Cockburn Sound Management Council Members

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John Smedley

Richard Smith

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Absent: Paul Brown, Matt Gillett, Guy Watson

Cockburn Sound Management Council Staff

Dr Tom Rose

Geoff Botting

Petra Kohn

State of Cockburn Sound 2010 Report
The role of the Cockburn Sound Management Council in implementing the State Environmental (Cockburn Sound) Policy 2005

This report was endorsed by the Cockburn Sound Management Council on 2 May 2011

Cover Photographs:
- top – Mangles Bay moorings; middle – Twilight fishing in Rockingham; and bottom – Garden Island Causeway
2010 was Cockburn Sound Management Council’s sixth year of reporting on the state of the Sound and for assessing the health of Cockburn Sound through a wide range of monitoring programs under the terms of the State Environmental (Cockburn Sound) Policy 2005 (SEP). The results of the 2010 Report Cards were encouraging. In spite of the pressure on the waters of the Sound, this beautiful and economically crucial ocean waterway continues to retain a reasonable level of health and stability as measured by the criteria the SEP has established. While there have been fluctuations from time to time, and some areas that regularly fail to meet the SEP standards, there are also signs of improvement in specific aspects, as can be seen from the report cards contained within this Report.

All these results, however, need to be set against the backdrop of the Sound in the 1960s and 1970s when heavy industry was first established along its shoreline. With the loss of close to 80% of the seagrass meadows over that short time, the ancient ecosystem took a massive hit, and was ecologically altered, leaving a more sandy, exposed, turbid and disturbed environment. In other words, the baseline for the meaning of ‘healthy’ has changed.

Since the establishment of monitoring programs, our aim has been to protect the Sound from further damage and, wherever possible, improve its health by identifying problems quickly and coordinating remedial or preventative action through the relevant government, industry or community stakeholder groups. With escalating urbanisation in the Sound’s catchment, some large industrial port developments planned in the near future and ever increasing use of the Sound for recreational activities – boating, swimming, fishing, tourism the pattern of threats and pressures on the Sound has also changed. Stronger regulatory frameworks, along with innovations in waste-water management and other measures by industries to protect the Sound have had a profoundly positive effect. The challenge of the future will be to ensure that any new developments do not cause a ‘tipping point’ to be reached where the hard won ecological stability and sustainability of Western Australia’s most heavily and diversely used stretch of water begins to take a downward turn.

Late in 2010 a Report by the W.A. Auditor General on the Environmental Management of Cockburn Sound by the CSMC, the Department of Environment and Conservation, and the Environment Protection Authority, made a series of findings and recommendations. We have included these in this report. However, we will focus in more detail on our responses in the 2011 State of the Sound Report. However, some of the technical recommendations of the OAG report had an impact on the process of analysis of the 2010 monitoring results, causing the timing of this report to be out of step with the normal pattern.

I would like to acknowledge here the tireless commitment of the very small group of CSMC officers who coordinate the monitoring program and work on many fronts, producing expert advice to government, the EPA and the community, from a minimal resource base. I also acknowledge the extraordinary contribution of the Council itself which is made up of a wide range of leaders from the community, industry and government, who pool their expertise and experience to work together with a single purpose – that of protecting the Sound for all users into the future. It is through the generous efforts of these people that the CSMC is able to offer its unique service to the community of Western Australia.

Professor Kateryna Longley
Chair, Cockburn Sound Management Council
August 2011
The Cockburn Sound Management Council (CSMC) is responsible for coordinating and undertaking a range of environmental monitoring programs to assess the environmental health of Cockburn Sound. The CSMC reports annually to the Minister for Environment, Parliament, the Environmental Protection Authority (EPA), and the wider public, on the state of the Sound and on whether the environmental values and objectives established for the Sound are being met, as defined in the State Environmental (Cockburn Sound) Policy 2005 (SEP). The activities and progress of projects and programs are also reported to Parliament and the community. The CSMC therefore provides this State of the Cockburn Sound Report 2010 to the Minister for Environment and to Parliament, as mandated by the State Environmental (Cockburn Sound) Policy 2005 (SEP).

The SEP and the CSMC’s Environmental Management Plan 2005 (EMP) are endorsed Parliamentary and Cabinet documents. This report is the sixth State of the Sound Report submitted to the Minister for Environment and Parliament. During 2010 ten scientific monitoring programs were accessed and analysed to assess ecosystem health in Cockburn Sound.

The 2010 Report Cards indicate that the marine environment of Cockburn Sound, as assessed by the criteria established by the SEP, remains generally healthy. The areas or zones of High and Moderate ecological protection, which currently make up 96% of the Sound, conformed overall with the SEP’s guidelines and standards. Monitoring carried out at all sites in the Sound has shown that light attenuation, temperature, salinity and pH levels have met established guidelines. These are all key indicators of a healthy ecosystem. However a number of individual monitoring sites raise some concerns in relation to other criteria as the report cards indicate.

Dissolved oxygen levels at two sites, one in the deeper southern Sound, the other at Mangles Bay, slightly exceeded the environmental quality guidelines of 90% saturation and went just below this level on a number of occasions.

In Jervoise Bay Northern Harbour the environmental quality standard for phytoplankton biomass was exceeded and the environmental quality guidelines for chlorophyll ‘a’ and light attenuation were also exceeded. The CSMC is completing a Management Action Plan to help guide parties to address these conditions in the Northern Harbour and expects to provide this Plan to the Minister for Environment in late 2011.

During 2010 the CSMC was examined by the Office of the Auditor General (OAG) as part of a broader audit which looked at the effectiveness of the Council, EPA and the DEC in managing and maintaining ecosystem health in Cockburn Sound. There is further information on this audit later in this report.

The main activities of the CSMC during 2010 fell into three broad categories: annual; strategic; and community-investigative. The CSMC now has ten years of continuous environmental data. This provides a robust foundation for understanding this highly complex marine embayment and it helps to quickly identify areas of concern. Utilising its extensive knowledge and experience, the CSMC provided expert advice throughout 2010 to various stakeholders, including the Commonwealth and State Governments and the EPA, on development proposals, and to the three local governments bordering Cockburn Sound and Owen Anchorage, on a wide variety of issues.

As a consequence of the timing of the OAG Audit, the CSMC could not hold its usual community forums to present its environmental report cards in 2010. However, as part of its communication strategy, CSMC staff gave numerous talks and presentations to a range of stakeholders and community groups on environmental matters, policy and management. The Chair also made a presentation to the Kwinana Industries Council’s Community Industries Forum (CIF) on the OAG report. The CSMC produced two editions of its newsletter, and published ‘Sounding Out – a Way Forward’, a foundational resource document for facilitating multiple use of Cockburn Sound and Owen Anchorage.

The CSMC office near Rockingham Beach, and their community contact phone number, remained popular, attracting over 300 phone enquiries, approximately 370 office visitors and approximately 2350 window front display visitors. Table 2 provides a summary.
of some of the many inquiries and queries the CSMC office has received throughout 2010.

At a strategic level, the CSMC provided advice on several major development proposals, including large scale port and marina projects, as well as on Public Environmental Reviews and changes to Ministerial Conditions under Section 45 of the Environmental Protection Act 1986 (EP Act 1986).

The CSMC has progressed two long-term projects during 2010: the investigation into the grey sands in Owen Anchorage has been completed and there has been further progress on the environmental sign and sculpture interpretation trail for Cockburn Sound and Owen Anchorage.
Cockburn Sound

Cockburn Sound, located approximately 20 kilometres south of the Perth-Fremantle area, is the most intensively used marine embayment in Western Australia. The Sound’s sheltered waters support diverse marine life and a range of recreational, commercial and industrial activities.

The Cockburn Sound marine ecosystem is a significant community asset which has a range of important ecological features (e.g. fish nursery and habitat, seagrass meadows) and number of key social values (e.g. swimming, boating, fishing and aquaculture). Its shores also contain some of Australia’s largest value adding industrial areas, employing over 4000 direct employees and approximately 26 000 other contractors. The Kwinana Industrial Area uses Cockburn Sound for its clean waters to help cool industrial processes and for large scale shipping and commercial activities. Aside from thermal discharges, very little industrial waste is now released into Cockburn Sound (estimated less than 4% of historical levels). Garden Island Stirling Naval Base is also reliant on a clean and accessible Sound to support Australia’s Indian Ocean Fleet.

Cockburn Sound Management Council

In April 2000 the State Government established the Cockburn Sound Management Council in response to a range of increasing pressures on Cockburn Sound. The Council’s purpose, as expressed in its Strategic Plan (2010–2015) is to ‘Keep Cockburn Sound and Owen Anchorage healthy and sustainable for the Western Australian community.’ The role of the CSMC is to ‘ensure coordination and facilitation of environmental planning and management of Cockburn Sound and Owen Anchorage to keep them healthy and sustainable into the future’.

