



Cattle Bay Marina

Water Quality Management Plan



FINAL REPORT

Prepared on behalf of Eden Resort Hotel Pty Ltd.

31 March 2015

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SUMMARY

Ocean Environmental was engaged by Eden Resort Hotel Pty Ltd to undertake a water quality impact assessment and prepare a Water Quality Management Plan in relation to the proposed development of a marina at Cattle Bay, Eden, New South Wales.

The current study includes:

1. A review of existing background marine water quality data for the site.
2. Identification of the potential water quality impacts associated with the construction and operation of the marina.
3. Discussion of the management / mitigation measures which could be put in place to reduce or avoid these impacts.
4. Suggestions for baseline, during construction and post-construction water quality monitoring.



CONTENTS

| | | |
|-----|---|----|
| 1. | PROJECT BACKGROUND | 5 |
| 1.1 | Project Background | 5 |
| 1.2 | Proposed Development | 6 |
| 1.3 | Study Location | 7 |
| 1.4 | Scope of Works | 8 |
| 2. | BACKGROUND WATER QUALITY DATA | 9 |
| 2.1 | NSW Food Authority – NSW Shellfish Program | 9 |
| 2.2 | NSW Office of Environment and Heritage - Beachwatch Data | 11 |
| 2.3 | Australian National University, Dean L. Honours Thesis (2011) | 13 |
| 3. | POTENTIAL WATER QUALITY IMPACTS | 15 |
| 3.1 | Construction Phase Impacts | 15 |
| 3.2 | Operation Phase Impacts | 16 |
| 4. | WATER QUALITY MANAGEMENT / MITIGATION MEASURES..... | 20 |
| 4.1 | Construction Phase Mitigation..... | 20 |
| 4.2 | Operation Phase Mitigation | 21 |
| 4.3 | Mitigation Relating to Aquaculture Facilities | 21 |
| 5. | PROPOSED WATER QUALITY SAMPLING PROGRAM | 23 |
| 5.1 | Baseline and Post-Construction Water Quality Monitoring | 23 |
| 5.2 | During Construction Monitoring..... | 25 |
| 6. | REFERENCES..... | 26 |

FIGURES

| | | |
|------------|---|----|
| Figure 1.1 | Location and layout of proposed marina (Haskoning Australia 2013)..... | 6 |
| Figure 1.2 | Location of Eden and Twofold Bay in relation to the NSW coastline. | 7 |
| Figure 1.3 | Location of Cattle Bay, Eden..... | 8 |
| Figure 2.1 | Water quality sampling sites..... | 9 |
| Figure 2.2 | Temperature data for Snug Cove..... | 10 |
| Figure 2.3 | Salinity data for Snug Cove..... | 10 |



| | |
|---|----|
| Figure 2.4 Faecal coliforms data for Snug Cove..... | 11 |
| Figure 2.5 Microbial (enterococci) data from Cocora Beach 2009 - 2014. | 12 |
| Figure 2.6 Trends in microbial (enterococci) data through time. | 13 |
| Figure 2.7 Response of microbial (enterococci) levels to rainfall. | 13 |
| Figure 5.1 Proposed water quality sampling sites. | 23 |

TABLES

| | |
|---|----|
| Table 2.1 Physicochemical water quality data for Snug Cove / Cattle Bay..... | 14 |
| Table 3.1 Potential construction water quality impacts..... | 15 |
| Table 3.2 Potential operational water quality impacts. | 17 |
| Table 5.1 Proposed water quality parameters for baseline and post-construction sampling. | 24 |

Appendices

APPENDIX 1 – Phytoplankton Data

APPENDIX 2 – Environmental Action for Marinas, Boatsheds and Slipways (DECC 2007)

APPENDIX 3 – Best Practice for Marinas and Boat Repair Facilities (EPA 1999)



1. PROJECT BACKGROUND

1.1 Project Background

Eden Resort Hotel Pty Ltd has proposed the construction of a 154 berth floating marina in Cattle Bay, Eden, New South Wales (NSW). In 2013, Inspire Urban Design & Planning and Haskoning Australia (a company of Royal Haskoning DHV) prepared an Environmental Impact Assessment (EIA) under Part 4 of the *Environmental Planning & Assessment Act (EP&A Act 1979)* on behalf of Eden Resort Hotel Pty Ltd. for the proposed development. This was submitted to Bega Valley Shire Council for consideration.

In January 2015 responses to the submission were received from a number of government agencies. In relation to water quality the following comments were received from the NSW Environment Protection Authority (NSW EPA):

- *"No information has been included on the water quality of the receiving waters where the marina will be constructed. Water quality testing is important to establish a baseline by which water quality objectives can be determined. An understanding of the water quality of the receiving waters is essential for predicting and assessing impacts to waters including the quantity and physico-chemical properties of all potential water pollutants and the risks posed to the environment and human health, including the risk to the Water Quality Objectives in the ambient waters using criteria set out in ANZECC (2000)."*
- *"The environmental assessment should fully assess the potential water quality impact due to the construction of the marina (including sediment, erosion and stormwater controls and installation techniques to mitigate impacts and to ensure construction operations do not pollute waters)."*
- *"The impacts of any specific activities involved in site preparation during the construction phase should be identified and mitigation measures put in place."*
- *"The EIA raises the issue of water pollution from copper ablation and propeller wash disturbing sediments on the seabed. More detail should be included regarding this potential impact in light of ambient water quality information."*

The operators of Two Fold Bay Mussel Farm also expressed concerns regarding water quality including:

- Increased turbidity levels causing them to fail to meet Food Authority standards for sale on an unacceptable number of occasions and increasing the chances of pea crab infestation,
- pollution due to spillages of fuel or sewage and bilge water, and
- impacts of other contaminants including PAHs, TBT and heavy metals.

