



Managing Harmful Algal Blooms - Townsville City Council's Experience



Ross River Dam catchment



- Capacity of 233 GL
- Catchment area 750 km²
- Minimally protected catchment
 - Defence training grounds
 - Rural residential
 - Agriculture
 - Livestock grazing

Townsville's resident microalgae

Cyanobacteria



- *Raphidiopsis raciborskii* (pictured)
(*Cylindrospermopsis raciborskii*)
- *Planktolyngbya* sp.
- 2 *Pseudoanabaena* species
- *Dolichospermum* sp.

- > Filtration (bind filters)
- > Water quality issues
- > Taste and odour
- > Toxins

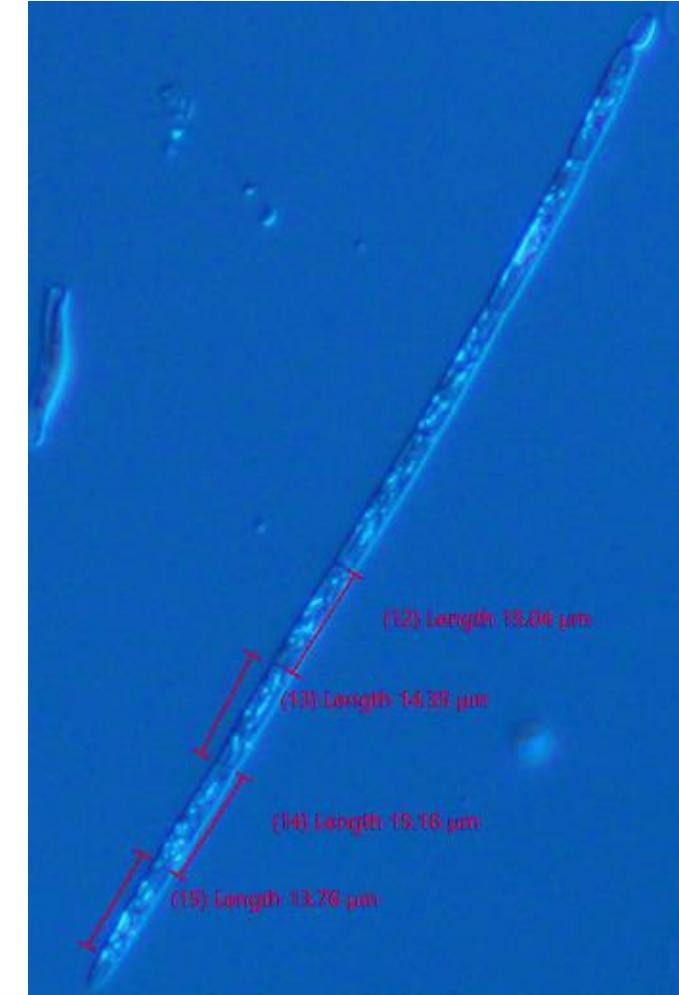