State Environmental Policy for Cockburn Sound

The State Environmental (Cockburn Sound) Policy 2005 is the guiding document for monitoring, interpreting and managing the Environmental Quality Objectives (EQOs) and Environmental Values. Benchmarks, known as Environmental Quality Criteria (EQCs), have been developed for Cockburn Sound and are used to determine whether the Environmental Values for Cockburn Sound are being protected. Because the SEP does not yet extend to Owen Anchorage, a parallel process has not yet been established for Owen Anchorage.

The CSMC’s annual Report Cards on the environmental health of Cockburn Sound, presented in this report, are derived by comparing monitoring data with relevant environmental quality criteria in accordance with these documents.

Environmental Management Plan for Cockburn Sound

The CSMC’s Cabinet-endorsed Environmental Management Plan (2005) represents the first coordinated approach to addressing the health of Cockburn Sound in the context of its multiple uses. The EMP details a five-point plan of action towards implementing the SEP and coordinating the environmental management of Cockburn Sound and its catchment:

- Protecting the environmental values of Cockburn Sound.
- Facilitating multiple use of Cockburn Sound and its foreshore.
- Integrating management of the land and marine environments.
- Coordinating research and investigations.
- Monitoring and reporting on performance.
In November 2009 the Office of the Auditor General (OAG) notified the Cockburn Sound Management Council, Department of Environment and Conservation and Environmental Protection Authority that it intended to undertake a preliminary examination of the environmental management of Cockburn Sound. The focus of the preliminary examination would be to gather information to determine whether the environmental values of Cockburn Sound were being adequately protected. In particular the OAG sought information on a number of issues, including:

- Have environmental standards been established for Cockburn Sound and are accountability arrangements adequate for meeting the standards?
- Are there reasonable monitoring practices in place that ensure prevention and detection of environmental risks and/or if contamination occurs?
- Does appropriate compliance and enforcement occur in Cockburn Sound?
- Are results being adequately reported and factored into future planning and monitoring?

Following the conclusion of the preliminary examination, in April 2010 the Auditor General decided to proceed with a full performance examination of the environmental management of Cockburn Sound. The focus of this examination was to determine whether existing environmental management practices promote ecosystem health in Cockburn Sound, including examination of the OEPA, DEC and CSMC and their roles in these management practices.

The examination’s core focus was based on three lines of inquiry and various criteria.

The OAG report then provided nine summary recommendations:

- The EPA, DEC and the CSMC should bring forward the planned 2012 review of the SEP. The review should consider the following measures to strengthen the current monitoring methodology and practice:
  - Confirm that Warnbro Sound remains a valid reference site
  - Improve transparency and reporting when benchmark standards for environmental quality criteria are adjusted
  - Clarify the requirement to report against zones or specific monitoring sites
  - Periodic seagrass mapping to assess overall trends in seagrass coverage in the Sound
  - Monitor cumulative contaminant inputs
  - Update the environmental risk assessment of Cockburn Sound
  - Strengthen quality assurance frameworks for how data is collected and used.

- The EPA, DEC and CSMC should strengthen the current reporting framework by providing sufficient information to allow an assessment of trends in ecosystem health. Reports should include monitoring results from the reference site and should place more emphasis on individual monitoring sites within zones. CSMC should set realistic timeframes to ensure that appropriate action is taken when environmental guidelines and standards are exceeded.

The OAG tabled in Parliament its formal Audit results in September 2010. The CSMC, DEC and OEPA are required to respond to the OAG audit in November 2011. The CSMC 2011 State of the Sound Report will outline the Council’s response and advise on how the Council intends to address many of the suggestions and recommendations outlined in the OAG report.
A recently completed project at Woodman Point to provide new boat launching ramps, jetties, and a floating universal access pontoon, has been well received by the boating community.

Jervoise Bay Northern Harbour

There has been positive feedback about the new facilities, and the number of users has increased by approximately 40% since the opening. The proposed second stage of works includes improvements to the car parking area which is in poor condition and overcrowded during peak boating periods. Work is anticipated to occur later this year. The Department of Transport (DoT) can provide further information on plans for Woodman Point.

Given the planning and development in progress, the DoT has been meeting regularly with stakeholders including the CSMC. The City of Cockburn, DEC, representatives of the Woodman Point Regional Park Community Advisory Committee and tenants have also been closely involved and this group has been providing input to the management of the Precinct and reviewing proposals associated with the Precinct master plan.

Woodman Point Development Plan (Dept of Transport)
In August 2004 the Minister for Environment announced the expansion of the CSMC’s roles and responsibilities to include the waters of Owen Anchorage and its catchment. As a result, the Government provided additional funding from 2005 to 2008 to support the Council’s expanded roles in this area.

Prior to the development of an Environmental Management Plan for Owen Anchorage, an up-to-date understanding of the Anchorage’s environment was needed. The CSMC commissioned Oceanica Consulting to prepare a State of Owen Anchorage Report. In order to most effectively consolidate and integrate available information the ‘Pressure-State-Response’ (PSR) model was used. This approach enabled the CSMC to: identify pressures (current and future) on the Owen Anchorage environment; describe the current state or condition of the environment; and document the current knowledge and management responses to the identified pressures. The result was the release of The State of Owen Anchorage – A Pressure State Response Report, completed in 2007.

Recreational activity – Ammunition Jetty, Owen Anchorage

The CSMC has been using the information contained in this report to assist in the implementation of its new management role within the Owen Anchorage area, with most of the information being used as the basis for the preparation of a Draft Environmental Management Plan for Owen Anchorage and its catchment. In conjunction with the development of the Plan and in preparation for its future endorsement, the CSMC will continue its management role within the area. This may include the prioritisation of various issues and recommendations raised in the PSR report and, where deemed necessary, the implementation of investigations or actions to address such matters.

Owen Anchorage did not undergo the high level of environmental degradation caused by nutrient and contaminant inputs in Cockburn Sound from the mid-1950s to the early 1980s but the Anchorage was still adversely affected by domestic waste discharge up to 1964 and industrial discharge (mainly animal processing wastes) up to 1998. In addition, there have also been numerous physical alterations to Owen Anchorage. Modifications to the seabed have occurred by the dredging of Fremantle Ports’ shipping channels and shell sand dredging by Cockburn Cement Limited (CCL). The shoreline has been extensively modified by coastal structures (Woodman Point groyne, WAPET groyne, Port Coogee and Ammunition and Coogee Beach jetties, South Fremantle Power Station groyne) and beach re-nourishment. However, unlike Cockburn Sound, Owen Anchorage has not undergone a major loss of seagrass meadows due to nutrient enrichment. The seagrass losses that have occurred have been largely due to dredging and it is estimated 280 hectares have been lost. Owen Anchorage retains over 2230 hectares of seagrass, with about 2204 hectares outside of those areas approved for shell sand dredging by CCL.

Key pressures in Owen Anchorage at present have been identified as:

- **Dredging:**
  - CCL (shell sand extraction)
  - Fremantle Ports (maintenance of shipping channels);
- **Port Coogee marina development;**
- **CCL’s wash plant discharge;**
- **Commercial shipping;**
- **Commercial and recreational fishing;**
- **Inputs of nutrients and contaminants (from groundwater, storm water, occasional Swan River discharge and atmospheric deposition).**

Future pressures are considered to be:

- **Increased coastal development;**
- **Increased recreational use, including boating; and**
- **Climate variability and change, which includes:**
  1. less rainfall, and therefore lower inputs from groundwater, storm water and the Swan River;
  2. increased sea temperatures;
  3. rising sea levels, and therefore more coastal erosion;
4. increased storminess and therefore more coastal erosion.

Although water quality in Owen Anchorage was adversely affected by industrial discharges prior to the late 1990s, these have largely ceased, with the only remaining significant discharge being wastewater from CCL’s wash plant. Pressures due to boat-based commercial and recreational activities other than fishing (e.g. snorkelling, Scuba diving, scenic tours, jet skis, yachting) include: fuel spills from boats; discharge of sullage; rubbish; loss of gear; habitat damage from propeller and hull scour, and anchors; and disturbance to wildlife (sea lions, dolphins, penguins, seabirds). Shore-based recreational activities can also affect the marine environment, including: impacts on water quality due to human, dog or horse faeces; dumping of rubbish; and disturbance of seabirds (by people and dogs).

Profile showing grey sands along Owen Anchorage beaches

The main issues in Owen Anchorage are considered to be:
- Alteration of the shoreline (and coastal processes);
- Loss/alteration of benthic (seabed) habitat;
- Grey sands;
- Water quality (turbidity);
- Nutrient and contaminant inputs (via groundwater and stormwater);
- Recreational use (balancing and managing present and future recreational needs).

These issues and the information gaps identified within the PSR will form the basis of many of the management responses outlined in the CSMC’s Draft Interim Environmental Management Plan.

Owen Anchorage - Where CSMC is going in the future

The CSMC has developed a Draft Interim Environmental Management Plan (EMP) for Owen Anchorage. This Plan is currently being edited and revised to ensure that it will meet the long-term strategic environmental management needs of Owen Anchorage. Once the EMP is endorsed by the CSMC it will be presented to the EPA for consideration prior to community consultation meetings and advertisement for local government and public comment. This feedback will be included and a final EMP tabled with the EPA for approval. The CSMC is committed to a transparent and inclusive process that engages the community in development of the final management plan.