1.2 Proposed Development

The proposed marina at Cattle Bay is to include the following features:

- Repair and refurbishment of the existing fish cannery wharf.
- A 154 berth floating marina south of the cannery wharf with three marina arms orientated approximately south-east towards Snug Cove and a northern arm extending along the eastern side of the cannery wharf.
- Berthing for 63 x 12 m vessels, 65 x 15 m vessels and 26 x 18 m vessels with temporary berthing for 2 – 3 visiting super yachts and for other vessel pickup and set down needs.
- A wave attenuator to protect the marina from prevailing local seas from the SSW and from refracted ocean swell - this will be a fixed, non-floating structure, approximately 230 m long with a 'cranked' or 'kinked' alignment to avoid impacts on Cocora Beach due to reflections of swell waves off the attenuator. The wave attenuator will comprise a series of raked and vertical piles that support precast concrete panels held off the seabed but with sufficient distance below the water level to provide the required wave attenuation.
- Fixed utilities (i.e. power, communications, fire-fighting and potable water) and the provision of a mobile sewage pump out unit.
- The marina layout provides channel widths >25 m between the eastern ends of the marina and the -2 m ISLW contour offshore from the mainland (Figure 1.1).

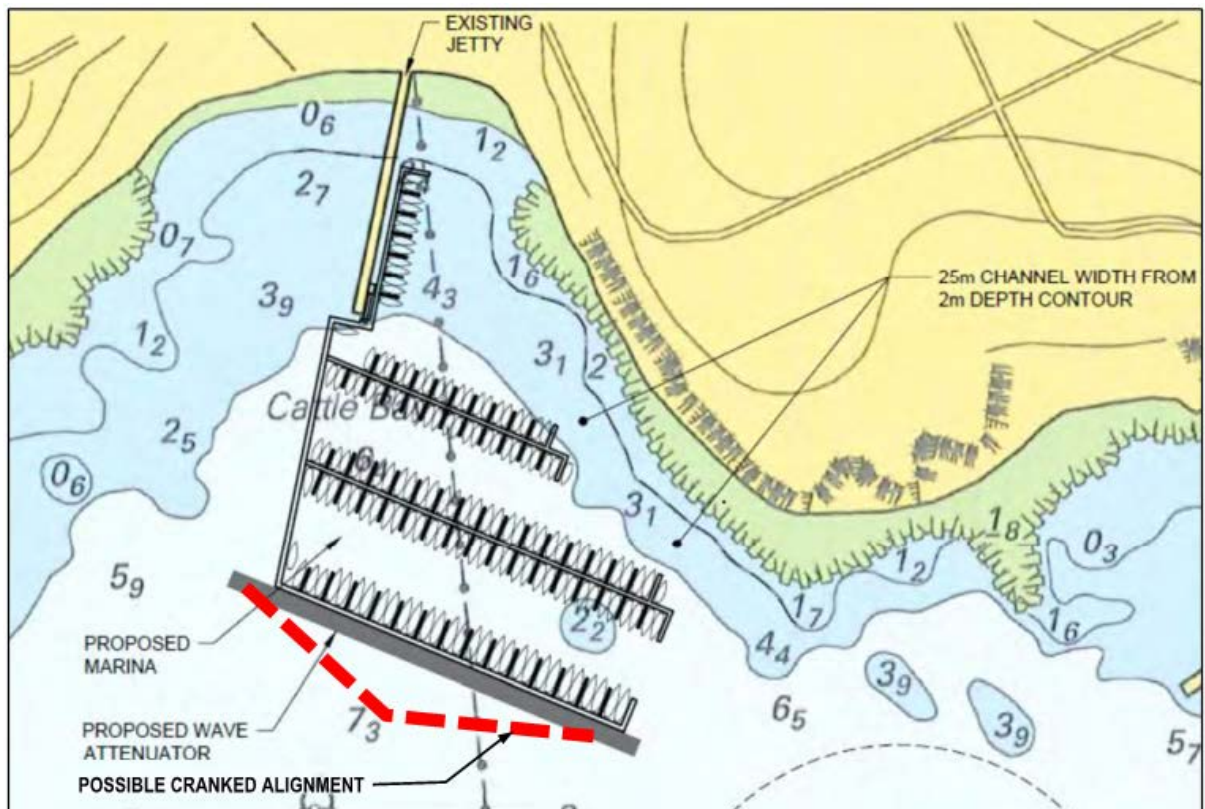


Figure 1.1 Location and layout of proposed marina (Royal Haskoning DHV 2015).