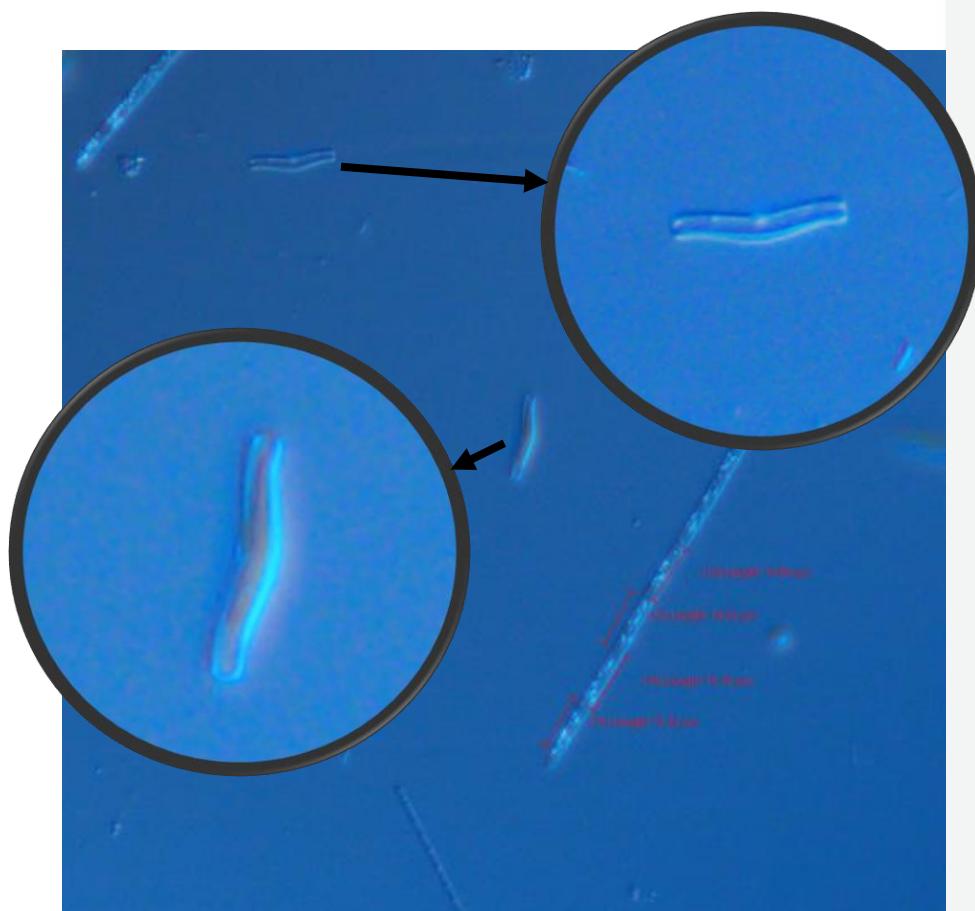
Photo by Edgar Salvador and Bob Ballais from Townsville Laboratory Services

Townsville's resident microalgae

Diatoms



- *Achnanthidium minutissimum* (pictured)
 - *Synedra sp.*
-
- > Silica shells cause issues with filtration
 - > Reduced water production



Douglas Water Treatment Plant



- 2 Treatment Trains
 - 2 Modules use conventional treatment
 - 2 Modules use direct filtration with clarifiers
- Disinfection by Sodium Hypochlorite
- PAC
- Pre-chlorination



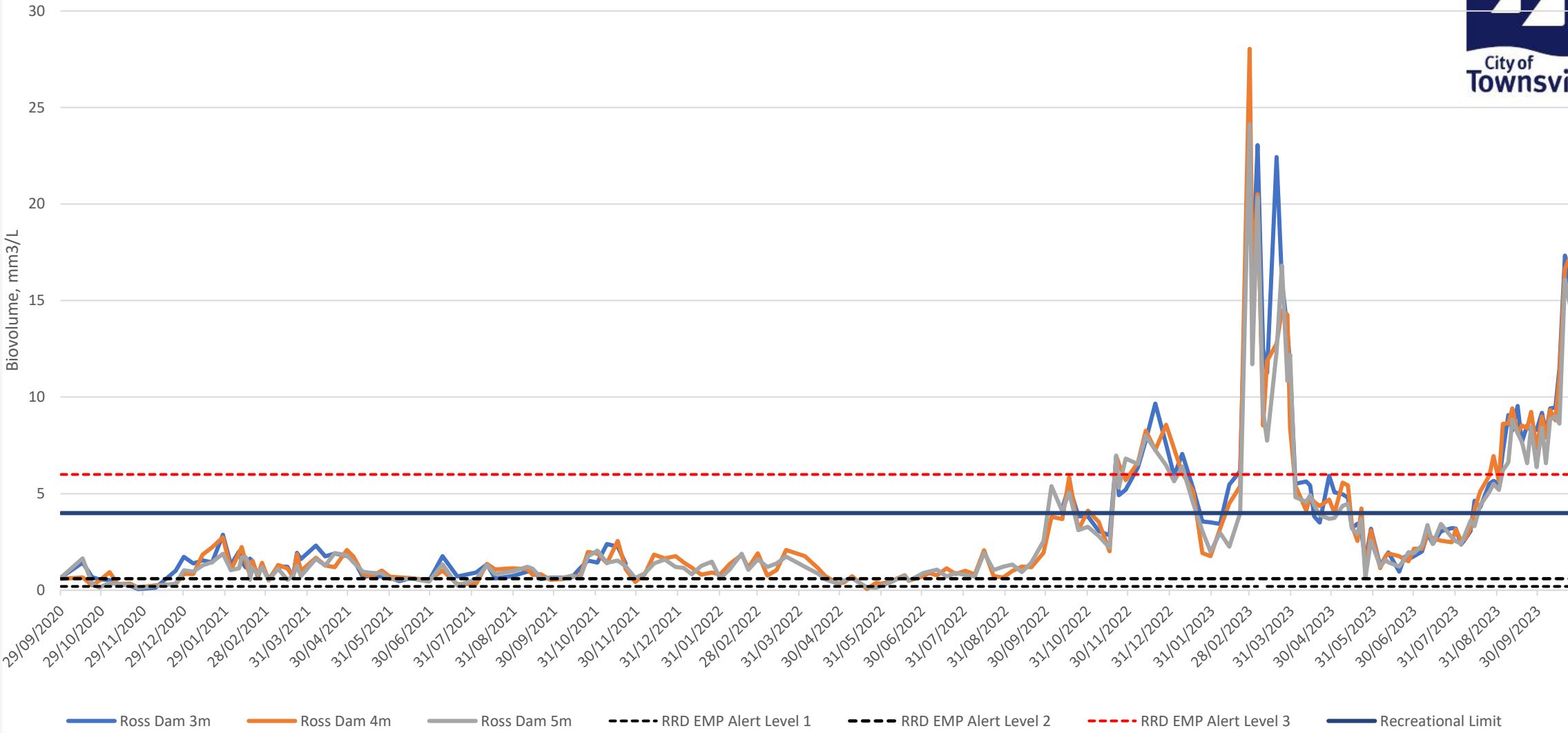
Photo provided by Matt Reusch from Trility