Port Coogee marina during construction
The CSMC undertook a range of activities in 2010 that can be generally categorised as annual work including reactive responses; strategic; and those related to addressing community concerns and investigations. The examples provided here are in addition to the annual work the CSMC undertakes to manage and coordinate environmental monitoring programs, and to analyse and interpret monitoring results, for the production of its annual environmental report cards and other activities undertaken to meet the intent of the State Environmental (Cockburn Sound) Policy 2005.

**Annual**

The CSMC provided approximately 10 submissions or formal advice to a range of Commonwealth and State agencies, Parliament and the three local governments. This included:

- The CSMC provided comment and advice on the Strategic Environmental Assessment for Rockingham Industrial Zone (RIZ or IP14) just south of the Kwinana Industrial Area bordered by the City of Rockingham and Town of Kwinana. This advice was provided to the EPA. In general the CSMC recognised the critical need for industrial land but believed this could still be achieved by supporting the already proposed conservation area in the estate. The CSMC also suggested including some extra areas with existing functional vegetation (e.g. providing roosting, canopy or tree cover, hydrological functions or representing a Threatened Ecological Community (TECs). It was felt that as these areas dry out due to declining rainfall over the next 30 years, the vegetation is likely to be lost. They could then be converted into use for the industrial estate. This phased approach recognises their current value and importance. This advice was qualified in terms of addressing and ensuring that critical hydrological, local climate, flora and fauna links with Cockburn Sound, i.e. the catchment links, and other interconnected processes, were not compromised.

- The CSMC provided extensive advice on improving the Environmental Scoping Document (ESD) James Point Industrial Port. This ESD outlines investigations and issues for investigation and explanation in the PER required by James Point Propriety Ltd. The PER must be assessed before the proposed development of Stages Two and Three can be considered. CSMC advice sought to ensure rigorous descriptions of the existing environment flora and fauna in the area and to ensure adequate management would occur for marine pests, water and sediment quality, mitigation for any lost environmental values, traffic and construction impacts of the industrial port development.

- The CSMC provided advice on the District Structure Plan for the already approved Latitude 32 Industrial and Commercial Precinct near old Wattleup. CSMC advice concentrated on ensuring appropriate water sensitive design, groundwater and wetland restoration and management was undertaken. It also commented on potential noise, landscaping and biodiversity corridor management so that these issues could be adequately addressed. Our advice also sought to make sure that adequate complaint management for dust and noise was in place. An accord for future estate tenants was also proposed as a means of facilitating the implementation of the aims and objectives of the District Structure Plans.

- The CSMC was actively engaged in discussing aspects of an ESD for the proposed Mangles Bay Marina Based Tourist Precinct. The majority of liaison related to ensuring that studies and monitoring would adequately assess water quality, seagrass, fish and other fauna (e.g. penguins), as well as affected existing moorings. Assessment of potential impacts on adjacent vegetation, groundwater and Lake Richmond was also sought so that an adequate PER would be provided to allow comprehensive environmental assessment.

- CSMC staff were involved in the development of the Western Trade Coast Industries Committee that has replaced the former Kwinana Industries Consultative Committee. This engagement, in partnership with the DEC, allowed the CSMC to work towards ensuring that consideration would be given to preventing or minimising impacts of development on the catchment and marine environment of Cockburn Sound.
The CSMC provided input into the Upper House Environment and Public Affairs Committee Inquiry into Cockburn Cement’s operations in Munster. The CSMC considered the terms of reference for the investigation should be extended to include wash plant operations affecting Owen Anchorage on the northern side of Woodman Point. The CSMC highlighted issues associated with the chronic turbidity plume affecting water quality and seagrass health in close proximity to the wash plant outfall.

The CSMC provided advice and commentary on the WA Planning Commission’s ‘Directions 2031 – Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy’. Comments were mainly directed towards impacts on Thompsons Lake and conservation reserves, erosion and loss of the catchment buffer between Industry and urban development, capacity to adequately address community concerns and complaints, as well as applauding the Commission for addressing the need to provide strategic direction to future planning in the region.

The CSMC was actively engaged in providing advice to the Water Corporation on proposed deviations and duplication of the Sepia Depression Ocean Outfall Line (SDOOL). This necessary duplication is in abeyance until issues associated with the proposed Mangles Bay Marina are clarified. Regardless, the CSMC wanted to ensure that dewatering and construction were undertaken at appropriate times and with adequate controls. The CSMC were also engaged in liaising with the Water Corporation over the location, and the management of construction and operation, of the East Rockingham Sewage Treatment Plant that is proposed for the northern Rockingham Industrial Zone.

Extensive commentary was provided by the CSMC on the draft EPA Environmental Assessment Guideline No7 for Dredging. Comments were made in light of the level of dredging, current and future, in Cockburn Sound for the maintenance of existing navigation channels, the expansion of the Australian Marine Complex in southern Jervoise Bay and proposed industrial ports.

The CSMC staff gave six formal presentations including presentation to the Perth Urban Ecology Conference, Curtin University, the Kwinana Industry Council’s Community Industries Forum and Department of Defence. Presentations covered topics including urban impacts on Cockburn Sound, aspects of marine policy and the role of Cockburn Sound Management Council, explanation of the Auditor General’s Report on environmental management of Cockburn Sound and context for improved management of the contaminated sewage plume caused by the original sewage treatment plant for Stirling Naval Base.

The CSMC office also dealt routinely with a large volume of walk-in and phone queries by the public over a wide range of issues including the Wanliss Street (Port Rockingham) Marina, the proposed Mangles Bay Marina, industrial ports, concerns over specific local government operations and concerns about sea life, such as dead starfish on the beaches. Numerous community complaints and anxieties were handled and frequently defused.

Strategic

Strategic Plan 2010–2015. The Cockburn Sound Management Council continued to refine and implement its Strategic Plan. This plan was developed in 2009. The Council framed its actions and activities for the year in the context of this plan and its existing Environmental Management Plan 2005. Tasks were identified and completion dates set to meet its five central strategies of:

1. Planning for the Future of the Sound (Foresight),
2. Enhancing its database and decision making capacity (Knowledge),
3. Strengthening connections with the community (Connection),
4. Strengthening relationships with key government agencies and industry (Positioning), and
5. Developing further sources of funding (Funding)

Development of a Database Management System (DBMS). During the ten month investigation by the Auditor General, CSMC staff were constantly providing data, reports and explanations to assist the auditors. It became evident that the CSMC held over ten years of extensive and valuable environmental data such as water quality, seagrass and other environmental and contaminant monitoring data collected in the Sound by a range of stakeholders that provide data for the CSMC’s annual environmental report cards. This information also included historical data, in some cases going back to 1978. It became very
evident that because the data was in multiple formats and dispersed, it required a great deal of effort for staff to provide quality-assured data, with metadata statements explaining the data to the auditors. Since public and research institution requests for data are constant and in some cases increasing, the CSMC recognised the need to develop a scoping document and strategy to obtain the resources to develop a DBMS. This would facilitate quality assurance, allow analyses and reports to be more easily produced and also provide a more consistent and accessible basis for answering environmental questions more generally.

Research and Scholarship Plan and Research & Development Manual (2010). Following a contribution by the Kwinana Industries Council towards a CSMC R&D Leverage Fund, the CSMC developed these two documents to provide guidance and prioritisation on what research and associated projects would be supported. The documents also identify criteria for supplying scholarship top-up funding to relevant University PhD projects. These documents indicate that the CSMC now believes seagrass restoration should be pursued to a much greater extent than has occurred in the past. Recent research and publications indicate that it is possible to restore seagrass to a substantial portion of the shallows in the Sound. However, adequate resourcing and operational protocols ensuring cost effective restoration need to be developed in order to make this happen. These documents help direct research towards these ends and also provide guidance on filling research and knowledge gaps for better management and protection of the environment of Cockburn Sound.

Australian Research Council (ARC) Industry Linkage Grants. In order to address the need to fill critical information gaps on Cockburn Sound and to complement its Research and Scholarship Plan (2010) and Research and Development Manual (2010), the CSMC began to develop two ARC Linkage Grant proposals in 2010, with university, industry and CSMC as partners, for submission in 2011. One project was associated with the effect of sea water temperature rise on hard substrates. Insights into the effects of rising water temperatures, especially in relation to organisms that are likely to settle in warmer conditions, would give the Council an idea of what may happen to Cockburn Sound’s seagrasses and hard reefs, and also to infrastructure located along its shores, such as jetties, outfalls, and moorings. The CSMC supported this potential project with some funding that has been matched and multiplied by a range of stakeholders with similar interests. The CSMC will play a coordinating role in any such projects that are successful in obtaining funding from Canberra. Similarly, the CSMC supported a project to develop a remote monitoring observation system in order to be able to observe real-time environmental conditions in the Sound. In 2011 it hopes to also encourage a research project that will develop a ‘tool box’ to help identify where seagrass restoration is most likely to succeed.

