



Great Barrier Reef Catchment Loads Monitoring Program

Mack Whitsunday Regional Science Forum – May 2023

Water Quality and Investigations - Department of Environment and Science, Australia

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**Queensland
Government**



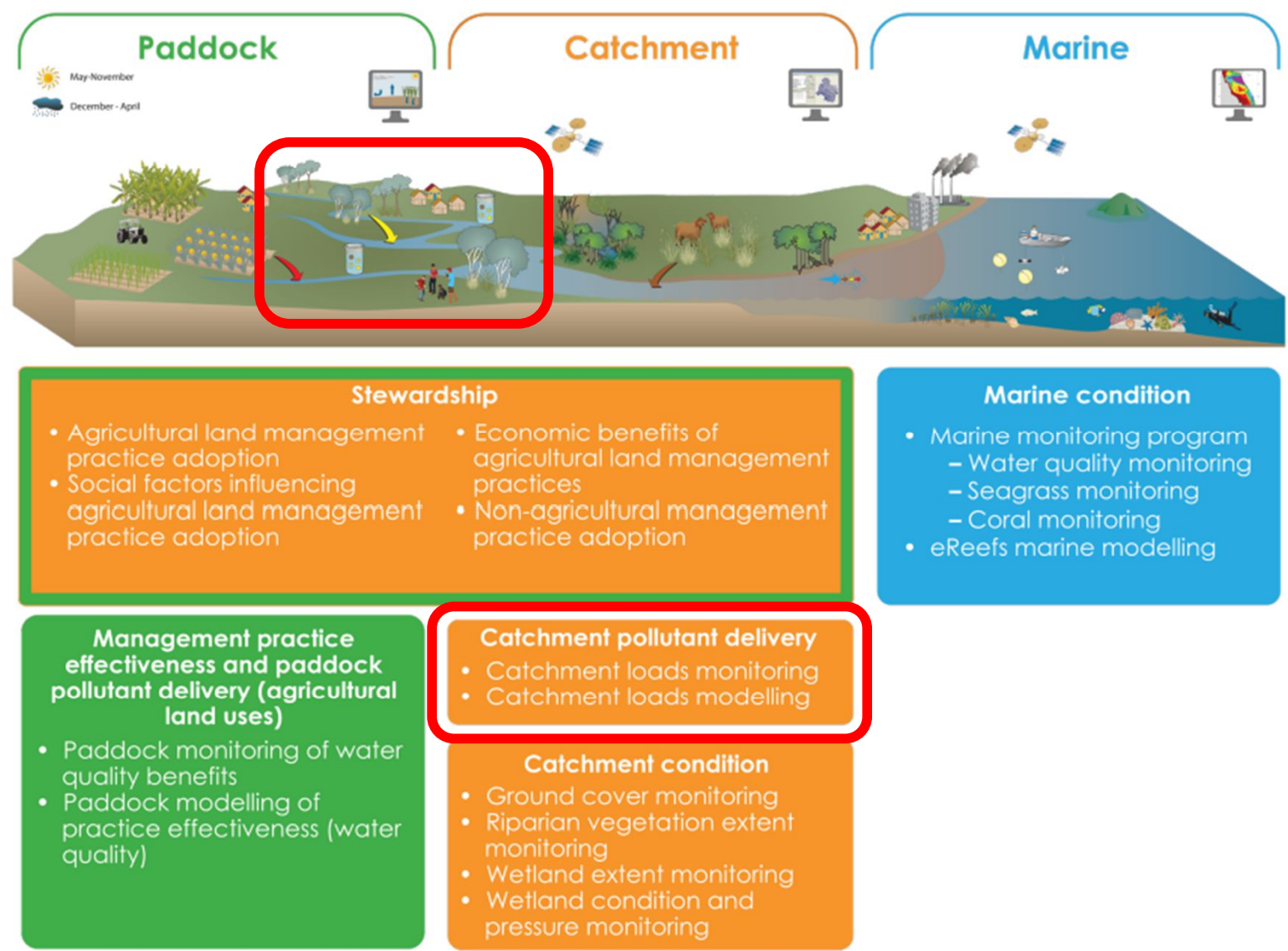
Acknowledgement of Country

I would like to acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Owners and Custodians of the Country on which we meet.

We recognise their connection to land, sea and community.

We pay our respects to them, their cultures, and to their Elders, past present and emerging.

There are 14 program components, which are integrated through a common assessment and reporting framework.