1.3 Study Location

Eden is a small coastal town located on the shore of Twofold Bay, on the far South Coast of NSW (Figure 1.2). Twofold Bay is the southern-most of five oceanic bays on the NSW coast. The region is known for its fishing and coastal trading and has a strong maritime heritage including recreational and commercial boating. The proposed Cattle Bay marina is located in Cattle Bay, within Snug Cove, Eden. Snug Cove and Cattle Bay are both located within Twofold Bay (Figure 1.3).

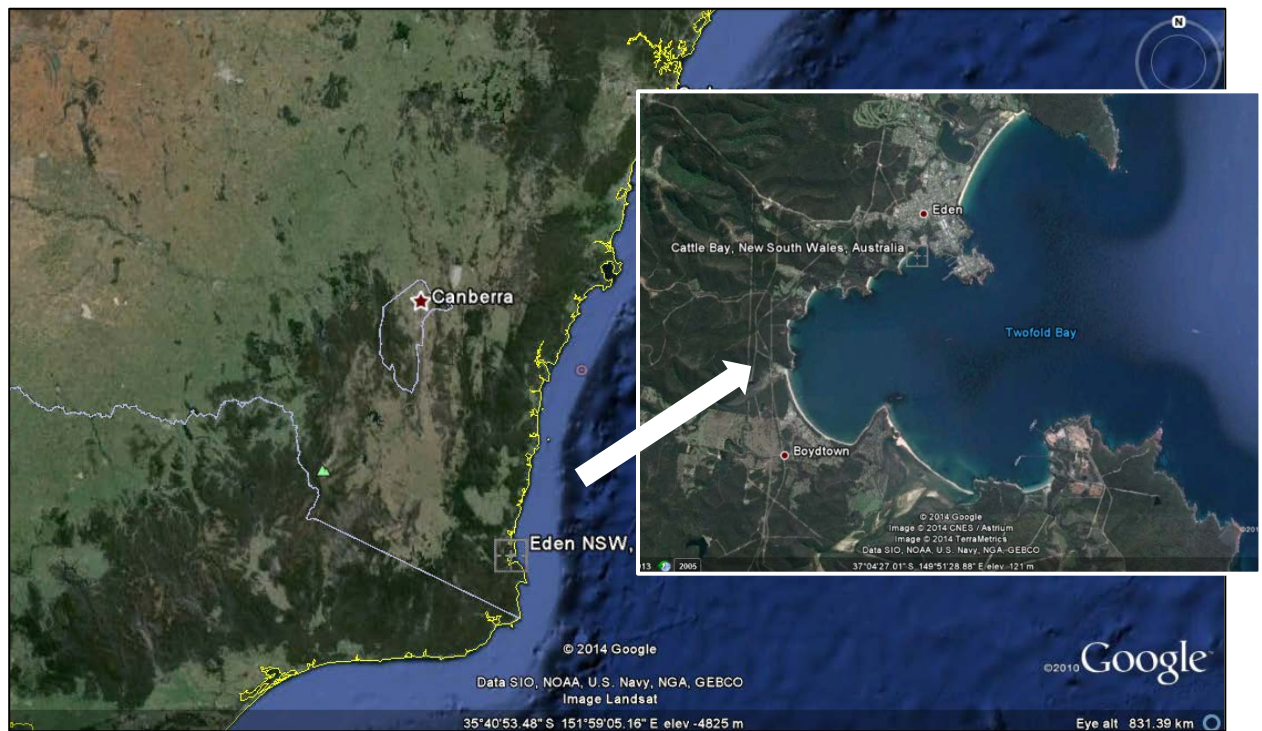


Figure 1.2 Location of Eden and Twofold Bay in relation to the NSW coastline.



Figure 1.3 Location of Cattle Bay, Eden.

1.4 Scope of Works

This document provides information regarding available background water quality data in Twofold Bay (in particular Snug Cove and / or Cattle Bay), an assessment of potential water quality impacts during construction and operation phases, mitigation and / or management measures to reduce these impacts and an outline for a water quality monitoring program for the site.



2. BACKGROUND WATER QUALITY DATA

There is little available background water quality data for Twofold Bay, in particular for Snug Cove and / or Cattle Bay. Data which could be sourced for the Cattle Bay area included temperature, salinity, dissolved oxygen, pH, electrical conductivity, faecal coliforms and enterococci. This data was collected as part of the NSW Food Authority NSW Shellfish Program, the NSW Office of Environment and Heritage (OEH) Beachwatch Program and a PhD thesis. A summary of this water quality data is provided in the following sections.

2.1 NSW Food Authority – NSW Shellfish Program

All oysters and mussels produced in NSW are harvested in accordance with the NSW Shellfish Program, which has adopted the Australian Shellfish Quality Assurance Program (ASQAP) as a minimum standard. Regular water quality monitoring of temperature, salinity, faecal coliforms and phytoplankton is undertaken for the mussel aquaculture facilities in Twofold Bay (Figure 2.1).