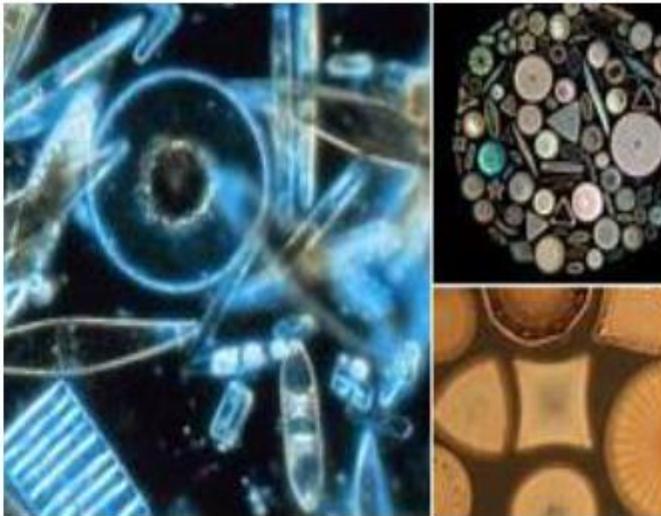
Townsville's cyanobacteria story



- Cyanobacteria first detected in Ross River Dam in 2018
- 2019 floods
- Increase in biovolume every summer since
- Dominant species is *Cylindrospermopsis raciborskii* (*Raphidiopsis raciborskii*)