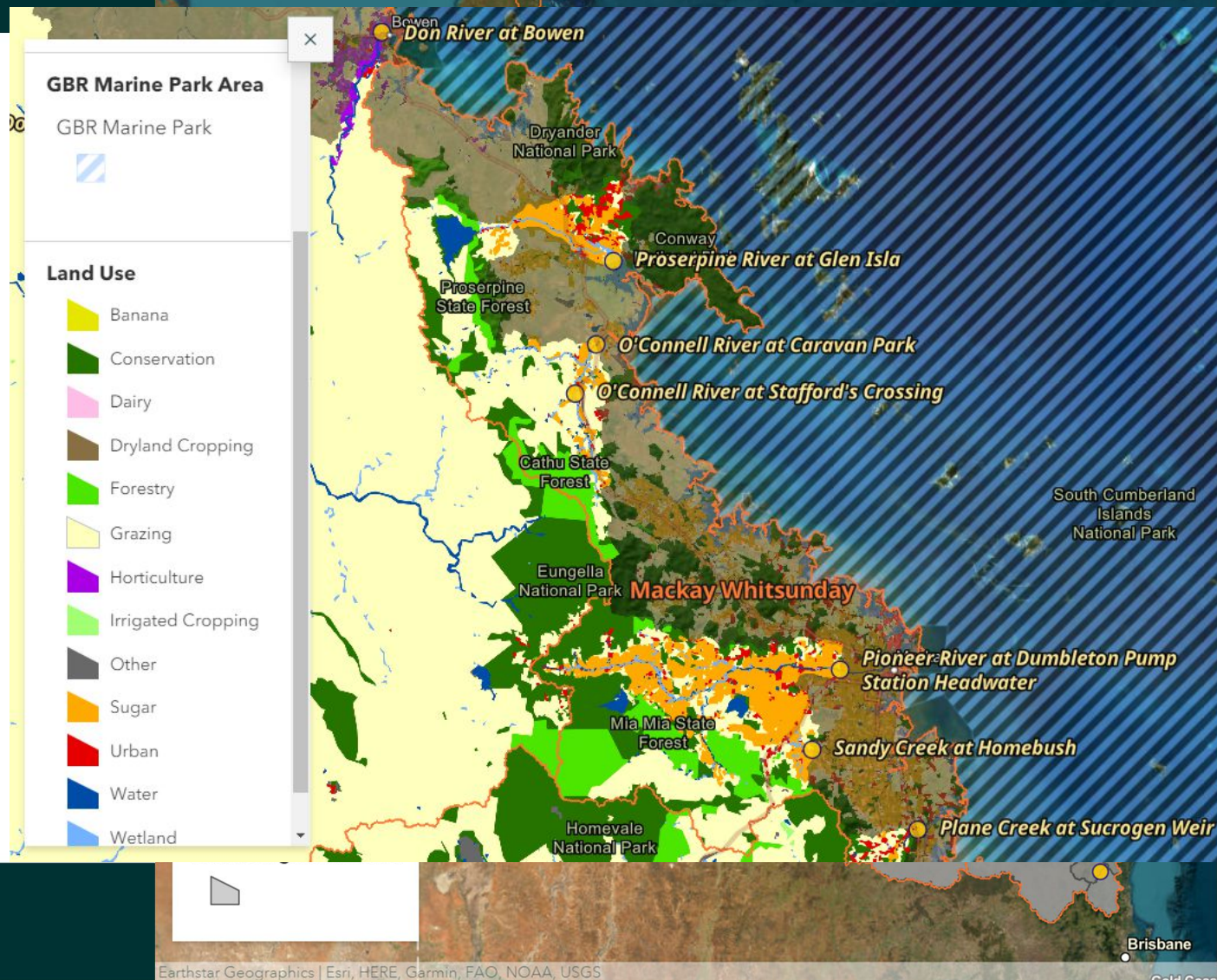


P2R Program

- 14 components
- Loads monitoring
- Catchment scale (with some fine scale projects)

WQI 2021-2022 Sites

- More than 110 sites across the GBR Catchments
- 6 Mack Whitsunday
 - TSS, Nutrients
 - 5 EoC Sites
 - 1 SC Sites (Stafford's Crossing)
 - Pesticides
 - 5 EoC Sites