Review of Communication Plan and updating the CSMC web site. The CSMC has been updating its web site with current documents and reports but it is also investigating how it can make its web site more accessible to the public as well as more interactive and informative. Developing a Data Base Management System to complement this site would also help in streamlining public queries and information content for the range of query types. A Draft Communication Plan is being developed for CSMC endorsement as part of the process of updating the CSMC’s interface with the public. This will include the use of Facebook, interactive web communication, as well as more effective use of media and office window displays.

Community-Investigative

While addressing the Auditor General’s Report and undertaking its annual activities such as managing water quality and seagrass monitoring programs, the CSMC was also able to progress several community initiated projects.

* Grey Sands investigation. The Grey Sands investigation was completed in 2010. Staff reviewed and provided comments in 2011. The results indicate that there are natural biogeochemical and environmental reasons for the observed greyness reported by members of the community. The issue of how much is contributed by human activities that could exacerbate the reported greyness is not clearly resolved in the report. However, the investigation does reveal that greyness has always been a characteristic of the Owen Anchorage beach sands and that several factors influence human perceptions of greyness. However, more detailed results, history, factors and interpretations will be available in the 2011 State of the Sound Report.
*Sea Sculptures and Eco-signage project.* This project has progressed slowly due to the need to clarify insurance issues for local governments where the installation of the four small sea sculptures will occur. Once local government approvals are received, the sculptures can be installed. The CSMC will then be able to complete the development and construction of a related signage trail along the foreshore from Point Peron to Port Coogee, informing the community about various aspects of the Cockburn Sound and Owen Anchorage environment.

*Work experience students.* Two work experience students were taken in by staff at the CSMC in 2010. A student from Kolbe College helped to assess the colour and quality of the beaches from Point Kennedy to Woodman Point, developed ideas for the eco-signage trail and looked at what impact sail and petrol powered boats may have on water quality and the environment in general. A Curtin University student helped to further develop the eco-signage trail and also assisted with office work and reporting.
Environmental Quality Monitoring Program (EQMP)

What did we do?

In 2010, the CSMC coordinated an EQMP to assess the health of Cockburn Sound. Data was collected for physical and chemical measures, direct and indirect biological measures, contaminants in sediments, biological contaminants, and chemical contaminants in seafood flesh.

What did we find?

Ecosystem Health in Areas of a High Level of Protection (broader area of Cockburn Sound) (Figure 1)

The High Protection Area (HPA) met the Environmental Quality Guidelines (referred to as the guidelines) for chlorophyll ‘a’; however concentrations exceeded the EQC at six of the thirteen sites in this Area. Median light attenuation met the guidelines but was elevated at two sites. Dissolved oxygen levels met the guidelines except for two sites in the deeper basin and at Mangles Bay, which occasionally exceeded the guidelines. All sites met the guidelines for temperature, salinity and pH (surface and bottom). Chlorophyll ‘a’, as an indicator of phytoplankton biomass, met the guidelines except for concentrations at Mangles Bay and two sites in the Southern Sound. Seagrass monitoring sites met the guidelines for seagrass shoot density except at Mangles Bay and Garden Island Settlement which were labelled red for exceeding the Standards. Garden Island Settlement has been deteriorating for the four to five years. It is believed human and possibly environmental factors are influencing these two seagrass sites. Interestingly, Mangles Bay has shown slight improvement this year. All sites met the guidelines for seagrass depth limit. No observed reductions in the seagrass depth limit were detected. Stability at the lower depth limit suggests that there has not been a regional decline in water clarity and light availability sufficient to cause a loss of seagrass meadows. (Seagrass monitoring results and trends are currently being reviewed to address the OAG’s recommendations that this be done) Consequently, the CSMC graded overall seagrass health as amber – exceeding guidelines and standards at two out of seven sites for the whole area. No Contaminants in Water sampling occurred in 2010. While of limited value for 2010 conditions, 2009 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits. No TBT sediment sampling was done this year in the High Ecological Protection Area. Sampling in 2007 showed all monitoring sites were well below the guidelines. No formal sampling for imposex in snails has been done by CSMC since 2005–06. All sediment samples monitored to date (collected during March 2006 at 86 sites) met the guidelines.

Ecosystem Health in Areas of a Moderate Level of Protection (outside Jervoise Bay Harbours) (Figure 3)

Chlorophyll ‘a’ met the guidelines; however concentrations were occasionally above EQG levels at three of the seven sites in this Area. Median light attenuation met the guidelines. All sites met...
the guidelines for dissolved oxygen, temperature, salinity and pH. All sites also met the guidelines for phytoplankton biomass. Seagrass shoot density met the guidelines. No reductions in seagrass depth limits were observed. Contaminants in water concentrations met the guidelines or were below laboratory reporting limits. Limited sampling of contaminants in sediments (mainly around industrial and commercial jetties and terminals) met the guidelines. Results indicated that some samples had concentrations which exceeded the guidelines but median values were well below guideline values. Two sites around industrial ports partially exceeded the guidelines; while these sites were individually coded amber the overall code was green. No formal sampling for imposex in snails has been done by CSMC since 2005–06. The MPA met the guidelines for contaminants in sediments. However, two sites had elevated cadmium and copper sediment concentrations and one site had some elevated poly-aromatic hydrocarbons that exceeded guidelines, but not the Standards.

### Ecosystem Health in Areas of a Moderate Level of Protection (inside Jervoise Bay Harbours) (Figure 5)

The median chlorophyll ‘a’ concentration for Jervoise Bay Northern Harbour exceeded the guidelines. No sampling occurred for this in the Southern Harbour in 2010. Light attenuation in Northern Harbour sites exceeded the guidelines. No sampling occurred for this in the Southern Harbour during 2010. Dissolved Oxygen, Temperature, Salinity and pH concentrations in Northern Harbour met the guidelines. No sampling for these parameters occurred in the Southern Harbour. Exceedance of a standard (high phytoplankton biomass) was registered again in Jervoise Bay Northern Harbour. The median chlorophyll ‘a’ concentration exceeded the standards. Again no sampling occurred in the Southern Harbour for this year. No sampling for contaminants in water was undertaken in these areas this year. When tested last in 2008, contaminant levels met the EQGs. Based on limited sampling, TBT concentrations for the Northern Harbour exceeded the EQG. Three out of four sites exceeded the guideline. Southern Harbour met the guideline except at one site, which exceeded the guideline. No formal sampling for imposex in snails has been done by CSMC since 2005–06. No sampling for organic contaminants in the Northern and Southern Harbours was undertaken this year.

### Safe Seafood for Eating Report Card (Figure 7)

The criteria for thermo-tolerant faecal coliform levels in seafood flesh were met at all sites (Figure 8). It is important to note that the levels of bacteria in the flesh of mussels, as opposed to within the water column, met the EQG at all sites sampled.

All samples taken from the commercial mussel harvesting areas in Southern Flats and in proximity to the Kwinana Grain Terminal met the EQG for thermo-tolerant faecal coliform levels in water. Other guidelines, however, were not met at a number of non-commercial sites where water samples with elevated levels of phytoplankton that exceeded WASQP/ ANZECC guidelines were recorded.

Exceedances of the EQG for the presence of potentially toxic algal species were recorded within the Jervoise Bay Harbours. The public needs to be reminded of the risk associated with the consumption of potentially contaminated seafood collected recreationally from within the Jervoise Bay Harbours.
Clean Waters for Swimming and Boating (Figure 9)

All parameters met the criteria (Figure 10) which are for primary contact (swimming). All sites met the EQG for bacterial Enterococci. It is important to note that these monitoring results are based on results of over the past five years of summer monitoring. Positive indicators include the improvements noted between 2005–06 and 2010–11 for bacterial Enterococci levels at the Rockingham Beach sites.

The Rockingham drainage improvement program has resulted in improved water quality near beach drain outfalls. Also, phytoplankton sampling does not occur at swimming beaches and thus samples taken further out near mussel growing areas as part of WASQAP sampling are currently used as surrogates to determine the presence of high levels of potentially toxic species. No algal biotoxins have ever been detected in these samples nor were there any reports of dermatitis from swimming for the year.

Protecting the Health of Aquaculture Species (Figure 11)

All parameters monitored met the criteria and there were no concerns noted.

Summary of Overall Health

The 2010 Report Cards indicate that the marine environment of Cockburn Sound is generally good. Monitoring carried out at all sites in the Sound has shown that measures for dissolved oxygen, temperature, salinity and pH levels have generally met established guidelines. These are all key indicators of a healthy ecosystem.

On-Going Action

The CSMC believes high phytoplankton biomass measurements at Mangles Bay and two closely located sites in the southern Sound – High Ecological Protection Area are a feature of being located in the south leeward side of Point Peron and the Garden Island causeway. The Council will be working with the DEC and EPA to see if there are any practical management steps that can be taken to improve phytoplankton biomass results at this site.

