

Roebuck Bay Working Group

Contingency Management Plan

Broome Lyngbya



Job number: ASE09003

May 2009

RBWG

Contingency Management Plan

Broome Lyngbya

Acacia Springs Pty Ltd (Aust)
A.C.N. 077 834 667
A.B.N. 945 23123 843
Copyright © 2009
Mobile: 0438 527446
Email: ase1@iinet.net.au

The information contained in this report is solely for the use of the client identified on the cover sheet for the purpose for which it has been prepared.

Report by: Dr DM Deeley
Signed: DMD
Approved: DMD
Date: 12th May, 2009
Distribution: Client x 1 ecopy
ASE x 1

Cover Illustration: Broome Lyngbya 21st Jan 2006, below RB Caravan park.. Photo: Emily Burke

May 2009

Contents

Summary	1
Background	2
Objectives and actions for Broome Lyngbya	4
Develop clear objectives	4
Undertake relevant actions	4
Contingency management.....	5
Governance.....	5
Monitoring Lyngbya.....	6
Preliminary assessment	9
Toxicity testing.....	9
Human health risk assessment	9
Avoidance and management.....	9
Information gathering.....	9
Communication strategy	10
Review and refinement	10
Scientific assessment.....	10

Figures

1	Conceptual Lyngbya distribution map and action plan.....	6
2	Draft contingency management plan for Broome Lyngbya.....	7

Summary

GOAL

To ensure that the Lyngbya nuisance in Roebuck Bay is effectively managed to minimise potential adverse human and ecological impacts.

ACTIONS

- To establish a Lyngbya task force as a sub-committee of the RBWG.
- To establish a Memorandum of Understanding amongst key stakeholders to provide integration, efficacy and accountability.
- To provide regular scans of distribution and density of growth and accumulation areas in northern Roebuck Bay to inform management.
- To undertake toxicity testing, risk assessment and contingency management actions as required to avoid harm to people and the environment.
- To provide information updates using web based communication for both stakeholders and the broader community.
- To respond to Lyngbya detritus stranded on foreshores involving beach clean-up and closures, as necessary.
- To provide permits and approvals for removal of Lyngbya detritus from foreshores and safe disposal in secure landfills.
- To conduct field trials aimed at reducing the impacts of Lyngbya blooms, specifically investigating removal from critical seagrass and mangrove habitats and trials for the harvesting of floating Lyngbya 'rafts'.
- To endeavor to provide accurate scientific monitoring to track the Lyngbya nuisance over time.
- To endeavor to undertake comparative scientific analysis to scan the Broome Lyngbya's genotype for its toxicity profile and causal factors.

1. Background

Lyngbya majuscula is a naturally occurring marine blue-green algae that has been observed in coastal waters around Australia. *Lyngbya* contains toxins that turn some marine animals off their food and can also cause rashes, itches, burns, tingles, blistering and breathing problems in humans.

Despite significant research, the complex mechanisms controlling *Lyngbya* blooms in Moreton Bay Queensland are not yet fully understood. Several key factors were identified as possible causes for the proliferation of *Lyngbya*¹. *Lyngbya* blooms appear to be initiated after heavy rain events, calm weather conditions (resulting in high light penetration) and warm seawater temperatures >26°C.

Because of the insolubility of iron oxides at seawater pH, iron is normally a limiting element for algal growth. Blooms in northern Deception Bay appear to be caused by a unique combination of increased bioavailability of iron caused by the interaction between organic matter, iron and UV light, phosphorus availability and atmospheric nitrogen fixation. Rainfall events causing run-off from particular land uses/activities carry organic-rich (high humics) soils that combine with iron. In the marine environment, with sufficient light, the humics/iron complex breaks down making iron bio-available to *Lyngbya*.

Creeks flowing into northern Deception Bay also provide sources of organics/humics to *Lyngbya* bloom sites. Groundwater flows have the potential to also transport initiating elements to *Lyngbya* bloom sites. Laboratory work using field samples indicates that soil extracts from specific land uses/activities stimulate *Lyngbya* growth.

Lyngbya growth response to ‘triggering’ elements, have provided circumstantial evidence to support the conceptual models for northern Deception Bay *Lyngbya* blooms. Further work is needed to quantify and validate the relative contributions of ‘triggering elements’ on *Lyngbya* growth response.