Ross River Dam Offtake Level Biovolume





February 2021 Event

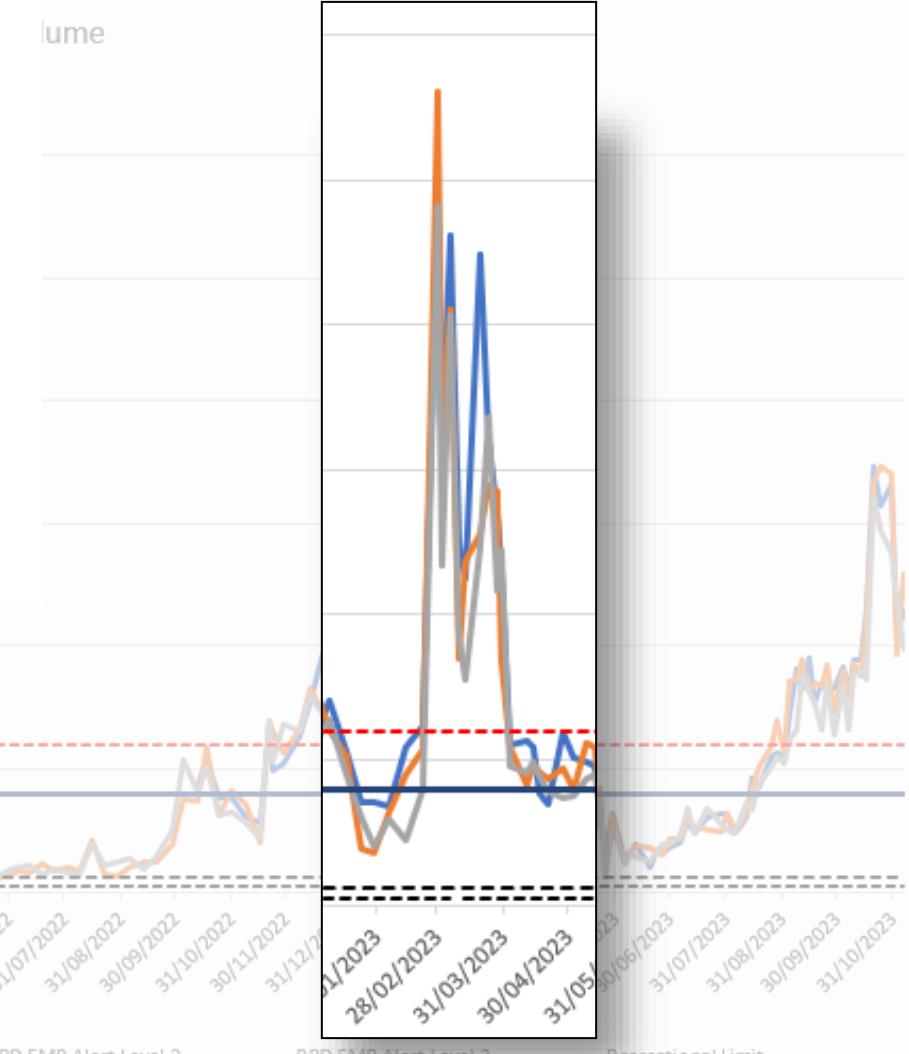
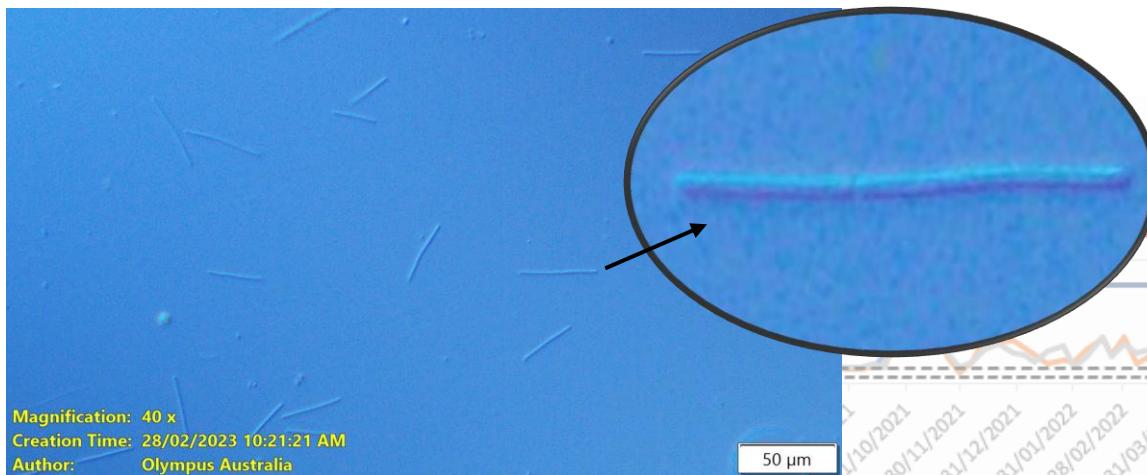
Event	4th February	8th February
Wooloowin	Douglas	Douglas
Wooloowin	Aitkenvale	Aitkenvale
Wooloowin	Cranbrook	Cranbrook
Wooloowin	Mundingburra	Mundingburra
Wooloowin	Annandale	Annandale
Wooloowin	Kirwan	Kirwan
Wooloowin	Rasmussen	Rasmussen
Wooloowin	North Ward	North Ward
Wooloowin	Heatley	Heatley
Wooloowin	Condon	Condon
Wooloowin	Wulguru	Wulguru
Wooloowin	South Townsville	South Townsville
Wooloowin	Oonoonba	Oonoonba
Wooloowin	Idalia	Idalia
Wooloowin	West End	West End
Wooloowin	Julago	
Wooloowin	Alligator Creek	
Wooloowin	Kelso	