As a result of historical monitoring and recent works undertaken by the City of Rockingham to reduce discharges of bacteria through the upgrade of near-shore drainage systems, it is pleasing to note that bacterial levels have further improved this year. Improved conditions in this area are expected in 2011.

The WASQAP plan is in the process of being updated. This plan is to ensure that mussels harvested from the aquaculture area in Cockburn Sound are safe for human consumption and are of the highest quality. The CSMC will be advised of any changes once it is finalised, particularly with regards to revisions relating to levels of potentially toxic algal species.

Action from 2010 Report Cards

The CSMC have presented their 2010 ‘Report Cards’ to the Minister for Environment. Separate advice has been provided to the Office of the Environmental Protection Authority advising of all exceedances of Guidelines and Standards identified by the Council’s Environmental Health monitoring, evaluation and reporting methodologies.

Further advice will be sought from the Department of Defence to determine what action can be undertaken to overcome the continuing decline of seagrass shoot density levels at Garden Island Settlement located within Naval Waters. The Council is also working with a range of stakeholders to complete an Action Plan that will outline a number of strategies to overcome historical, long-term poor water quality in the Jervoise Bay Northern Harbour.
Protection Areas
Cockburn Sound Management Council
Environmental Report Cards 2010

Legend for Report Cards overleaf

M Monitor: below guidelines, continue monitoring.
I Investigate: above guidelines; investigate and where necessary take precautionary action.
A Action Required: Above standards; initiate management response.
N/A No official rating can be applied.

Hatched means data greater than one year old.
Green hatched means data greater than one year old but was below guidelines when last measured.
Red hatched means data greater than one year old and above standards when last measured.
Unable to Report. Monitoring data results were not provided to the CSMC or data is too old to be relied upon.

Cockburn Sound Management Council
Environmental Monitoring Results – Evaluation Rules

The State Environmental (Cockburn Sound) Policy 2005 (SEP) requires the Cockburn Sound Management Council (CSMC) to report on two Ecological Protection Areas – High and Moderate Ecological Protection Areas. The CSMC have also created a third Ecological Protection Area – Moderate Protection Area Harbours – based on the SEP that advises the performance of harbours and marinas should be assessed individually and not be part of overall Moderate Ecological Protection Areas if the area is displaying different environmental conditions. Because of poor environmental conditions in Jervoise Bay harbours, the CSMC created this third area. Each Area is monitored at a number of sites. Measurements at each site are collectively analysed to report on the environmental performance for each Ecological Protection Area. Environmental data is analysed according to the rules and criteria outlined in the SEP and associated Environmental Quality Criteria (EQC) and Standard Operating Procedure (SOP) documents. While the CSMC reports mainly on the Areas of Ecological Protection, a number of parameters are reported on a site basis. This is either because that is the specified procedure for reporting on that set of Environmental Quality Objectives (e.g. Clean Waters for Swimming and Boating) or because the CSMC believes that regardless of the overall Area meeting Environmental Guidelines, exceedances at sites are deemed important enough to grade the whole Area as exceeding the Guideline or Standard. In some cases this year, even though the Area met the EQC, if ≥50% of sites did not, then the Area was reported to have exceeded the EQC. When reporting, the CSMC also provides maps to show how the Areas and individual sites have performed against the EQC for a given parameter.
State Environmental (Cockburn Sound) Policy 2005

Schedule 2 – Boundaries between the High and Moderate Ecological Protection Areas
State Environmental (Cockburn Sound) Policy 2005
Schedule 3 – Location, size and cumulative area of authorised Low Ecological Protection Areas

Legend
- High Ecological Protection
- Moderate Ecological Protection
- Low Ecological Protection
- James Point Pty Ltd Stage 1 – Approved but not yet constructed

Data Source
- State Environmental (Cockburn Sound) Policy Area 2005 (EPA 2010)
- Jetties (Department of Planning 2004)
- Coastline (Landgate 2008) with James Point Pty Ltd Stage 1 development

Areas of LEPAs
(A) – Western Power – 35.90 ha
(B) – BP – 15.64 ha
(C) – Tiwest Pty Ltd – 0.12 ha
(D) – CSBP Ltd – 0.48 ha
(E) – Mintech Chemical Industries – 0.04 ha

These areas currently occupy 4.39% of the water area east of the high/moderate ecological protection boundary.
### Report Card 2010

#### Ecosystem Health in the High Ecological Protection Area

<table>
<thead>
<tr>
<th>Environmental Quality Indicators</th>
<th>Management Response</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical and Chemical Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chlorophyll ‘a’</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Light Attenuation</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Dissolved Oxygen</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Temperature</td>
<td>M</td>
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<td>• Salinity</td>
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<td>• pH</td>
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<td></td>
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<tr>
<td><strong>Indicators</strong></td>
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<tr>
<td><strong>Management</strong></td>
<td></td>
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<tr>
<td><strong>Response</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Comments</strong></td>
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</tr>
</tbody>
</table>

The High Ecological Protection Area met the Environmental Quality Guidelines (guidelines-EQGs); however concentrations exceeded the guidelines at six of the thirteen sites in this Area.

Median light attenuation met the guidelines but was slightly elevated at two sites and exceeded guidelines.

All sites met the guidelines for temperature, salinity and pH (surface and bottom). Most sites met the guideline for dissolved oxygen however; two deep sites in the southern Sound and at Mangles Bay exceeded the guidelines on a number of occasions.

**Physical and Chemical Measures**

Chlorophyll ‘a’ as an indicator of phytoplankton biomass did not meet the guideline. High concentrations were monitored at Mangles Bay and two deeper sites in the Southern Sound.

All sites met the guidelines except at Mangles Bay and Garden Island Settlement which were labelled Red. Garden Island Settlement has been deteriorating for the last five years. It is believed that this is due to human and possibly environmental factors influencing this site. N.B. Mangles Bay has shown improvement this year.

All sites met the guidelines. No observed reductions in the seagrass depth limit were detected. Stability at the lower depth limit suggests that there has not been a regional decline in water clarity and light availability sufficient to cause a loss of seagrass meadows (Seagrass monitoring results and trends are currently being reviewed).

**Direct Biological Measures**

Chlorophyll ‘a’ as an indicator of phytoplankton biomass did not meet the guideline. High concentrations were monitored at Mangles Bay and two deeper sites in the Southern Sound.

All sites met the guidelines except at Mangles Bay and Garden Island Settlement which were labelled Red. Garden Island Settlement has been deteriorating for the last five years. It is believed that this is due to human and possibly environmental factors influencing this site. N.B. Mangles Bay has shown improvement this year.

All sites met the guidelines. No observed reductions in the seagrass depth limit were detected. Stability at the lower depth limit suggests that there has not been a regional decline in water clarity and light availability sufficient to cause a loss of seagrass meadows (Seagrass monitoring results and trends are currently being reviewed).

**Contaminants in Water**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Metals and Metalloids**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Non-metallic Inorganics**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Organics**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Pesticides**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Herbicides and Fungicides**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Surfactants**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Hydrocarbons**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Miscellaneous/Others**

No formal Contaminants in Water sampling occurred in 2009–10. 2008 sampling indicated that all sites met the guidelines or were below normal laboratory reporting limits.

**Imposex in Marine Snails**

No formal sampling for imposex in snails has been done by CSMC since 2005–06, but university studies (not published) have shown substantial reduction in imposex.

**Metals and Metalloids**

No formal sampling for imposex in snails has been done by CSMC since 2005–06, but university studies (not published) have shown substantial reduction in imposex.

**Organics**

No formal sampling for imposex in snails has been done by CSMC since 2005–06, but university studies (not published) have shown substantial reduction in imposex.

---


2. Limited sampling for imposex in snails occurred out of season (university studies 2007 & 2009). These studies indicated a continued decline in TBT contamination in Perth coastal waters as measured through the degree of imposex. However, a number of sites assessed (including Colpoys Point, Garden Island and Jervoise Bay harbours) still have relatively high levels of imposex, indicating that TBT contamination is still prevalent around industrial and naval harbours in the Sound. A significant reduction in imposex frequency was observed at Woodman Point. Sites at South Jervoise Bay and Colpoys Point have shown slight improvements since the 2005 and 2007 studies.
### Physical and Chemical Measures

- Chlorophyll ‘a’
- Light attenuation
- Dissolved Oxygen
- Temperature
- Salinity
- pH

#### Chlorophyll ‘a’
Met the guidelines; however concentrations were occasionally above guidelines at three of the seven sites in this Area.

#### Light attenuation
The median light attenuation coefficient met the guidelines.

#### Dissolved Oxygen, Temperature, Salinity, pH
All sites met the guidelines for dissolved oxygen, temperature, salinity and pH.