Professor Ron Johnstone of the University of Queensland stated: “There’s no silver bullet or quick fix for the problem and clearing fine sediments out of waters entering the Bay is believed to be critical to minimizing blooms”....

¹ SEQROC (2002) *Lyngbya* management strategy. South East Queensland Regional Organisation of Councils.

The Queensland Lyngbya and other algal management strategies²:

- is underpinned by the initial Lyngbya scientific results;
- provides a coordinating management framework and set of management actions to commence addressing the issues associated with outbreaks of Lyngbya;
- includes on-going research that is focussed on the identification of the causes of Lyngbya blooms in the eastern Bay;
- includes on-going monitoring actions, public (web-based) and stakeholder communication frameworks, seagrass and mangrove habitat protection trials and beach clean-up actions.

A Lyngbya contingency management plan should include¹:

- Development of objectives for the plan to address;
- Identification of roles and responsibilities for contingency actions: This alerts key agencies with roles being confirmed as more information comes to light;
- Implementation of the (draft) plan;
- Determining the location and extent of bloom growth;
- Identification of areas likely to be affected by the spread or movement of the bloom;
- Determining the mitigation actions to include in the plan;
- Documenting the plan; and
- Reviewing the plan.

² Moore, N., Yeates, M., Esdaile, J., Beumer, J., Dobos, S., Clements, G. and Milne, P. (2006). Guidelines for Contingency Response to Coastal Algal Blooms. Moreton Bay Waterways and Catchments Partnership, Brisbane.

2. Objectives and actions for Broome Lyngbya

2.1 Develop clear objectives

The following goal is considered appropriate for Broome Lyngbya management.

GOAL

To ensure that the Lyngbya nuisance in Roebuck Bay is effectively managed to minimise potential adverse human and ecological impacts.

2.2 Undertake relevant actions

The following actions are considered appropriate for Broome Lyngbya.

ACTIONS

- To establish a Lyngbya task force as a sub-committee of the RBWG.
- To establish a Memorandum of Understanding amongst key stakeholders to provide integration, efficacy and accountability.
- To provide regular scans of distribution and density of growth and accumulation areas in northern Roebuck Bay to inform management.
- To undertake toxicity testing, risk assessment and contingency management actions as required to avoid harm to people and the environment and to confirm the hazard that it poses. This is to protect the public, including Traditional Owners, from product contaminated by toxins; and to minimise public exposure to harmful/toxic algae at certain bathing areas and beaches.
- To provide information updates using web based communication for both stakeholders and the broader community so as to inform the public of the risks posed by the algae.
- To respond to Lyngbya detritus stranded on foreshores involving beach clean-up and closures, as necessary. To identify the source and movement/s of the algal bloom and to manage at-risk areas. To prevent detached algae building up to the point where it will cause odour nuisance at certain locations.
- To provide permits and approvals for removal of Lyngbya detritus from foreshores and safe disposal in secure landfills.
- To conduct field trials aimed at reducing the impacts of Lyngbya blooms, specifically investigating removal from critical seagrass and mangrove habitats and trials for the harvesting of floating Lyngbya 'rafts'. To protect mangrove seedlings and pneumatophores from floating algal rafts and to minimise the impacts of algae growing

on seagrass beds. To protect the Ramsar listed bay and seagrass areas supporting marine turtles and dugong.

- To endeavor to provide accurate scientific monitoring to track the Lyngbya nuisance over time.

3. Contingency management

Figure 1 presents a conceptual Lyngbya distribution map and action plan. This diagram is purely illustrative and is intended to demonstrate the sort of information that may need to be generated to underpin the contingency management actions.

Figure 2 presents a draft contingency management framework for Broome Lyngbya.

3.1 Governance

Lyngbya task force

The Roebuck Bay Working Group held a workshop on the 15th December, 2008, to address issues concerning Broome's Lyngbya nuisance. In moving to a more formal response, it will be necessary to set up a Lyngbya task force for Broome. Key stakeholders may need to include members of the Roebuck Bay Working Group, the Shire of Broome (SoB), the Department of Environment and Conservation (DEC), the Department of Health WA (DHWA), the Department of Planning and Infrastructure (DPI), the Department of Fisheries WA (DFWA), and the Broome Port Authority.

Other stakeholders including the Water Corporation, Broome Pearl Producers and Tourism agencies may also need to be involved.