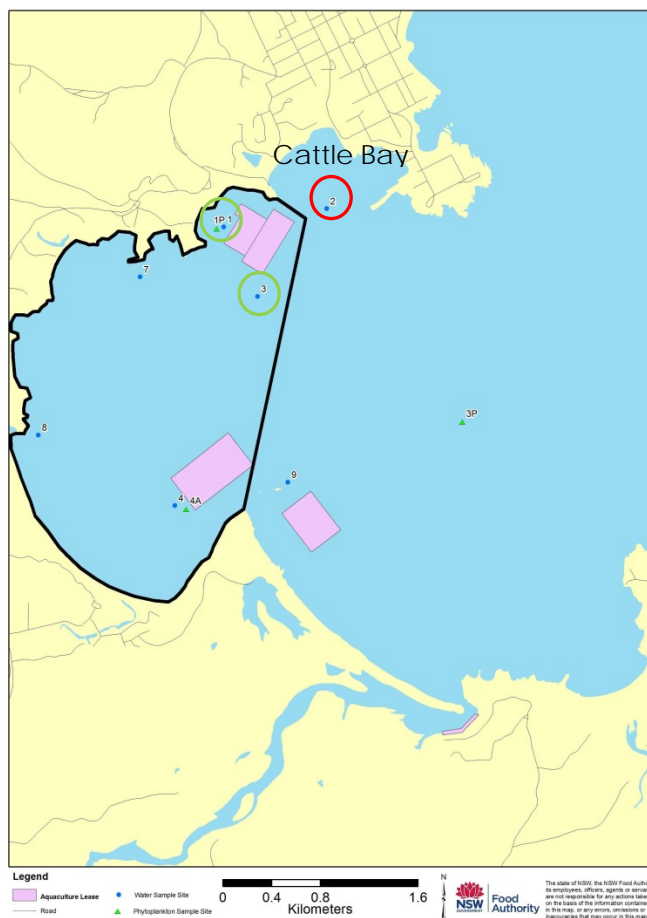


Figure 2.1 Water quality sampling sites.



Temperature, salinity and faecal coliforms data collected between February 2010 and January 2015 was provided by the NSW Food Authority. Data for Site 2, which is located in Snug Cove and circled in red in Figure 2.1, was analysed and is displayed in scatterplots below.

Water temperature ranged from 13°C to 20°C with the highest values recorded between December and February and the lowest values in June and September. The average water temperature was 18 °C and median water temperature was 17°C (Figure 2.2).

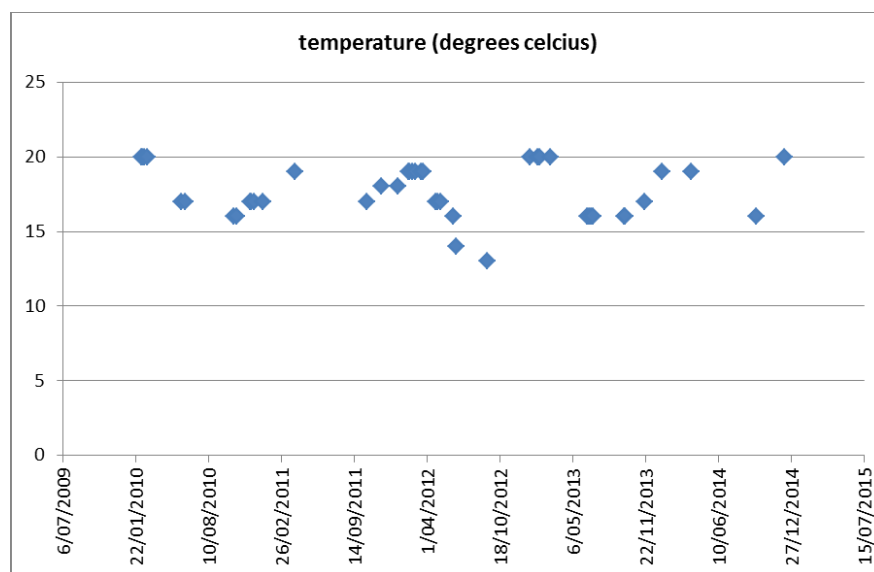


Figure 2.2 Temperature data for Snug Cove.

Salinity values in Snug Cove ranged from 33.5 ppt (in September 2012) to 39.3 ppt (in March 2013). Average salinity was 34.8 ppt and median salinity was 34.6 ppt (Figure 2.3).

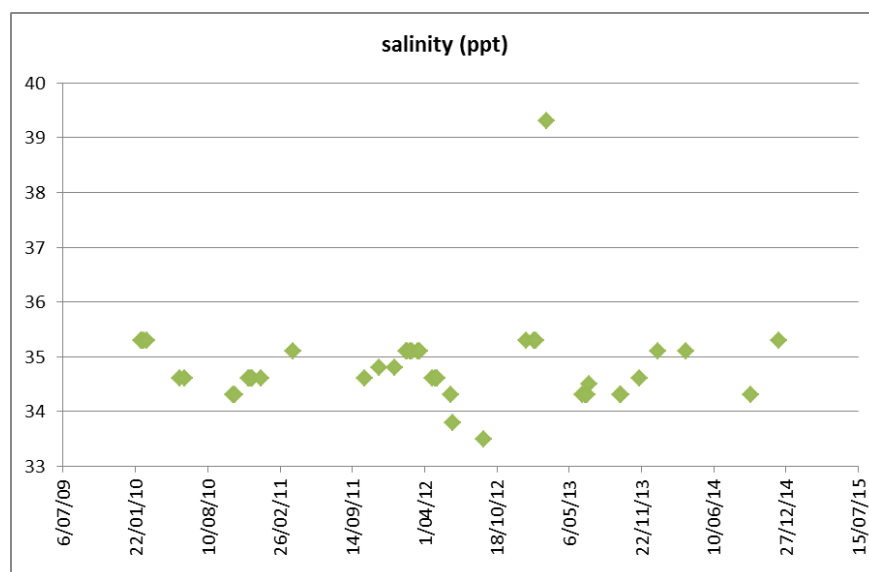


Figure 2.3 Salinity data for Snug Cove.



