	
	OFF-SITE	<ul style="list-style-type: none"><li>• Along plume length</li><li>• At receptor(s) where possible</li></ul>	<ul style="list-style-type: none"><li>• PFOS, PFOA</li><li>• 6:2 FtS</li><li>• 8:2 FtS</li><li>• TOC</li><li>• TDS, pH</li></ul>	Impact at receptor wells → Implement remedial action EPA notice → Comply with notice Complaints → Re-assess risk rating	
MEDIUM	ON-SITE	<ul style="list-style-type: none"><li>• Sources</li><li>• Boundaries</li><li>• Sufficient to assess flow direction and gradient</li></ul>	<ul style="list-style-type: none"><li>• PFOS, PFOA</li><li>• 6:2 FtS</li><li>• 8:2 FtS</li><li>• TOC</li><li>• TDS, pH</li></ul>	Plume increasing (not stable) → Re-assess risk rating	
	OFF-SITE	<ul style="list-style-type: none"><li>• Assess presence of PFCs off-site if present in boundary wells on site</li></ul>	<ul style="list-style-type: none"><li>• PFOS, PFOA</li><li>• 6:2 FtS</li><li>• 8:2 FtS</li><li>• TOC</li><li>• TDS, pH</li></ul>	PFCs present → Re-assess risk rating	
LOW	ON-SITE	<ul style="list-style-type: none"><li>• Potential sources</li><li>• Sufficient to assess flow direction and gradient</li></ul>	<ul style="list-style-type: none"><li>• PFOS, PFOA</li><li>• 6:2 FtS</li><li>• 8:2 FtS</li><li>• TOC</li><li>• TDS, pH</li></ul>	Impact identified → Install additional wells to delineate plume and at site boundaries. Re-assess risk rating	

## Concluding comment

- A practical risk-based response to the PFC problem at Federal airports
- Will be revised as guidance is developed by CRC CARE and further information is available



# Acknowledgements

- CRC CARE
- Airservices Australia
- GHD specialists