Lyngbya Memorandum of Understanding

As part of duty of care obligations associated with potentially hazardous algal blooms, it is desirable to establish a MOU between key stakeholders as soon as possible. This Lyngbya MOU would need to document various agency statutory obligations and potential roles in contingency management. Statutory obligations concerning potential hazardous algal blooms is currently not clear because of potential legislative gaps and overlaps.

For example, different agencies may be responsible depending on whether the Lyngbya bloom is toxic or not, or whether accumulations are below the low tide mark or above the high tide mark.

These issues, responsibilities and potential roles need to be established in order to provide appropriate levels of efficacy and accountability.

3.2 Monitoring Lyngbya

There are essentially two types of monitoring that may be undertaken to determine that the distribution and density of Lyngbya.

Scientific monitoring based on remote sensing or aerial photography, fixed quadrats and transects and with numerous sub samples weighed and calibrated, would produce reliable estimates of biomass and distribution to track it's occurrence over time. This type of monitoring requires significant resources to produce known levels of accuracy.

The second type of monitoring is more management focused, where the emphasis is on guiding contingency actions rather than scientific certainty. This type of monitoring can be undertaken less expensively, by people trained using benchmarks and guidelines, to infer its distribution and density and to guide risk assessment and contingency actions.

It is important to understand the resource implications and accuracy associated with each type of monitoring and they should not be confused or substituted.

For Broome (Figure 2), it is recommended that monthly scanning be undertaken to support management, and if possible, augmented by an annual scientific survey to track Lyngbya occurrence over time.