Loads vs Concentration

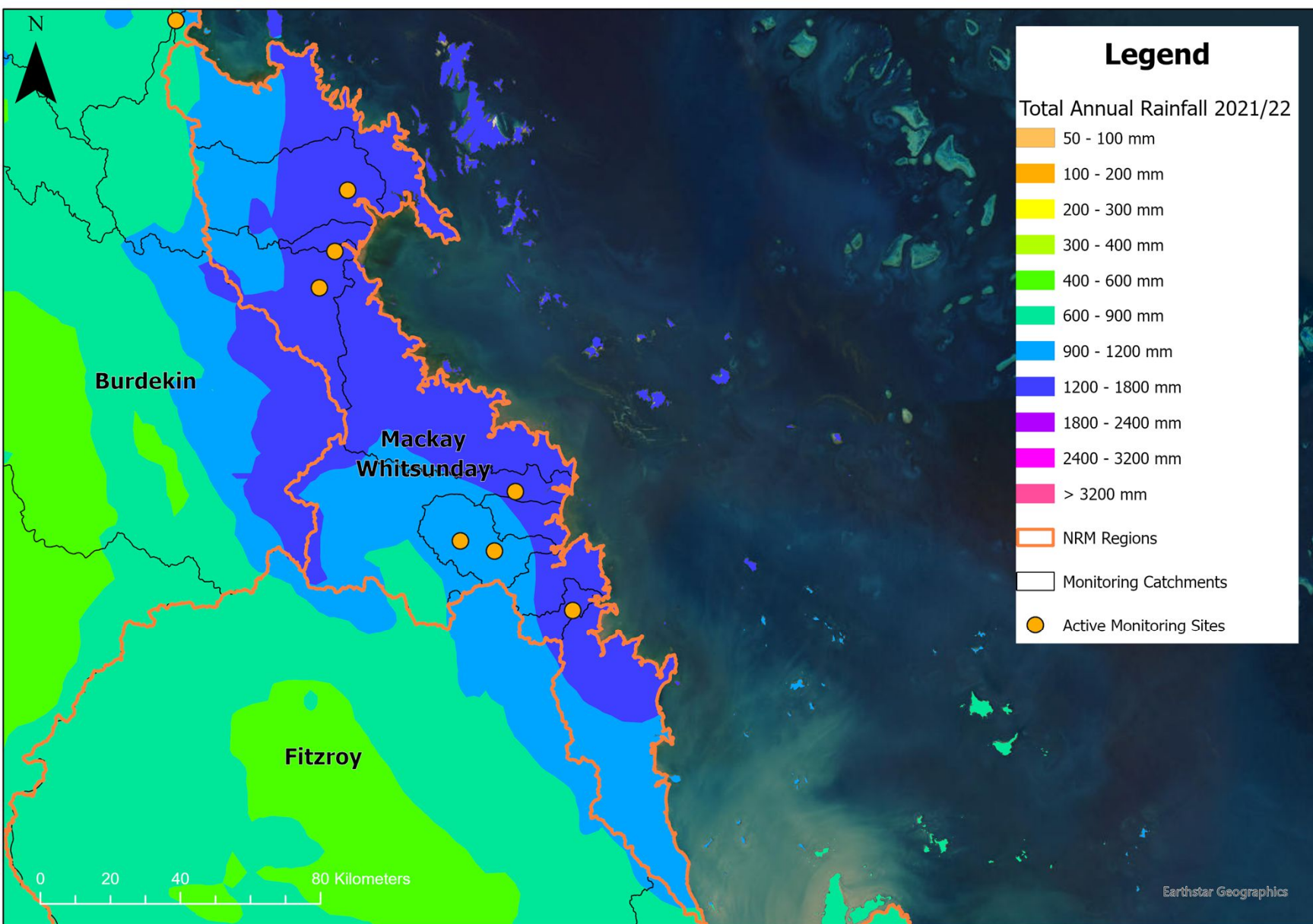
Water Quality
Sediments and Nutrients



X

Water Quantity
River Flow





2021/22 year

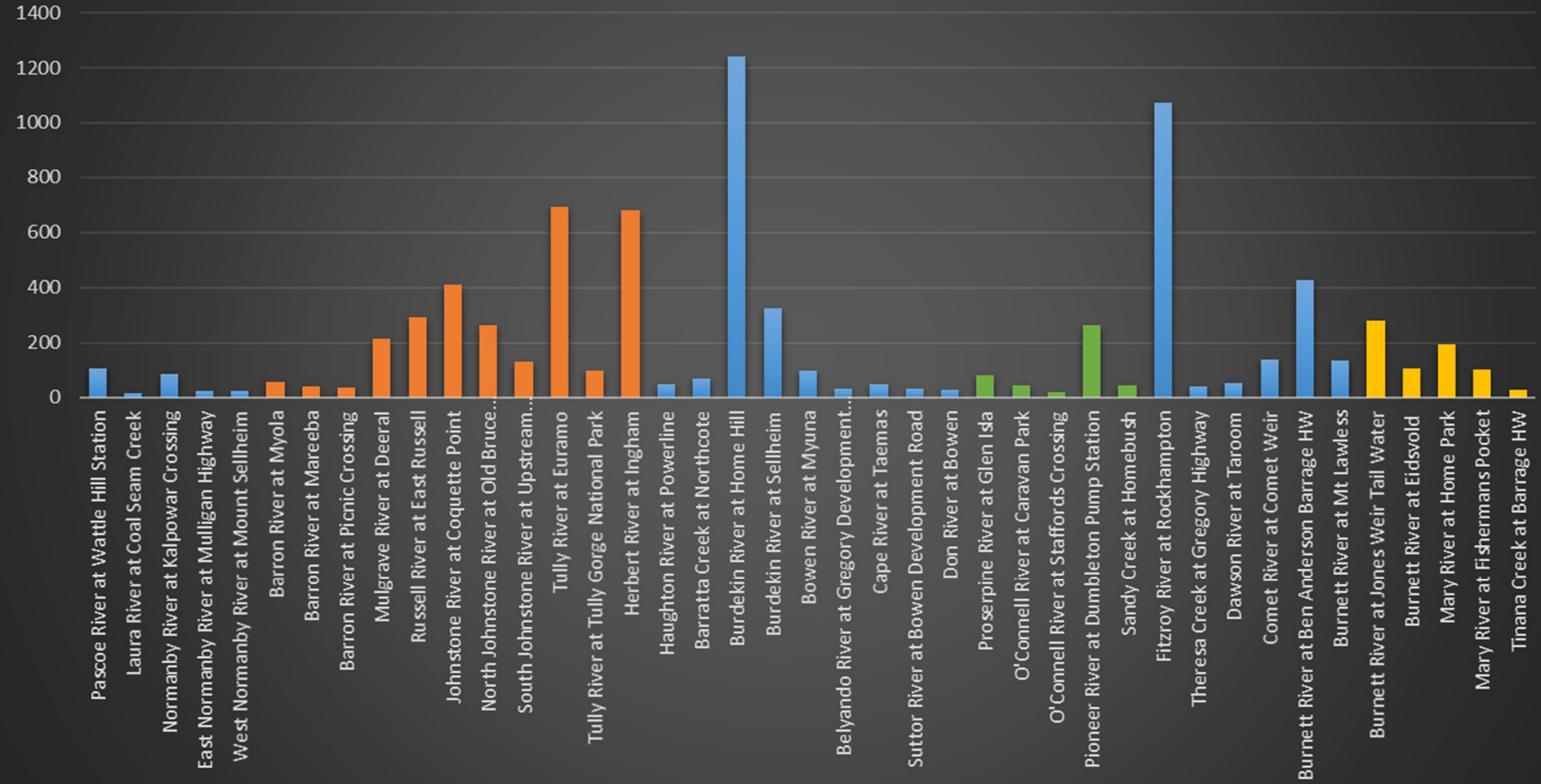
Comparatively dry

Table 2. End-of-catchment anthropogenic water quality targets for the Reef catchments by 2025 and relative priorities for water quality improvement (t = tonnes, MCL = maintain current load, ND = not determined)

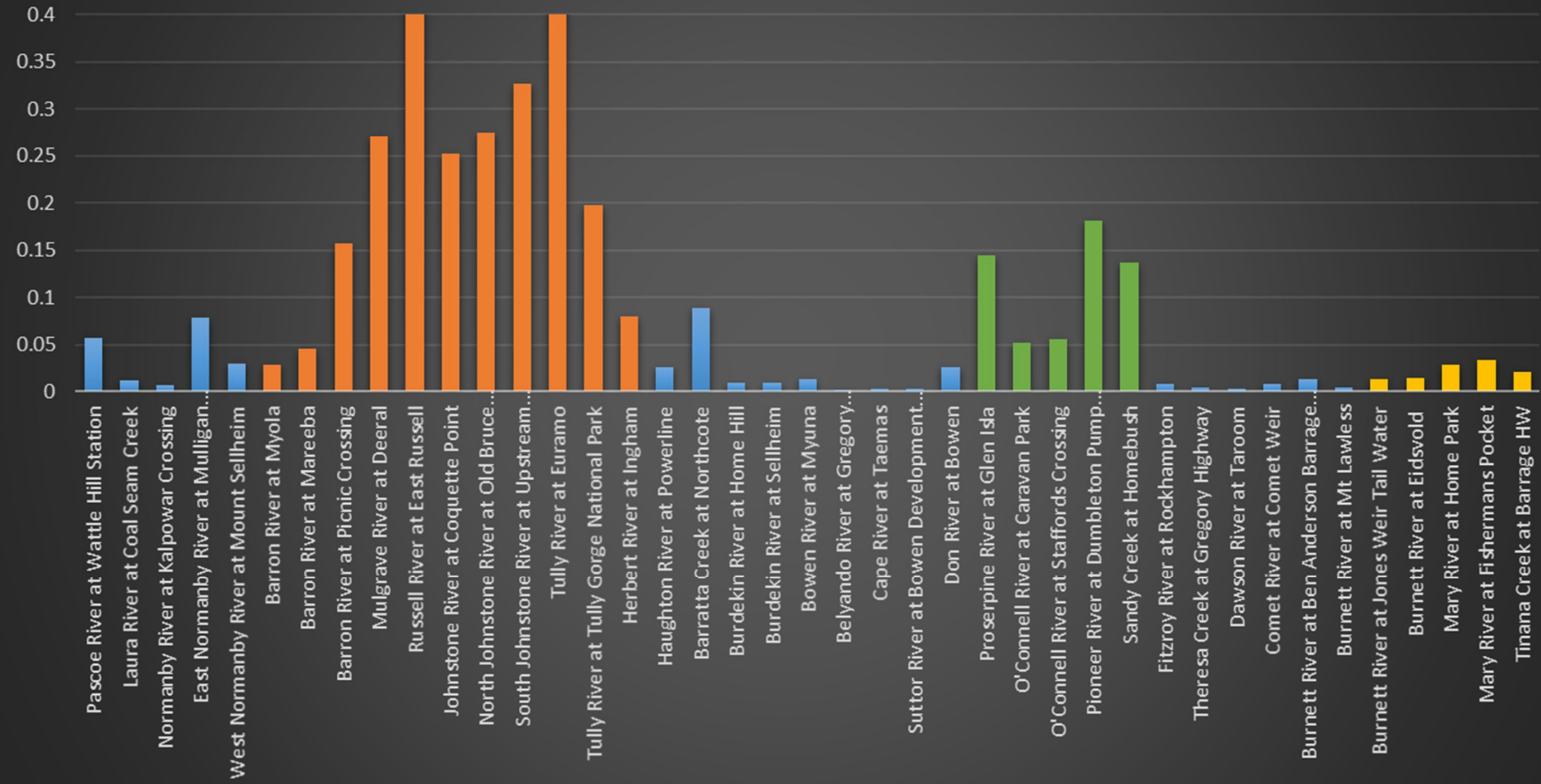
Management priority											
	Very high		Moderate		Minimal						
	High		Low		Not assessed						