### Direct Biological Measures

- Phytoplankton Biomass (Activity)
  - Chlorophyll ‘a’
  - Seagrass
  - Shoot density
  - Depth limits

#### Phytoplankton Biomass (Activity)
All sites met the guidelines for Phytoplankton Biomass (activity).

#### Seagrass
Seagrass shoot density met the guidelines.

### Contaminants in Water

- Metals and Metalloids
  - Non-metallic inorganics
  - Organics
  - Pesticides
  - Herbicides and Fungicides
  - Surfactants
  - Hydrocarbons
  - Miscellaneous/Others

#### Metals and Metalloids
Concentrations met the guidelines or were below laboratory reporting limits.

#### Non-metallic inorganics

#### Organics

#### Pesticides

#### Herbicides and Fungicides

#### Surfactants

#### Hydrocarbons

#### Miscellaneous/Others

### Contaminants in Sediments

- Organometallics (e.g. TBT)
- Sediment

#### Organometallics
Limited sampling of contaminants in sediments (mainly around industrial and commercial jetties and terminals) met the guidelines. Results indicated that some samples had concentrations which exceeded the guidelines but median values were below the guidelines. Two sites around industrial ports exceeded the guidelines; while these sites were individually coded amber the overall code was green.

#### Sediment

### Imposex in Marine Snails (2006)

- No formal sampling for imposex in snails has been done by CSMC since 2005–06.²

#### Imposex in Marine Snails

### Metals and Metalloids

- Organics

#### Metals and Metalloids
The Moderate Ecological Protection Area met the guidelines. Two sites had elevated cadmium and copper sediment concentrations and one site had some elevated poly-aromatic hydrocarbons that exceeded guidelines.

---

² Limited sampling for imposex in snails occurred out of season (university studies 2007 & 2009). These studies indicated a continued decline in TBT contamination in Perth coastal waters as measured through the degree of imposex. However, a number of sites assessed (including Colpoys Point, Garden Island and Jervoise Bay harbours) still have relatively high levels of imposex, indicating that TBT contamination is still prevalent around industrial and naval harbours in the Sound. A significant reduction in imposex frequency was observed at Woodman Point. Sites at South Jervoise Bay and Colpoys Point have shown slight improvements since the 2005 and 2007 studies.
CONTAMINANTS IN SEDIMENT – Metals, Metalloids, Inorganics and TBT 2010

- Action required
- Investigate
- Monitor

COCKBURN SOUND

GARDEN ISLAND

Careening Bay

Southern Flats

Mangles Bay

Rockingham

Jervoise Bay

Figure 2
## Ecosystem Health in the Moderate Ecological Protection Area – Harbours (MEPAH – Jervoise Bay Harbours)

<table>
<thead>
<tr>
<th>Environmental Quality Indicators</th>
<th>Management Response</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical and Chemical Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chlorophyll ( \text{a}' )</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>• Light Attenuation</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>• Dissolved Oxygen</td>
<td>M</td>
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<tr>
<td>• Temperature</td>
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<tr>
<td>• Salinity</td>
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<td>• pH</td>
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<td></td>
</tr>
<tr>
<td><strong>Direct Biological Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phytoplankton Biomass (Activity)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Chlorophyll ( \text{a}' )</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Exceedance of a standard (high phytoplankton biomass) was registered again in Jervoise Bay Northern Harbour as it has every year since 2003. The median chlorophyll ( \text{a}' ) concentration exceeded the standards. No sampling occurred in the Southern Harbour in 2009–2010.</td>
<td></td>
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<tr>
<td><strong>Contaminants in Water</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals and Metalloids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-metallic Inorganics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Organics</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Pesticides</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Herbicides and Fungicides</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Surfactants</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Hydrocarbons</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Miscellaneous/Others</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>No sampling for Contaminants in Water was undertaken in these Areas this year. When tested last in 2008 contaminant levels met the guidelines.</td>
<td></td>
<td></td>
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<tr>
<td><strong>Contaminants in Sediments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organometallics (e.g. TBT)</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>TBT in Sediment</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Based on limited sampling, TBT concentrations for the Northern Harbour exceeded the guideline. Three out of four sites exceeded the guideline. Southern Harbour met the guideline except at one site, which exceeded the guideline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imposex in Marine Snails</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>No formal sampling for imposex in snails has been done by CSMC since 2005–06(^1).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals and Metalloids Organics</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>No sampling for organic contaminants in the Northern and Southern Harbours was undertaken this year.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)The CSMC did not receive any Physical/Chemical, Direct biological or Contaminants in Water monitoring data for the Southern Harbour in 2009–10 and older data is considered too old to reliably report upon. The last time monitoring for this data occurred was in 2008.
### Biological Contaminants

- Thermo-tolerant faecal coliform levels in water
- Thermo-tolerant faecal coliforms in seafood flesh
- Algal Biotoxins
  - Presence of potentially toxic algae above guideline levels (e.g. > 15,000 cells/mL)
  - Presence of algal bio-toxins in mussel flesh due to elevated levels of toxic algae

### Chemical Contaminants in seafood flesh

- Metals
- Organic Chemicals

<table>
<thead>
<tr>
<th>Environmental Quality Indicators</th>
<th>Management Response</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Thermo-tolerant faecal coliform levels in water</td>
<td>M</td>
<td>All sites except one (KGT1) met the guidelines.</td>
</tr>
<tr>
<td>• Thermo-tolerant faecal coliforms in seafood flesh</td>
<td>M</td>
<td>All sites met the guidelines.</td>
</tr>
<tr>
<td>• Algal Biotoxins</td>
<td>M</td>
<td>Levels of potentially toxic phytoplankton algae exceeded Environmental Quality Criteria and WASQAP guidelines in five Jervoise Bay Northern Harbour samples and one sample in Jervoise Bay Southern Harbour. However, the algae were not toxic. Shellfish are not commercially harvested from these areas and are not covered in the WASQAP program. However the WASQAP provides direction on how to interpret cell concentrations of potentially toxic species. Under WASQAP, commercially farmed mussels in Cockburn Sound are subject to strict quality assurance processes to protect public health, including routine water quality and mussel sampling. A watch-list of species known to be toxic to human health is maintained by WASQAP. These species, when tested in Cockburn Sound have not been found to be toxic. <em>The public need to be aware of the risk associated with the consumption of potentially contaminated seafood collected recreationally outside of areas monitored by WASQAP, particularly in Jervoise Bay or around any jetties, piers and port related facilities. These shellfish are unmonitored and their quality cannot be assured.</em></td>
</tr>
<tr>
<td>• Metals</td>
<td>M</td>
<td>All sites met the guidelines for cadmium, copper, lead, zinc and mercury levels in mussels. Some natural heavy metals were detected but well below food and safety guidelines.</td>
</tr>
<tr>
<td>• Organic Chemicals</td>
<td>M</td>
<td>All sites met the guidelines. No problems were identified for aquaculture in the monitoring data. All organic chemicals were below laboratory reporting limits or were well below food and safety guidelines.</td>
</tr>
</tbody>
</table>
SAFE SEAFOOD FOR EATING – THERMOTOLERANT COLIFORMS IN WATER 2010

Figure 4
### Clean Waters for Swimming and Boating

<table>
<thead>
<tr>
<th>Environmental Quality Indicators</th>
<th>Management Response</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bacterial Enterococci (swimming)</td>
<td>M</td>
<td>All sites met the guidelines. Beach sites have greatly improved for bacteria contamination over the last few years. Levels are lower than last year, particularly in the Rockingham region.</td>
</tr>
<tr>
<td>• Bacterial Enterococci (boating)</td>
<td>M</td>
<td>All sites met the guidelines.</td>
</tr>
<tr>
<td>• Toxic algae</td>
<td>M</td>
<td>All sites met the guidelines based on WASQAP sampling further off-shore. There were no reports of skin or eye irritation caused by toxic algae or algal poisoning by recreational users in 2009–10.</td>
</tr>
<tr>
<td><strong>Physical Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• pH</td>
<td>M</td>
<td>All sites met the pH guidelines. All sites except Mangles Bay and one Jervoise Bay Northern Harbour site met the guidelines; these individual sites were coded amber.</td>
</tr>
<tr>
<td>• Water clarity</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td><strong>Contaminants in Water</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Inorganic chemicals</td>
<td>M</td>
<td>All sites met the guidelines. The CSMC’s contaminants in water survey conducted in 2008 indicated a large majority of sites had concentrations below laboratory reporting limits including pesticides.</td>
</tr>
<tr>
<td>• Organic chemicals</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>• Pesticides</td>
<td>M</td>
<td></td>
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</tbody>
</table>
CLEAN WATERS FOR SWIMMING –
BACTERIAL ENTEROCOCCI 2010