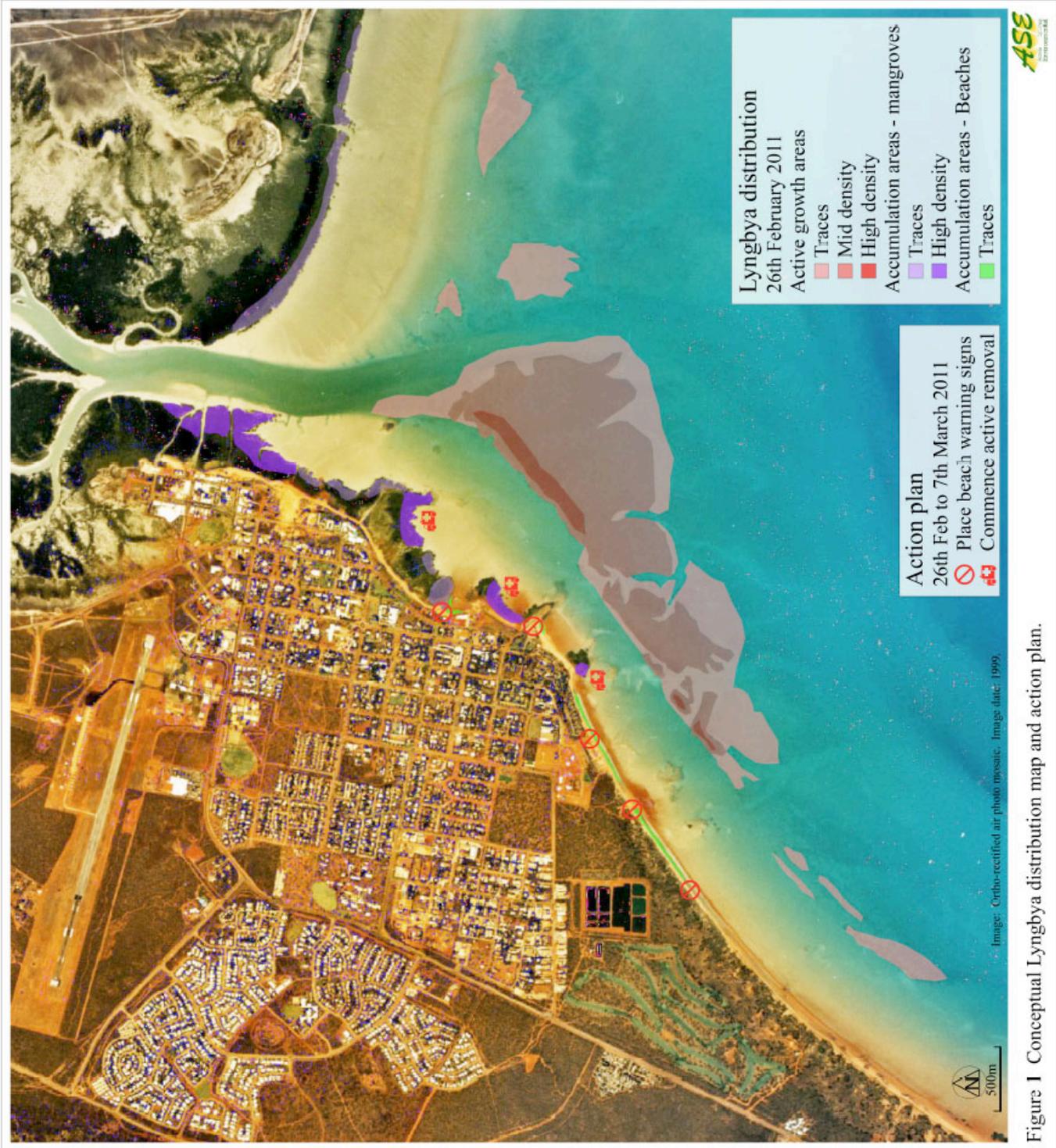


Figure 1 Conceptual Lyngbya distribution map and action plan.