Faecal coliforms levels were generally low with 83% of values below 10 cfu/100ml and 70% of values below 2 cfu/100ml. Three unusually high values of 54, 150 and 201 cfu/100ml were recorded over the sampling period and are considered to be outliers (Figure 2.4). The average faecal coliforms value for the sampling period was 12.4 cfu/100ml and when the three outliers were removed the average was just 3.9 cfu/100ml. The median faecal coliforms value was 1.99 cfu/100ml both with and without the outliers removed from the dataset.

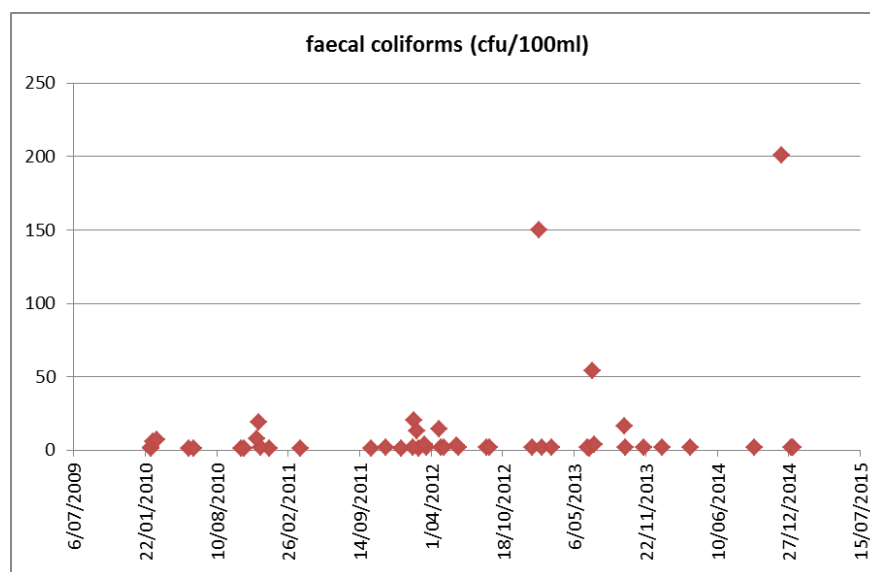


Figure 2.4 Faecal coliforms data for Snug Cove.

Phytoplankton data for Twofold Bay is also collected as part of the NSW Shellfish Program in order to “scan for harmful, nuisance and related phytoplankton species”. Data is collected and analysed by Microalgal Services. Data (2012-14) from Site 1 and 3 which are circled in green in Figure 2.1 is provided in **Appendix 1**.

2.2 NSW Office of Environment and Heritage - Beachwatch Data

The water quality of NSW beaches and other swimming locations is monitored under the NSW Government’s Beachwatch program. Routine microbial assessment (of enterococci) at NSW swimming beaches is undertaken regularly. Microbial assessment measures the impact of pollution sources, enables the effectiveness of stormwater and wastewater management practices to be assessed and highlights areas where further work is needed. Swimming sites are graded as Very Good, Good, Fair, Poor or Very Poor in accordance with the National Health and Medical Research Council’s 2008 Guidelines for Managing Risks in Recreational Waters. Grades are determined from the most recent 100 water quality results (two to four years’ worth of data) and a risk assessment of potential pollution sources.

There are four Microbial Assessment Categories (A to D) and these are determined from the 95th percentile of an enterococci dataset of at least 100 data points. Each category is associated with a risk of illness determined from epidemiological studies. The risks of illness



shown below are not those associated with a single data point but are the overall risk of illness associated with an enterococci dataset with that 95th percentile (Wyer et al. 1999).

| Category | Enterococci (cfu/100mL) | Illness risk* |
|----------|-------------------------|--|
| A | ≤40 | GI illness risk: <1% AFR illness risk: <0.3% |
| B | 41–200 | GI illness risk: <1–5% AFR illness risk: <0.3–1.9% |
| C | 201–500 | GI illness risk: <5–10% AFR illness risk: <1.9–3.9% |
| D | >500 | GI illness risk: >10% AFR illness risk: >3.9% |

* GI = gastrointestinal; AFR = acute fever and rash

The NSW OEH State of the Beaches Report 2013-14 for South Coast NSW was referred to for information relating to Cocora Beach, located in Snug Cove, immediately southwest of Cattle Bay. Cocora Beach has been monitored since 2009. Enterococci data from 2009 - 2014 is shown in Figure 2.5. Trends in enterococci data through time are shown in Figure 2.6. Higher levels of enterococci have been reported in more recent years (i.e. 2012 - 2014). The response to rainfall graph (Figure 2.7) indicates that enterococci levels increased slightly with increasing rainfall but mostly remained below the safe swimming limits (i.e. the Category B illness risk shown above).