Action required
● Investigate
★ Monitor

COCKBURN SOUND

GARDEN ISLAND

HIGH PROTECTION AREA

MANGLES BAY

SOUTHERN FLATS

CAREENING BAY

Jervoise Bay

Figure 5
# Protecting the Health of Aquaculture Species

<table>
<thead>
<tr>
<th>Environmental Quality Indicators</th>
<th>Management Response</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physico-Chemical Stressors</td>
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<td>All sites met the guidelines.</td>
</tr>
<tr>
<td>• Dissolved Oxygen</td>
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</tr>
<tr>
<td>• pH</td>
<td>M</td>
<td>All sites met the guidelines.</td>
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<tr>
<td>Contaminants in water</td>
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<td>All sites met the guidelines.</td>
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<tr>
<td>Metals and Metalloids</td>
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<td>All sites met the guidelines.</td>
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<td>Non-metalic inorganic chemicals</td>
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<td>All sites met the guidelines.</td>
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<tr>
<td>• Organic Chemicals</td>
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<td>All sites met the guidelines.</td>
</tr>
<tr>
<td>• Pesticides</td>
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<td>All sites met the guidelines.</td>
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<tr>
<th>Area</th>
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<th>2006</th>
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<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>Change</th>
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<td><strong>High Protection Area</strong></td>
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<td>I</td>
<td>I</td>
<td>M</td>
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<td>I</td>
<td>M</td>
<td>M</td>
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<tr>
<td></td>
<td>Dissolved Oxygen</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>I</td>
<td>M</td>
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<td></td>
<td>Seagrass Shoot Density</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>I</td>
<td>I</td>
<td>↔</td>
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<tr>
<td></td>
<td>Safe Seafood for Eating (Presence of potentially toxic algae)</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>I</td>
<td>M</td>
<td>↑</td>
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<td></td>
<td>Clean Waters for Swimming – Potentially toxic algae Primary Contact</td>
<td>M</td>
<td>M</td>
<td>A</td>
<td>A</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
<td>↑</td>
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<tr>
<td></td>
<td>Clean Waters for Swimming – <em>Enterococcus</em> Primary Contact</td>
<td>M</td>
<td>M</td>
<td>A</td>
<td>A</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
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<td>Imposex – TBT (All areas)</td>
<td>NA</td>
<td>NA</td>
<td>N/A</td>
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<td><strong>Moderate Protection Area</strong></td>
<td>TBT Sediment</td>
<td>A</td>
<td>I</td>
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<td>I</td>
<td>M</td>
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<td>NA</td>
<td>NA</td>
<td>I</td>
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<tr>
<td>(Moderate)</td>
<td>Chlorophyll ‘a’</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<td>↔</td>
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<tr>
<td></td>
<td>TBT Sediment</td>
<td>A</td>
<td>I</td>
<td>I</td>
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<td>I</td>
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<td>I</td>
<td>I</td>
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<tr>
<td><strong>Southern Harbour</strong></td>
<td>TBT Sediment</td>
<td>A</td>
<td>I</td>
<td>I</td>
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<td>I</td>
<td>I</td>
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Table 1
Figure 7 Median summer chlorophyll a concentrations in Cockburn Sound. (For 1986 n = 32; 1983, 1985 and 1987 to 1998 n = 112; 1999 to 2002 n = 136; 2003 and 2004 n = 144; 2005, 2006, 2009 and 2010 n = 128; 2007, and 2008 n = 120). The red line represents the high protection environmental quality guideline (EQG) of 0.8 μg/L for chlorophyll a in Cockburn Sound.

Figure 9 Median dissolved oxygen in the surface (S) and bottom (B) water at the 20 sampling sites from December 2009 to March 2010 (site locations in Figure 1). Note that the surface water results of the sites are grouped according to location (pale blue = middle of Cockburn Sound; dark blue = shoreline; purple = Garden Island; and pink = Warnbro Sound).

Table 2 Percentage of occasions where Phytoplankton Biomass as measured by chlorophyll ‘a’ concentrations exceeded EQC values over the last six years’ summer monitoring (2005 to 2010). Numbers which exceed EQC values (EPA 2005) are shown in bold.

<table>
<thead>
<tr>
<th>Site</th>
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<th>Percentage of occasions (%)</th>
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<tr>
<td></td>
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<td>2005</td>
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<tr>
<td>CS4</td>
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<td>0</td>
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<td>CS5</td>
<td>high</td>
<td>0</td>
</tr>
<tr>
<td>CS8</td>
<td>high</td>
<td>6</td>
</tr>
<tr>
<td>G2</td>
<td>high</td>
<td>0</td>
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<td>G3</td>
<td>high</td>
<td>0</td>
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<tr>
<td>SF</td>
<td>high</td>
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<tr>
<td>CB</td>
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<tr>
<td>CS11</td>
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<td>19</td>
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<td>CS13</td>
<td>high</td>
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<tr>
<td>MB</td>
<td>high</td>
<td></td>
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<tr>
<td>CS6A</td>
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<td>CS7</td>
<td>moderate</td>
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<td>CS12</td>
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<td>G1</td>
<td>moderate</td>
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A major priority for the CSMC will be to address the recommendations made in the Auditor General’s report (released in September 2010) in collaboration with the DEC and EPA. Action relating to the OAG report is likely to include assessing and improving methods of monitoring and reporting on seagrass health, acquiring robust estimates of contaminant input loads, refining environmental risk assessments and re-directing monitoring to address those risks, and, most importantly, addressing issues associated with implementation of the SEP. In some cases work will be referred to the appropriate bodies for assistance. As part of the response to the OAG report, the review of the SEP (2005) has been moved forward one year to 2011, instead of 2012 when the SEP was scheduled for review in the EPA’s normal seven year review of policy cycles.

The process of addressing the Auditor General’s recommendations will complement the CSMC’s Strategic Plan 2010–2015 and Environmental Management Plan 2005 (EMP). The CSMC will continue to seek practical ways of achieving positive outcomes for the five strategies in the Strategic Plan. In this context, the CSMC will continue to develop relevant research projects, such as those that can be funded by the Australian Research Council, industry or State Government, as well as smaller university-associated projects. Ongoing research is critical to improving our state of knowledge of the system and its environmental management.

The CSMC also intends to continue to develop a Database Management System (DBMS). This is a priority because the amount of data that it now holds must be organised and made easily accessible to allow for more efficient reporting and availability to the public and other research institutions. While much of the CSMC’s data is public information it is not readily available to the public in its current form and is at risk of being lost through staffing changes and consequent loss of institutional memory. Strategies to complete development of a simple but efficient DBMS will be pursued in 2011.

Similarly, to more effectively communicate with the public and enhance the visibility of its commitment and effectiveness in coordinating the management and protection of Cockburn Sound, the CSMC plans to update and improve its web site and develop other social media tools such as a Facebook, as well as having interesting and engaging window displays. Because the CSMC is centrally located by the Sound in Rockingham Beach, large numbers of the public view and read information posted in the windows. This provides an excellent opportunity to educate and inform the community about Cockburn Sound, its multiple uses and its very sensitive marine environment.

Once insurance issues are clarified the CSMC will be actively progressing its sea sculpture and eco-signage projects since they provide a simple and attractive way to influence people’s understanding and appreciation of Cockburn Sound’s ecology and environment.

The CSMC will be active in seeking to improve knowledge of Cockburn Sound’s environment. The CSMC will try to develop or assist with collaborative initiatives that can address a range of critical research needs. Questions to pursue include the status of critical nutrient and carbon processes in Cockburn Sound, and issues regarding its food chain and animal and plant productivity in relation to fishing or food for fish, penguins and dolphins. Questions such as these need to be addressed in the context of increased urban development, fishing and industrial developments in the Sound and its catchment.
A detailed report outlining the monitoring programs undertaken in Cockburn Sound is available from <http://csmc.environment.wa.gov.au>. The following is a list of the programs undertaken in 2010 including the parameters they measure. Programs denoted with an asterisk contribute data for the Cockburn Sound Environmental Report Cards. A total of seven monitoring programs were accessed this year to produce the 2010 Report Cards.

Cockburn and Warnbro Sounds Water Quality Monitoring Program*

This program is coordinated by the CSMC and receives financial assistance from the KIC and DoD.

Objective: to coordinate monitoring and reporting under the SEP and implement the EMP.

Parameters measured

Water: temperature, salinity, dissolved oxygen, light attenuation, Secchi depth, pH, total nitrogen, total phosphorus, ammonia, nitrate-nitrite, phosphate (FRP), chlorophyll \(a\), total suspended solids (for 6 weeks).

Phytoplankton: species present but samples are stockpiled and stored. No analyses are undertaken.

Jervoise Bay Northern and Southern Harbour Monitoring Program*

This program is coordinated and funded by LandCorp.

Objective: to fulfil Ministerial Conditions and environmental approvals for the construction of Southern Harbour. The program also meets requirements under the Operation Environmental Management Plan for Southern Harbour.

Parameters measured

Water: temperature, salinity, dissolved oxygen, Secchi depth, light attenuation coefficient, total nitrogen, ammonium, nitrate-nitrite, total phosphorus, ortho phosphate, chlorophyll \(a, b\) and \(c\).

Sediment: heavy metals (As, Cd, Co, Cr, Cu, Pb, Hg, Ni, Sn and Zn), total Kjeldahl nitrogen, total phosphorus, total organic carbon, butyl-tin compounds (Mono-MBT, Di-DBT and Tri-TBT), polycyclic aromatic hydrocarbons (PAH).