Region	Catchment/ Basin	Area (ha)	Targets								Pesticide target to protect min 99% of aquatic species at end-of-catchment
			Dissolved inorganic nitrogen		Fine sediment		Particulate phosphorus		Particulate nitrogen		
			tonnes	% reduction	kilo-tonnes	% reduction	tonnes	% reduction	tonnes	% reduction	
Mackay/ Whitsunday	Proserpine River	249,440	110	70	MCL	MCL	MCL	MCL	MCL	MCL	
	O'Connell River	238,760	130	70	96	40	120	40	250	40	
	Pioneer River	157,360	140	70	35	20	23	20	61	20	
	Plane Creek	253,870	260	70	MCL	MCL	MCL	MCL	MCL	MCL	

Average dissolved inorganic nitrogen load (t) 2006-2019




Average dissolved inorganic nitrogen yield (t/km²) 2006-2019



















River and Site Name	Site Type	Discharge (GL)	% of Annual Average Discharge	TSS (kt)	PN (t)	DIN (t)	PP (t)
Proserpine River at Glen Isla	EoC	210	65	66	130	86	53
O'Connell River at Caravan Park	EoC	120	19	13	59	22	12
O'Connell River at Stafford's Crossing	SC	46	26	4.1	17	4	4.1
Pioneer River at Dumbleton Pump Station Headwater	EoC	200	26	2.9	29	27	9.4
Sandy Creek at Homebush	EoC	29	18	1.7	9	11	3.8
Sandy Creek South Branch at Downstream Sorbellos Road	SC	3.6	11	0.95	4.1	1.8	1.4
Plane Creek at Sucrogen Weir	EoC	22	43	1.4	11	4.2	3

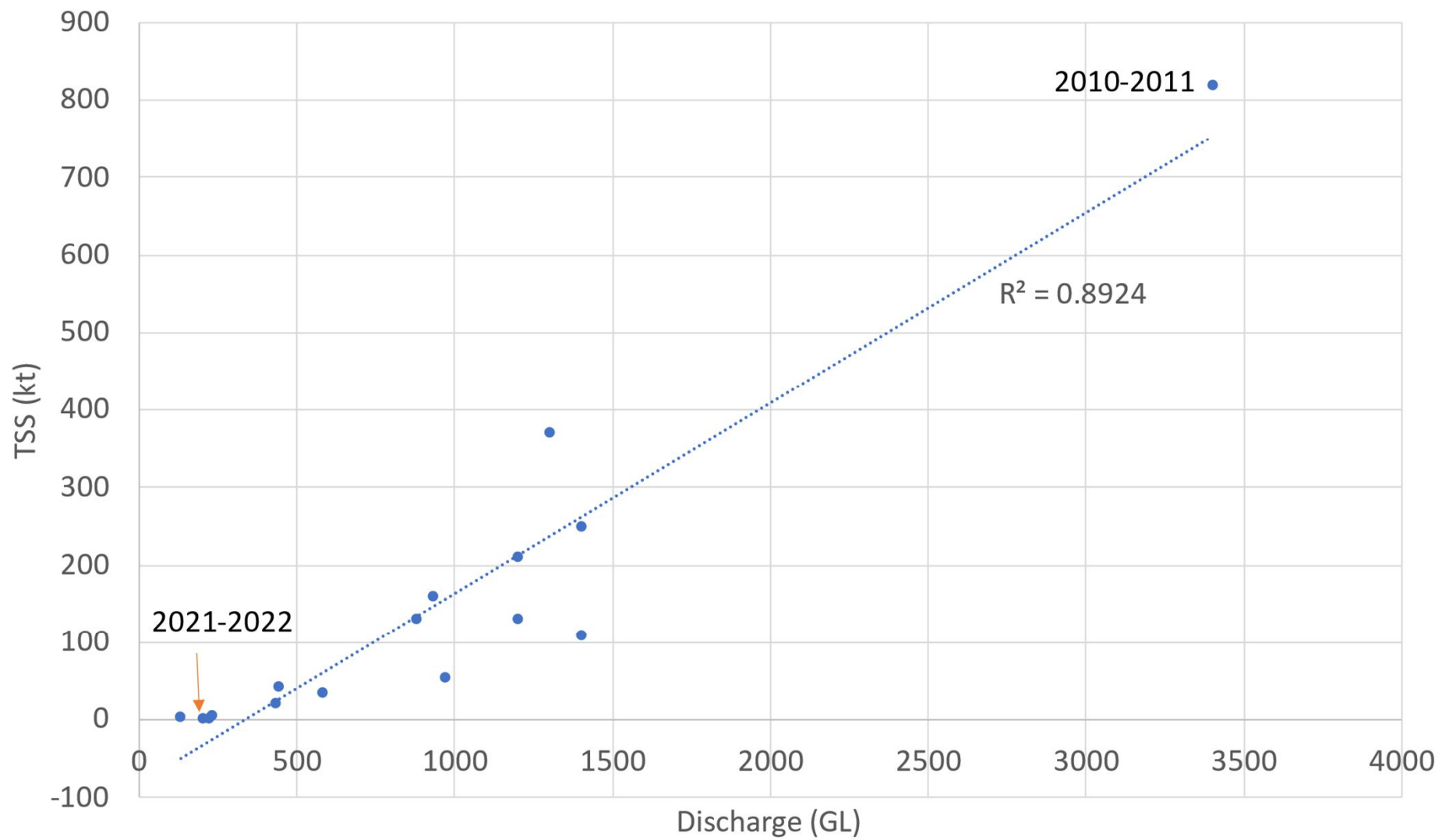


River and Site Name	Site Type	Discharge (GL)	% of Annual Average Discharge	TSS (t/km ²)	PN (kg/km ²)	DIN (kg/km ²)	PP (kg/km ²)
Proserpine River at Glen Isla	EoC	<div><div></div></div> 210	65	<div><div></div></div> 120	<div><div></div></div> 240	<div><div></div></div> 160	<div><div></div></div> 96
O'Connell River at Caravan Park	EoC	<div><div></div></div> 120	19	<div><div></div></div> 16	<div><div></div></div> 71	<div><div></div></div> 26	<div><div></div></div> 15
O'Connell River at Stafford's Crossing	SC	<div><div></div></div> 46	26	<div><div></div></div> 12	<div><div></div></div> 51	<div><div></div></div> 12	<div><div></div></div> 12
Pioneer River at Dumbleton Pump Station Headwater	EoC	<div><div></div></div> 200	26	<div><div></div></div> 2	<div><div></div></div> 20	<div><div></div></div> 18	<div><div></div></div> 6.5
Sandy Creek at Homebush	EoC	<div><div></div></div> 29	18	<div><div></div></div> 5	<div><div></div></div> 27	<div><div></div></div> 33	<div><div></div></div> 11
Sandy Creek South Branch at Downstream Sorbellos Road	SC	<div><div></div></div> 3.6	11	<div><div></div></div> 12	<div><div></div></div> 52	<div><div></div></div> 23	<div><div></div></div> 17
Plane Creek at Sucrogen Weir	EoC	<div><div></div></div> 22	43	<div><div></div></div> 15	<div><div></div></div> 120	<div><div></div></div> 46	<div><div></div></div> 33