Cocora Beach has been given a Suitability Grade of Good in the 2013-14 State of the Beaches Report. This indicates that the microbial water quality is considered suitable for swimming most of the time, but the water may be susceptible to pollution from several potential sources of faecal contamination, including outflow from Cocora Lagoon.

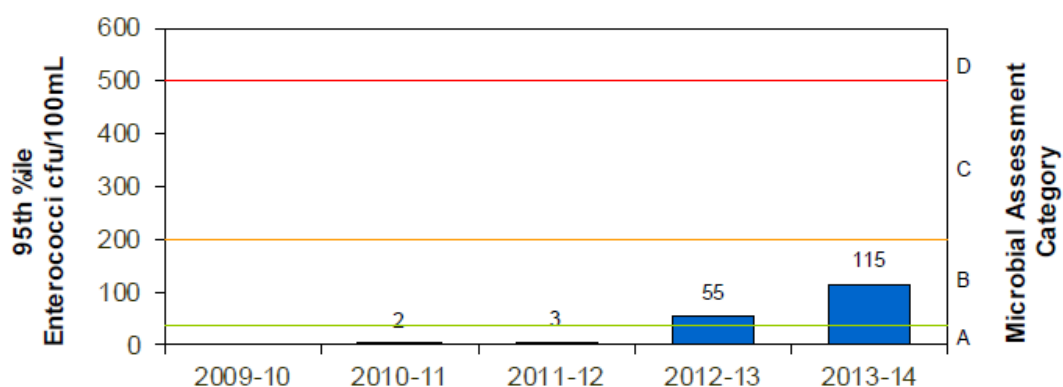


Figure 2.5 Microbial (enterococci) data from Cocora Beach 2009 - 2014.

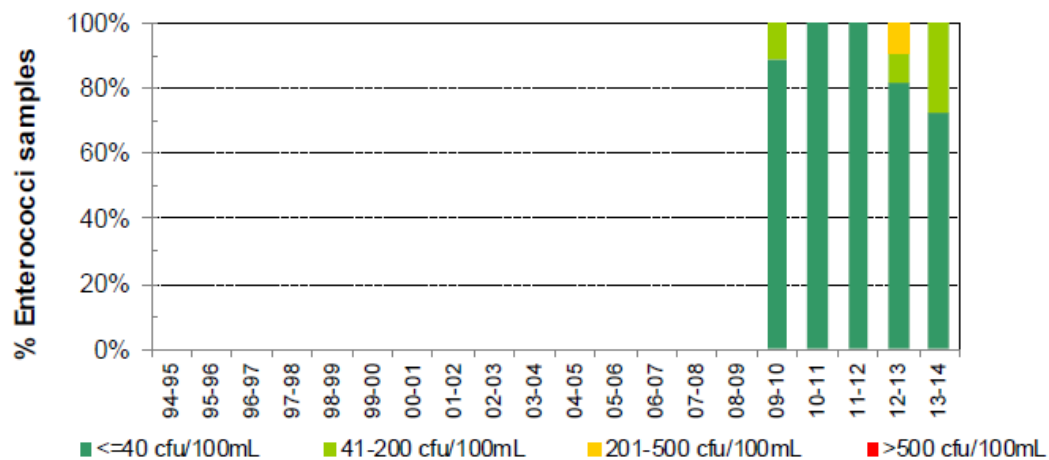


Figure 2.6 Trends in microbial (enterococci) data through time.

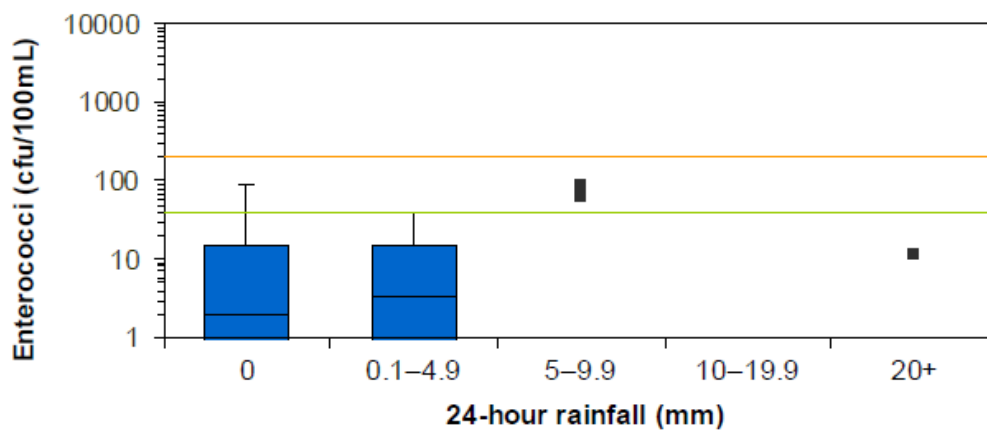


Figure 2.7 Response of microbial (enterococci) levels to rainfall.