Sentinel mussels: Ag, As, Cd, Cr, Cu, Pb, Hg, Ni and Zn. Mussels were taken but are not measured now.

Phytoplankton: species present.

Fremantle Ports Marine Quality Monitoring Program*

This program is coordinated and funded by Fremantle Ports.

Objectives: to determine whether water and sediment quality monitoring meets the Environmental Quality Criteria set out in the State Environmental (Cockburn Sound) Policy 2005. Further objectives are to monitor the overall health of those areas of the port that are at risk of being adversely affected by port-related activities and to monitor specific areas of environmental concern associated with historical activities, in order to identify possible requirements for management responses.

Parameters measured

Water: temperature, salinity, conductivity, dissolved oxygen, pH, Secchi depth, total suspended solids, total nitrogen, total phosphorus, ammonium, nitrate-nitrite, free reactive phosphorus, dissolved organic carbon, alkalinity, chlorophyll \(a, b\) and \(c\) and phaeophytin, dissolved copper.

Sediment: total nitrogen, nitrate, nitrite, total phosphorus, total organic carbon, heavy metals (As, Cd, Cr, Cu, Pb, Hg, and Zn), organotins (TBT, DBT, MBT), polycyclic aromatic hydrocarbons (PAH).

Mussels: metals (As, Cd, Cr, Cu, Pb, Hg, and Zn), organotins (TBT, DBT and MBT), polycyclic aromatic hydrocarbons (PAH).

Annual Survey of Selected Seagrass Meadows in the Fremantle–Warnbro Sound Region*

This program is coordinated and funded by the CSMC with assistance from the OEPA in conjunction with the University of Western Australia (UWA).
**Objective:** to monitor and report on seagrass health under the SEP.

**Parameters measured**

**Seagrass:** dominant seagrass species, epiphyte characteristics, rhizome mat, colonising species, videography, seagrass shoot density; seagrass shoot height, seagrass species, depth.

**Environmental Waters Microbiological Monitoring Program**

This program is coordinated and funded by the DoH.

**Objectives:** to undertake water quality monitoring in recreational areas within Cockburn Sound to establish the degree of microbiological contamination; to identify trends in the microbiological quality of recreational waters within Cockburn Sound and to provide advice to the public on microbial water quality.

**Parameters measured**

**Bacteria:** Bacterial Enterococci (confirmed).

**City of Cockburn Microbiological Monitoring Program**

This program is coordinated and funded by the CoC.

**Objectives:** to monitor the recreational water quality of Jervoise Bay and ensure compliance with the ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters 1992; to identify trends in the microbial water quality of recreational waters within Cockburn Sound and provide advice to the public on microbial water quality.

**Parameters measured**

**Bacteria:** Thermo-tolerant coliforms (presumptive), Enterococci (confirmed).

**City of Rockingham Microbiological Monitoring Program**

This program is coordinated and funded by the CoR.

**Objectives:** to undertake water quality monitoring in recreational waters within Cockburn Sound to establish the degree of contamination and identify trends in microbial quality; advise stakeholders on microbial water quality and gather data to assist decision making on initiatives to improve coastal waters for users.

**Parameters measured**

**Bacteria:** Bacterial Enterococci (confirmed).

**Defence Microbiological Monitoring Program**

This program is coordinated and funded by the DoD in conjunction with the DoH.

**Objectives:** to safeguard people who come into frequent and direct contact with the water during activities such as swimming.

**Parameters measured**

**Bacteria:** Thermo-tolerant coliforms (presumptive), bacterial Enterococci (confirmed).

**Parameters measured**

**Mussel flesh:** TBT, heavy metals (Cu, Zn, As, Cd, Pb, Hg, Sn).

**Owen Anchorage Water Quality Monitoring Program**

This program is coordinated and funded by the CSMC. In previous years it was funded by Cockburn Cement.

**Objective:** to coordinate monitoring under the SEP and implement the EMP, in general.

**Water:** temperature, salinity, dissolved oxygen, light attenuation, Secchi depth, pH, total nitrogen, total phosphorus, ammonia, nitrate-nitrite, phosphate (FRP), chlorophyll ‘$a$’, total suspended solids (for 4 weeks).

**Perth Seawater Desalination Plant Water Quality Monitoring Program**

This program is coordinated and funded by the Water Corporation.

**Objective:** to fulfil Ministerial Conditions set to ensure protection of the water quality of Cockburn Sound, and to ensure that the discharge complies with the requirements of the SEP and the EQC Reference Document (Cockburn Sound).
**Parameters measured**

**Water:** turbidity, total suspended solids, salinity, total dissolved solids, dissolved oxygen, pH, temperature, light attenuation, Secchi depth, total nitrogen, nitrate, nitrite, ammonia, total phosphorus, ortho-phosphate, total organic carbon, metals (Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Mo, Hg, Ni, Se, V, Zn) chlorophyll ‘a’, phaeophytin, phytoplankton species, fluorescence.

**Sediments:** Metals: (Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Mo, Hg, Ni, Se, V, Zn)

**Phytoplankton:** species, fluorescence.

**Sediment habitat:** habitat and benthos, species number, abundance of macrofauna.

**Meteorological observations:** wind (direction and speed), water levels (hourly intervals), estimated Swan River out-flow data.

**Brine:** toxicity testing (done once in 2006).

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**Defence Annual Survey of Selected Seagrass Meadows on the eastern shore of Garden Island***

This program is coordinated and funded by the DoD in conjunction with Edith Cowan University (ECU).

**Objective:** to monitor seagrass health in Department of Defence controlled waters under the SEP.

**Parameters measured**

**Seagrass:** dominant seagrass species, epiphyte characteristics, rhizome mat, colonising species, videography, seagrass shoot density, seagrass species, depth.

**Western Australian Shellfish Quality Assurance Program***

This program was coordinated and funded by the DoF and the DoH together with the WAMPA.

**Objective:** to ensure compliance with the WASQAP for the commercial harvest of aqua cultured bivalve molluscs.

**Parameters measured**

Phytoplankton in water and algal biotoxins: species present and presence of toxin.

**Mussel flesh:** algal biotoxins, *E.coli*, salmonella, inorganic arsenic, copper, zinc, cadmium, lead, mercury, organochlorine, organophosphate, pesticides, polychlorinated biphenyls.

**Water:** total coliforms, thermo-tolerant coliforms, *E. coli*. 

---

Bird, Matthew, *Assessment of Thais orbita as a biological indicator of tributyltin (TBT) contamination in Perth metropolitan waters*, Curtin University of Technology, 2007


Cockburn Sound Management Council (2005). *State Environmental (Cockburn Sound) Policy 2005*

Cockburn Sound Management Council (2005)

*Environmental Management Plan for Cockburn Sound and its Catchment*. Rockingham, Western Australia

Department of Fisheries Annual Report to the Parliament 2009/10 (2010)

Klau, K. Photo-Coffee Rockingham, Professional photographs


Western Australian Auditor General’s Report *Environmental Management of Cockburn Sound Report 8, September 2010*

CBH Terminal with Kwinana Industries in the backdrop
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<td>Australian Marine Complex (Henderson)</td>
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<tr>
<td>CoC</td>
<td>City of Cockburn</td>
</tr>
<tr>
<td>CoR</td>
<td>City of Rockingham</td>
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<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<td>Maritime Zone boundaries software based on MARXAN zonation package for marine multiple use planning</td>
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<td>Tributyltin (a common ingredient in anti-fouling paint pre 1992 recreational vessels/ 2003 in commercial vessels)</td>
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<td>Guy Watson</td>
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<td>Leon Brouwer</td>
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Table 2 - 2010 CSMC Shopfront - Customer Inquiries - Summary of Issues

- Port Rockingham Marina
- Public Environmental Review
- Blue Swimmer Crab fishing ban
- SIMP
- Mangles Bay Marina
- Penguin Island/brochures
- Mooring control and gazettal
- Mangles Bay swimming safety
- Dead starfish washed up on beach
- Palm Beach Jetty
- Algal blooms
- Magpies
- Crows in Nursing Home
- Wasps in Foreshore Park
- Seagrass at dog beach
- Sub-Antarctic Fur Seals
- Snakes/removal
- Wounded baby seal at Palm Beach Jetty
- Pink Snapper
- Fishing
- Bag limits
- Cockburn Sound
- Garden Island
- TBT
- Silver Gull deaths
- CBH drain discharges
- Boats on beaches and adrift
- Oil spills from moored and anchored boats
- Dolphin mortalities
- Seagrass anchor damage
- Little Penguin boat strikes
- Foreshore car parking and storm damage
- Palm Beach Jetty redevelopment
- Palm Beach boat ramps
- Foreshore rehabilitation and weed control

Kwinana Industry looking south-east from the shore of Cockburn Sound
COCKBURN SOUND MANAGEMENT COUNCIL

Shop 1, 15 Railway Terrace
Rockingham Beach WA 6168

PO Box 5161
Rockingham Beach WA 6969

Telephone: (08) 9591 3837
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