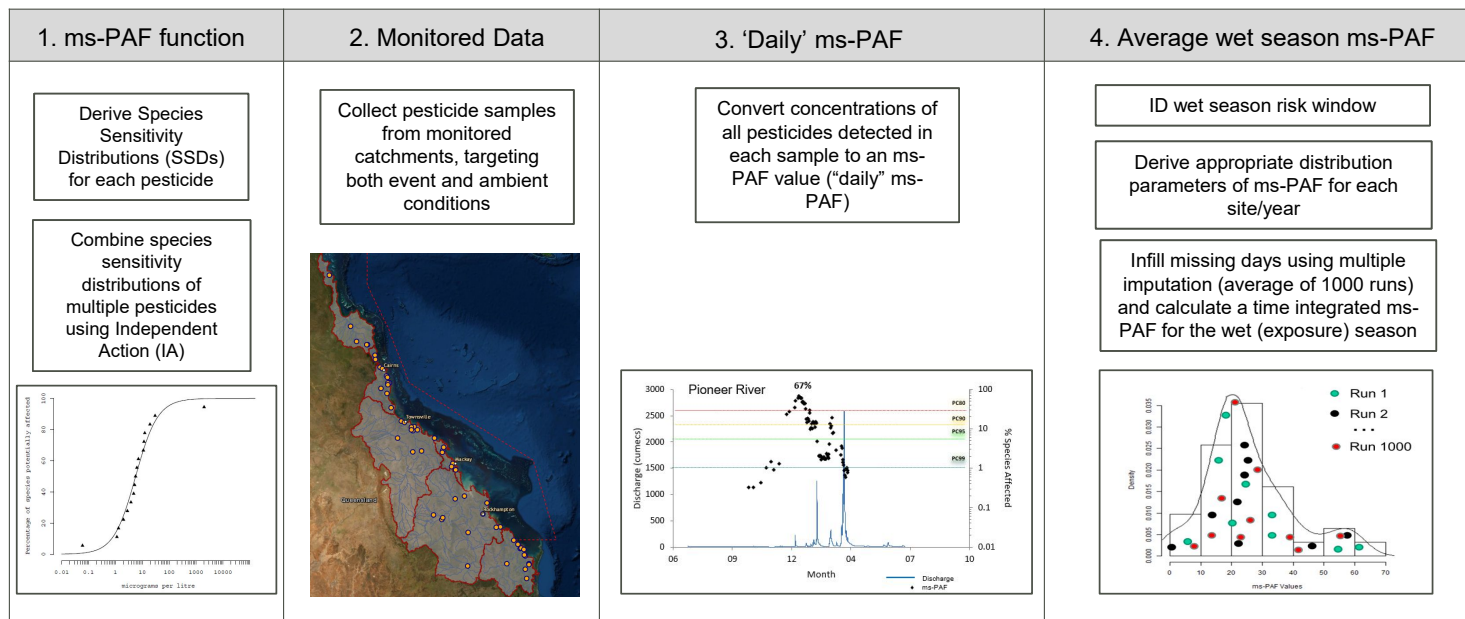


Sampling Year	River and Site Name	Site Type	Discharge (GL)	% of Annual Average Discharge	TSS (kt)	PN (t)	DIN (t)	PP (t)
2021-2022	Pioneer River at Dumbleton Pump Station Headwater	EoC	 200	26	2.9	29	27	9.4
2020-2021	Pioneer River at Dumbleton Pump Station Headwater	EoC	 220	28	3.2	32	68	11
2019-2020	Pioneer River at Dumbleton Pump Station Headwater	EoC	 430	54	22	110	120	36
2018-2019	Pioneer River at Dumbleton Pump Station Headwater	EoC	 970	120	55	240	400	78
2017-2018	Pioneer River at Dumbleton Pump Station Headwater	EoC	 230	29	7	45	55	15
2016-2017	Pioneer River at Dumbleton Pump Station Headwater	EoC	 1400	180	110	430	450	150
2015-2016	Pioneer River at Dumbleton Pump Station Headwater	EoC	 440	56	44	200	140	54
2014-2015	Pioneer River at Dumbleton Pump Station Headwater	EoC	 130	17	3.6	35	42	7.1
2013-2014	Pioneer River at Dumbleton Pump Station Headwater	EoC	 580	74	35	210	260	54
2012-2013	Pioneer River at Dumbleton Pump Station Headwater	EoC	 1200	160	130	510	250	160
2011-2012	Pioneer River at Dumbleton Pump Station Headwater	EoC	 1200	160	210	820	230	250
2010-2011	Pioneer River at Dumbleton Pump Station Headwater	EoC	 3400	430	820	2700	640	820
2009-2010	Pioneer River at Dumbleton Pump Station Headwater	EoC	 1300	170	370	960	480	270
2008-2009	Pioneer River at Dumbleton Pump Station Headwater	EoC	 930	120	160	610	110	180
2007-2008	Pioneer River at Dumbleton Pump Station Headwater	EoC	 1400	170	250	780	170	250
2006-2007	Pioneer River at Dumbleton Pump Station Headwater	EoC	 880	110	130	350	210	120

Pioneer River at Dumbleton Pump Station HW



The Pesticide Risk Metric (PRM) process



The Pesticide Risk Metric (PRM) reports combined toxicity for the 22 priority chemicals under the WQIP

PSII herbicides	Other herbicides	Insecticides
Ametryn	2,4-D	Chlorpyrifos
Terbuthylazine	Fluroxypyr	Fipronil
Atrazine	Isoxaflutole	Imidacloprid
Hexazinone	Pendimethalin	
Metribuzin	Triclopyr	
Simazine	Metsulfuron-methyl	
Prometryn	MCPA	
Diuron	Haloxypop	
Tebuthiuron	Imazapic	
	Metolachlor	

- ✓ Lab analysis
- ✓ Species sensitivity distribution
- ✓ Included in SC models
- ✓ Registered for use in Australia
- ✓ Regularly detected