March 2023 Event



- New unknown species = Unknown toxins!
- Response > Limiting treatment to Modules 1 & 2 for PAC
- Water restrictions
- *Pseudoanabaena limnetica*
 - Not toxin producing ☺



Mitigation strategies we have investigated

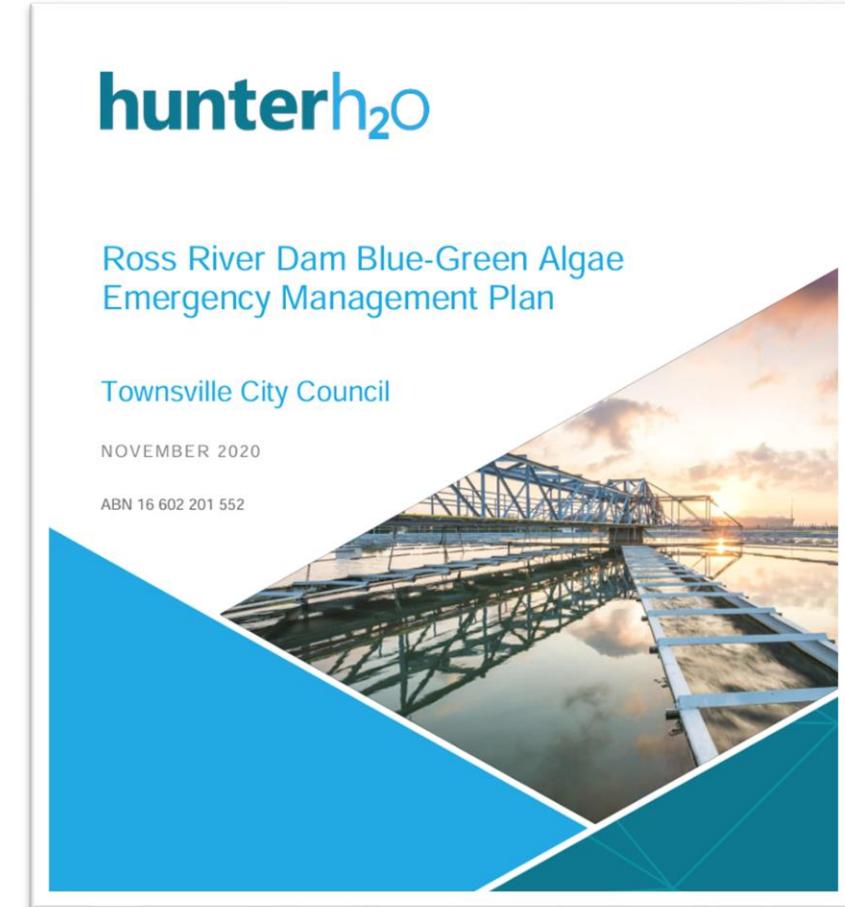


- Phoslock
- Ultrasonic Control
- Aeration
- Diatomix
- Earthtec (Copper Sulfate)
- Pre-Oxidation
- PAC
- Poly Dosing

Ross River Dam Blue-Green Algae Emergency Management Plan



- Developed with Beca/Hunter H2O
- Based off ADWG and WQRA Research Report 74
- Treatment options
- Alert and trigger levels
 - Constant communication with regulator
 - Monitoring





Sample location	pH	Turbidity	Dissolved Oxygen	Temperature	Iron	Manganese	Iron, soluble	Manganese, soluble	Oxidised Nitrogen as NOx-N	Phosphate as P	Total Nitrogen	Total Phosphorus	Blue Green Algae*	Toxin	DBPs	MIB/Geosmin	Plus Additional Monitoring Requirements
Ross River Dam																	
RRD First	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N		
RRD Second	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N		
RRD Monthly (IROL)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	
Trility																	
RW																	
Clarified																	
Mod Outlets																	
TW																	
FW																	
Desludge																	
Reticulation																	
Reservoirs (Daily)	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	
Houses (Daily)	Y	Y	Y	Y	Y	Y	Y	Y					Y	*	Y	Y	