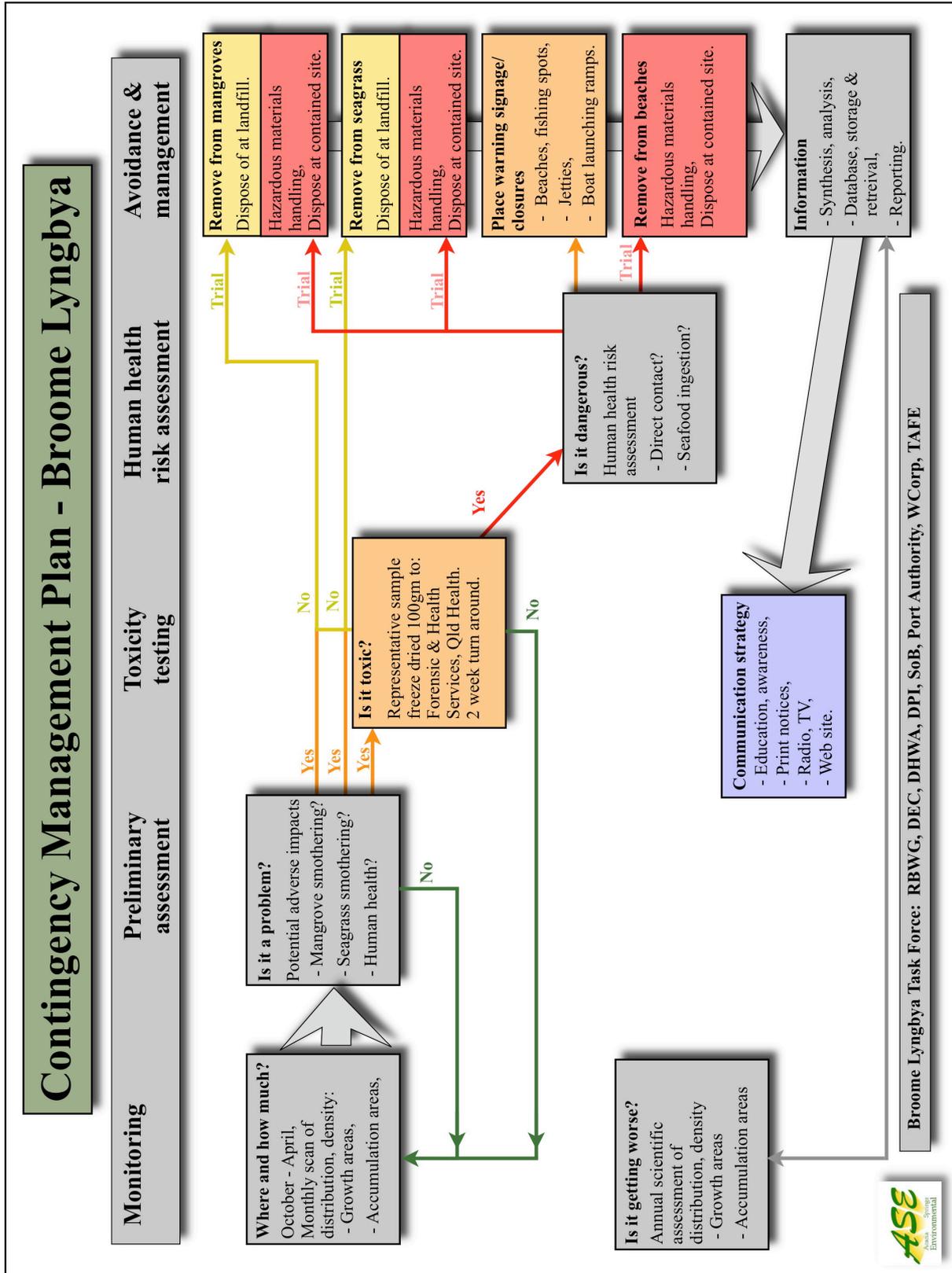


Figure 1 Draft contingency management plan for Broome Lyngbya.

3.3 Preliminary assessment

A preliminary risk assessment should be undertaken following each of the monthly distribution scans, to determine potential adverse impacts. This risk assessment would need to determine whether the Lyngbya was causing adverse impacts through smothering mangrove seedlings, propagules or mature communities and/or smothering seagrasses or other ecosystem elements.

The preliminary assessment should also be used to track whether the Lyngbya is of sufficient density, to cause potential human health impacts.

3.4 Toxicity testing

Should potential human health impacts be determined from the preliminary assessment, toxicity testing should be undertaken forthwith. There are very few laboratories in Australia currently able to undertake the sophisticated toxin testing. One such laboratory that provides a two-week turnaround with sample costs of \$250 per sample, is the Forensic and Health Services laboratory of Queensland Health.

Because of the difficulty in transporting fresh samples of potentially toxic material, it is preferable to freeze dry samples to produce 100 g of dried material. This material can then be safely transported through Post or Courier. The Department of Agriculture in Perth has freeze drying facilities they have made available in the past to prepare Lyngbya samples for lodgment to Queensland.

3.5 Human health risk assessment

If Lyngbya samples show toxicity, a human health risk assessment should be undertaken forthwith. Health professionals from the Department of Health will need to lead the human health risk assessment. The human health risk assessment will need to determine whether the material is dangerous through direct contact of fresh material in the water or accumulations on the beach, or whether contamination is possible through ingestion of seafood.

3.6 Avoidance and management

Initially, trials of removing Lyngbya from mangroves, seagrasses and beaches should be undertaken so that methods can be developed and refined for later use when conditions dictate. care should be taken if the toxicity of the material is unknown. As part of 'duty of care', it may be prudent to consider the material toxic until proven otherwise. Should the material prove to be toxic, hazardous materials handling procedures would be required including disposal at a contained disposal site suitable for toxic materials.

Erecting signage at appropriate places such as beaches, fishing spots, jetties, boat launching ramps may be required should the Lyngbya prove to be toxic. In severe cases, temporary closure of some of these facilities may be warranted.

3.7 Information gathering

An important component of the contingency management plan, is gathering relevant information so as to track and refine the plan's performance over time. It will be important to

document the results of the monthly scans, preliminary assessments, toxicity testing, human health risk assessments and any avoidance and management actions undertaken.

3.8 Communication strategy

An important component of the plan is developing an appropriate communication strategy. The Broome community should be made aware of the nature of the Lyngbya nuisance. It may be prudent to undertake toxicity testing initially, so as to be appropriately informed prior to developing any communication messages. There is some anecdotal evidence that previous tests have found the Lyngbya to be non-toxic. Nevertheless, it has been found to be toxic on numerous occasions in Moreton Bay Queensland so precaution should be exercised.

Once the contingency management actions have been developed and finalised, there is potential for some good news media coverage. A number of local agencies have indicated they have facilities and plant they would consider providing for Lyngbya management as an in-kind contribution.

3.9 Review and refinement

It will be important for the Lyngbya task force to regularly review its management actions over time and during the peak growth season, so as to refine the plan regularly.

3.10 Scientific assessment

Should resources be available, it is highly desirable to track with known levels of certainty, the distribution of density of Lyngbya on at least one occasion annually. The local genotype should be submitted to Queensland to have its toxicity profile and factors contributing to its initiation and growth documented scientifically. Unfortunately scientific certainty comes at a significant cost and significant additional funds may be required to provide this level of causal information and reassurance.

Lack of funding should not be seen as an impediment to management however, as very modest levels of resources are required to undertake monthly scans of Lyngbya distribution and density and contingency management actions, particularly given the indicative in-kind support from local agencies.