2.3 Australian National University, Dean L. Honours Thesis (2011)

An Honours thesis entitled "Distribution of Foraminifera and sediments from Twofold Bay, Eden, New South Wales" (Dean 2011, ANU) includes limited physicochemical water quality data collected from Twofold Bay, with five sites located within Snug Cove and Cattle Bay.

Water quality data was collected near the seabed. Parameters measured included pH, electrical conductivity, dissolved oxygen and salinity. Data from the Snug Cove / Cattle Bay sites is provided in Table 2.1.

The average pH of the five sites sampled in Snug Cove was 8.612 and median value was 8.59. Average electrical conductivity was 54.64 mS/cm and median value was 54.6 mS/cm. Average dissolved oxygen was 76% saturation and 5.636 mg/L, and the median dissolved oxygen value was 75.8% saturation and 5.62 mg/L. Average salinity was 29.1 PSU and median was 29.5 PSU.



Table 2.1 Physicochemical water quality data for Snug Cove / Cattle Bay.

| Site | Depth (m) | pH | EC (mS/cm) | DO (%sat) | DO (mg/L) | Salinity (PSU) |
|----------------|-----------|--------------|--------------|-------------|--------------|----------------|
| TFB14 | 7 | 8.67 | 54.7 | 75 | 5.56 | 30 |
| TFB26 | 7 | 8.67 | 54.7 | 75 | 5.56 | 30 |
| TFB15 | 7 | 8.59 | 54.6 | 77.4 | 5.74 | 29.5 |
| TFB16 | 9 | 8.59 | 54.6 | 75.8 | 5.62 | 28 |
| TFB17 | 9 | 8.54 | 54.6 | 76.8 | 5.7 | 28 |
| Average | | 8.612 | 54.64 | 76 | 5.636 | 29.1 |
| Median | | 8.59 | 54.6 | 75.8 | 5.62 | 29.5 |

Considering the lack of background water quality data for the site relating to potential construction and operational impacts of marinas (e.g. turbidity, heavy metals, TBT etc.) a background water quality sampling program is proposed to be undertaken prior to construction of the marina. Details of the proposed water quality monitoring program are provided in Section 5.



3. POTENTIAL WATER QUALITY IMPACTS

3.1 Construction Phase Impacts

Water quality impacts during the construction phase will mainly be associated with the following water based activities:

- Removal of existing swing moorings and installation of new swing moorings.
- Piling activities.
- Installation of floating pontoons and associated infrastructure e.g. power, communications, fire-fighting and potable water.
- Installation of the wave attenuator.
- Movement and anchoring / mooring of construction barges / workboats.

Note that the land based component of the proposed Cattle Bay Marina development will not involve any earthworks or significant changes to the existing ground surface, including the area of impervious surface, so there are no additional water quality impacts associated with this component.

A summary of potential impacts and the consequences of these are provided in Table 3.1.

Table 3.1 Potential construction water quality impacts.

| Potential Impact | Possible Consequences |
|--|---|
| Sediment plumes caused by pile driving activities or by anchoring or movement of construction vessels. | <ul style="list-style-type: none"> • Very localised and short term increases in turbidity in the immediate vicinity of piling activities. Any sandy sediment disturbed by piling is expected to fall rapidly to the seafloor. • Very localised and short term levels of reduced dissolved oxygen in zones of increased turbidity with the potential to impact on marine flora and fauna in this zone. • Localised and short term reductions in light penetration around piling activities which can impact on marine flora e.g. seagrass beds. • Short term impacts on filter feeding organisms which occur in small zones of increased turbidity through clogging of pores and filter apparatus with fine suspended sediment (e.g. sponges and ascidians). • Potential for very localised smothering of flora / fauna. • Overall localised and short term impacts within the immediate construction zone in Cattle Bay only. No impacts outside of this zone are expected. • The impact on the marine environment is not expected to be significant. • This impact can be managed / mitigated effectively. |



| | |
|---|---|
| Spills of fuel, oil and other harmful substances from construction vessels. | <ul style="list-style-type: none"> Contamination of the local waterway (Cattle Bay) with chemicals or other pollutants. Impacts on marine flora and fauna in local area – i.e. through toxic effects of chemicals on mobile and sessile biota, or oil in feathers / fur which are harmful to marine fauna. Spills are expected to be able to be contained effectively and any substances entering the waterway would be rapidly diluted due to the high degree of mixing of the waters resulting from the large water body of Twofold Bay with its associated ocean currents, tides and waves. The overall impact of this is not expected to be significant. This impact can be managed / mitigated effectively. |
| Pollution of waterway with general waste. | <ul style="list-style-type: none"> Potential for contamination of local waterway (Cattle Bay) with general waste and for this waste to be carried further into Twofold Bay if not contained. Aesthetic impacts on the local waterway. Harm to marine fauna through ingestion and / or entanglement in debris causing harm or death. If not contained the impact of waste on marine fauna may be significant. However, this impact can be managed / mitigated effectively. |
| Toxic impacts on mussels in nearby aquaculture facilities associated with spills of fuel, oil and other harmful substances from construction vessels. | <ul style="list-style-type: none"> Toxic effects associated with spills of fuel, oil and other harmful substances from construction vessels on mussels. Spills are expected to be able to be contained effectively and any substances entering the waterway would be rapidly diluted due to the high degree of mixing of the waters resulting from the large water body of Twofold Bay with its associated ocean currents, tides and waves. The risk is considered low and overall impact of this is not expected to be significant as can be managed / mitigated effectively. |

3.2 Operation Phase Impacts

During the operation phase water quality could be impacted upon by discharge or release of materials from water-based activities or activities on the shore.