As per separate Spreadsheet

Laboratory sampling

>200 samples in Ross River Dam/ month

>2000 samples in the distribution network/ month

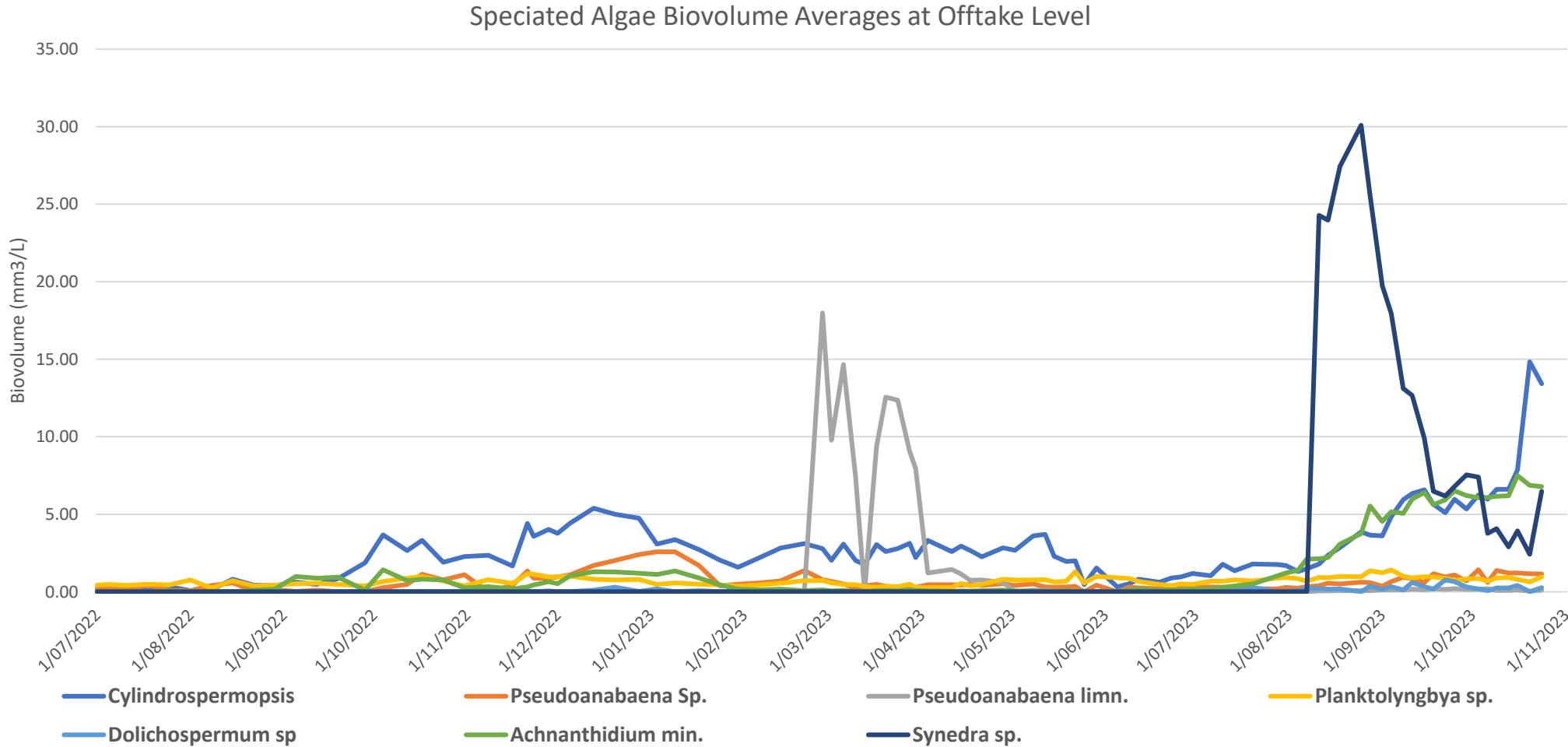
Targeted and staged approach

Realtime monitoring

Vertical Profiler in Dam

Online monitoring at the WTP (SCADA)

What's happening now...



How has our knowledge improved since 2019?



- 5 years monitoring data allows for improved trending and increased confidence in results
- Increased and targeted monitoring
- Biovolume vs cell count improved sensitivity of data
- Inhouse development of testing such as algal toxins
- Increased real time monitoring
- Confidence that cylindrospermopsin is very susceptible to chlorine

What we are doing now

- WEARS investigation
- LT22s trials
- Permanent PAC
- Permanent pre-chlorination
- Southern Water Treatment Plant



THANK YOU!

Townsville Laboratory Services

Celebrating 20 years of continuous accreditation
with NATA - Australia's principal governing body
for quality in laboratories.