Site Explorer

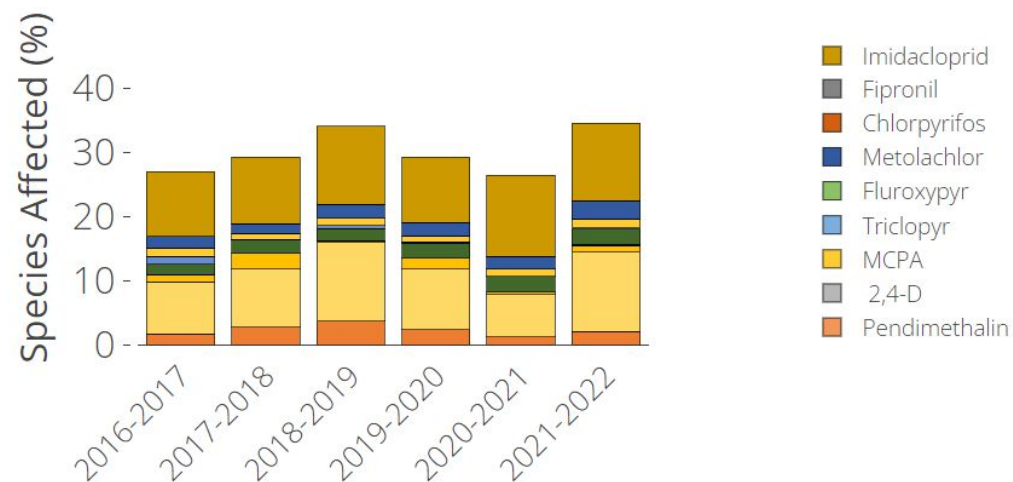
Please click on a green point on the map to select a site

Select Pesticide Group:

☒ Total Pesticides ☐ Total Pesticides + spp. protected ☐ PSII Herbicides ☐ Other Herbicides ☐ Insecticides

[Download Wet Season Site Data](#)

Proserpine River at Glen Isla

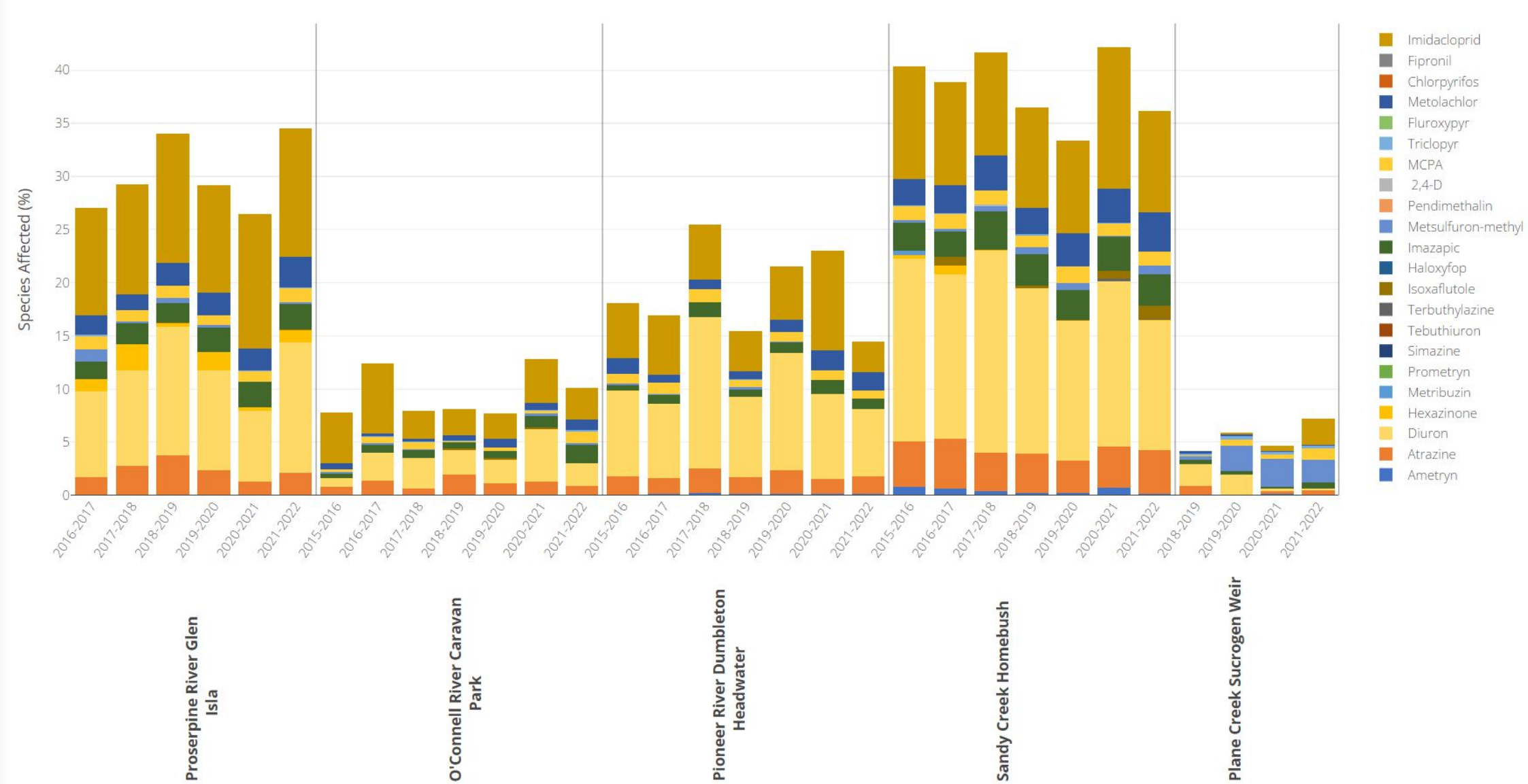


Select Pesticide Group:

☒ Total Pesticides ☐ PSII Herbicides ☐ Other Herbicides ☐ Insecticides



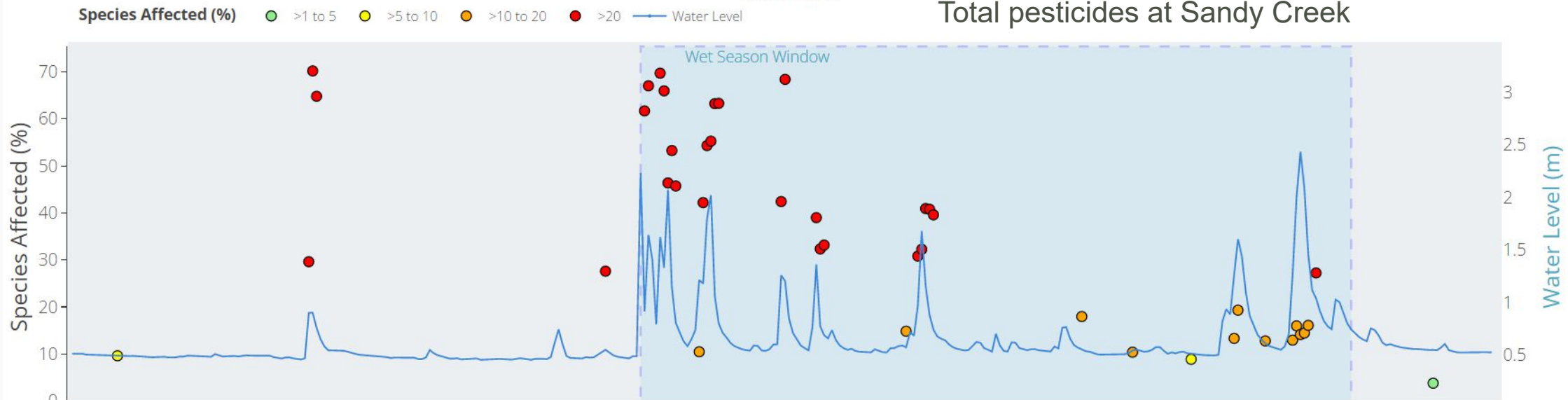
Region	Site Name	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Mackay Whitsunday	Proserpine River at Glen Isla		73	70.7	65.9	70.8	73.6	65.4
Mackay Whitsunday	O'Connell River at Stafford's Crossing		87.8	91.7	92.5	89.7		
Mackay Whitsunday	O'Connell River at Caravan Park	92.3	87.6	92.1	91.9	92.3	87.1	89.8
Mackay Whitsunday	Pioneer River at Dumbleton Pump Station Headwater	81.9	83	74.5	84.6	78.5	76.9	85.5
Mackay Whitsunday	Pioneer River at Forgan Smith Bridge				87.3			
Mackay Whitsunday	Sandy Creek at Homebush	59.7	61.1	58.3	63.5	66.6	57.9	63.9
Mackay Whitsunday	Sandy Creek at Bruce Highway				66.4			
Mackay Whitsunday	Sandy Creek South Branch at Downstream Sorbellos Road							77
Mackay Whitsunday	Plane Creek at Sucrogen Weir				95.9	94.2	95.3	92.8



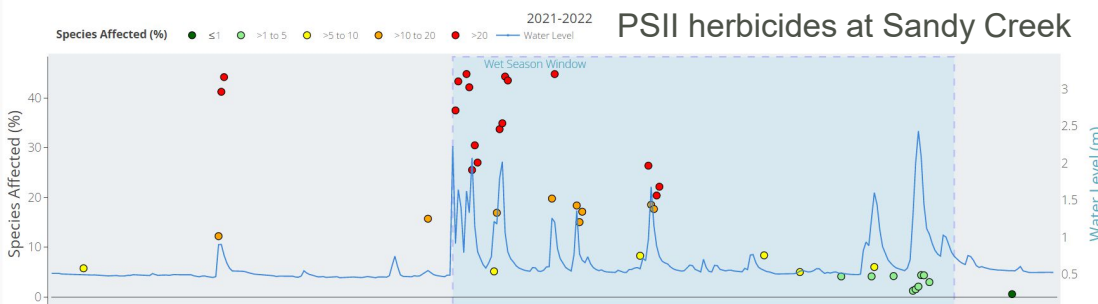


2021-2022

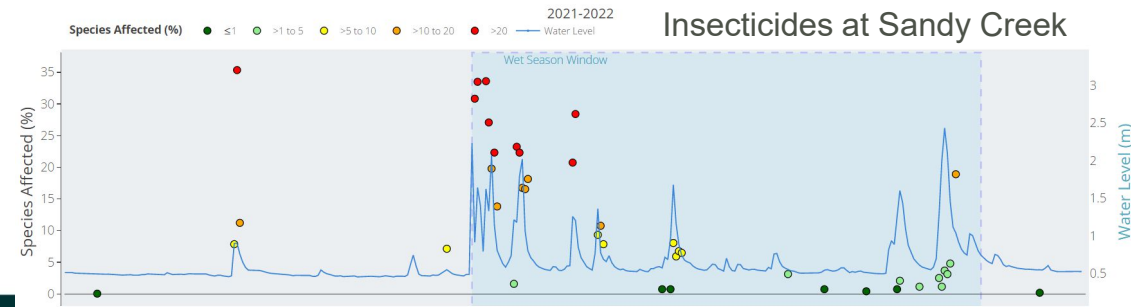
Total pesticides at Sandy Creek



PSII herbicides at Sandy Creek



Insecticides at Sandy Creek

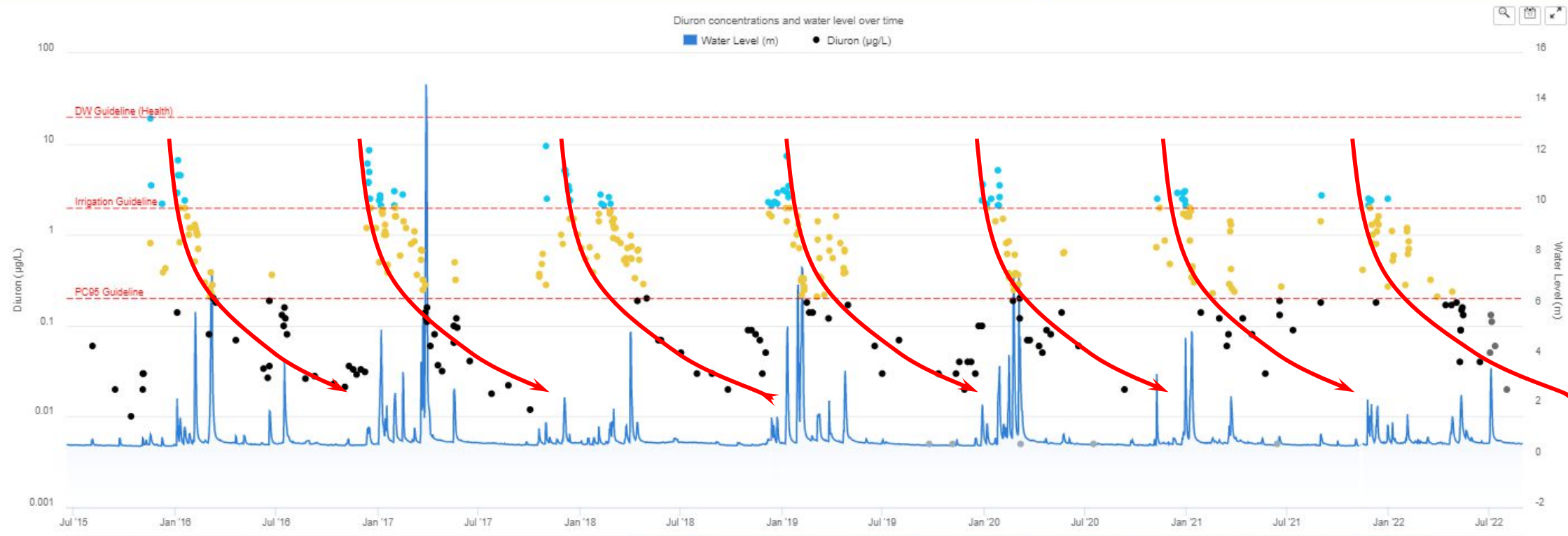


Diuron

Sandy Creek at Homebush

Most Recent Lab Results:

2023-02-10 12:26:00



Diuron

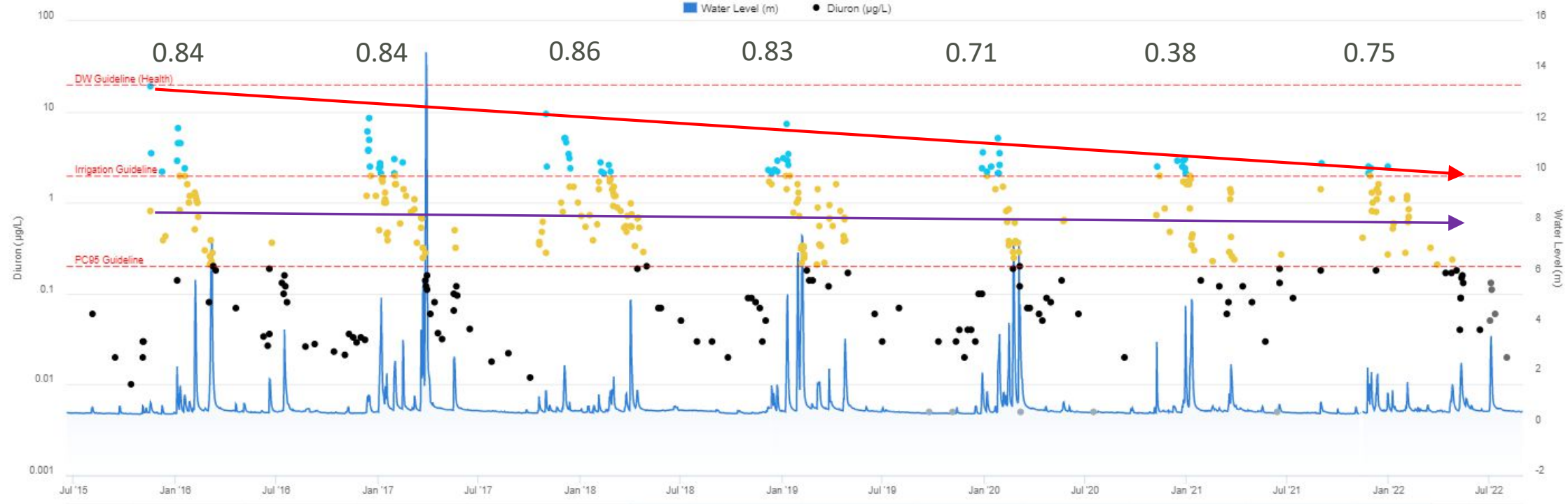
Sandy Creek at Homebush

Most Recent Lab Results:

2023-02-10 12:26:00

Diuron concentrations and water level over time

Water Level (m) • Diuron ($\mu\text{g/L}$)



Recommendation 13 of the International Review of the Great Barrier Reef Catchment Loads Monitoring Program

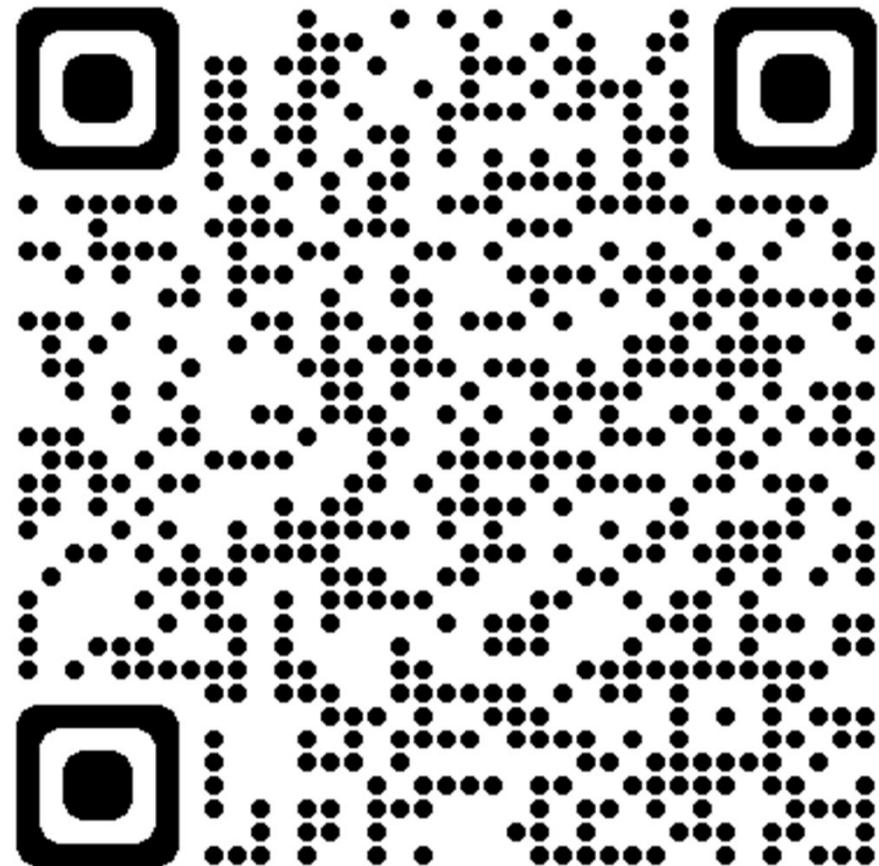
Thou shalt:

Allocate more time and effort to analysing the wealth of data generated by the Program. Develop a prioritised list of key knowledge gaps/questions to be addressed, maintained and disseminated to potential research providers.

Two high priority issues that should be considered are:

- analysing the temporal trends in suspended solids, nutrients and pesticides. This should include power analysis to indicate the minimum number of years that data sets need to be to detect changes of a certain magnitude.

<https://storymap.arcgis.com/collections/9a61cdb7ff1143db9eec98eccbc3b50e>





Thank you

Any questions?

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The GBRCLMP produces in excess of 210 000 discrete data points every year (32 500 TSS and nutrients, 180 000 pesticides)

These data are useful on their own but improved accessibility and context
= greater outreach and decision making power

WQI are working to:

- Respond to increased data needs
- Improve back end data processes
- Provide open data platforms for greater accessibility to the data
- Develop useful metrics and data visualisations
- Automate quality coding for real time and grab sample data
- Implement anomaly detection algorithms for real time data