Recreational and small commercial vessels permanently stored at the marina will generally use antifouling paint below the waterline to slow the growth of marine organisms on the vessels hull. The most common types of antifouling paint currently used on recreational and small commercial vessels in Australia are 'soft', copper-based paints which slowly leach copper, a biocide, into the water column as the paint matrix dissolves over a period of one or two years from application of the paint.



Note that there will be no slipway or other commercial marina based activities occurring on the shore. In addition, there will be no fuel supplied at the marina.

A summary of potential water quality impacts during the operation phase and the consequences of these are provided in Table 3.2.

Table 3.2 Potential operational water quality impacts.

| Potential Impact | Possible Consequences |
|---|---|
| Stormwater runoff from hard surfaces such as car parks. | <ul style="list-style-type: none"> Contamination of local water column with pollutants such as oils, detergents, synthetic rubber, heavy metals etc. The impact of this is expected to be low as there are no significant changes proposed to the existing ground surface at the site, including the area of impervious surface. The existing stormwater management system on site from the old cannery would be used, with the provision of an additional gross pollutant trap. This impact can be managed / mitigated effectively. |
| Runoff from tenants washing the topsides of their boats on berths on the marina (N.B. No hardstand or slipway with associated washing activities is proposed here). | <ul style="list-style-type: none"> Contamination of the local water column with potential pollutants such as oils, detergents, plastics etc. The overall impact of this is expected to be low considering the high degree of mixing of this waterway and management measures which can be applied. This impact can be mitigated effectively through education and marina regulations. |
| Illegal discharge of vessel holding tanks. | <ul style="list-style-type: none"> Contamination of water column in local area with pathogenic waste. Potential impacts on local fauna. Potential impacts on nearby aquaculture facilities from microbial organisms entering the waterway. The overall impact of this on the environment is considered to be low due to the high degree of mixing of the waterway and the small illegal discharges from holding tanks which would be expected to occur. This impact can be mitigated effectively through education and marina regulations. |
| Accidental spillages of bilge water, sewage and grey water. | <ul style="list-style-type: none"> Contamination of the water column in local area with pathogenic waste. Potential impacts on local fauna. Potential impacts on nearby aquaculture facilities from microbial organisms entering the waterway. Localised visual water quality impacts. Effective mixing of the waterway would reduce the potential impact of this to a low level. This impact can be managed effectively. |
| Spills of fuel, oil and other | <ul style="list-style-type: none"> Contamination of the local waterway with chemicals or other pollutants. |



| | |
|---|---|
| substances. | <ul style="list-style-type: none"> • Potential for the spread of these substances further into the bay if not maintained. • Impacts on marine flora and fauna in local area – i.e. through toxic effects of chemicals or oil in feathers / fur harmful to marine fauna. • Spills are expected to be able to be contained effectively and any substances entering the waterway would be rapidly diluted due to the high degree of mixing of the waters resulting from the large water body of Twofold Bay with its associated ocean currents, tides and waves. • The overall impact of this is not expected to be significant. • This impact can be mitigated / managed effectively. |
| Increased copper in water column from anti-foul ablation. | <ul style="list-style-type: none"> • Heavy metal contamination of the local water column (within Cattle Bay) and local marine sediments. • Potential toxic effects on marine life. • The impact is expected to be insignificant due to the high level of mixing of waters which would occur in the bay. • This impact can be mitigated effectively. |
| Pollution of waterway with general waste. | <ul style="list-style-type: none"> • Potential for contamination of local waterway and for this waste to be carried further into the bay. • Aesthetic impacts on local waterway. • Harm to marine fauna through ingestion and / or entanglement in debris causing harm or death. • If not contained the impact of waste on marine fauna may be significant. However, this impact can be managed / mitigated effectively. |
| Toxic impacts on mussels in nearby aquaculture facilities from spills of fuels and oils, illegal or accidental releases of sewage from vessels, and copper from antifoul. | <ul style="list-style-type: none"> • Toxic effects on mussels associated with spills of fuels and oils, illegal or accidental releases of sewage from vessels, and copper from antifoul. • Potential health risks to humans associated with consumption of contaminated mussels. • Any spills are expected to be able to be contained effectively and any substances entering the waterway would be rapidly diluted due to the high degree of mixing of the waters resulting from the large water body of Twofold Bay with its associated ocean currents, tides and waves. • The risk is considered low and overall impact of this is not expected to be significant as can be managed / mitigated effectively. |

The construction and operation of the proposed Cattle Bay Marina is associated with a number of potential water quality impacts. The majority of impacts will result from water based activities considering the limited shore-based construction and operational based activities at the site. Most of these impacts are preventable through the mitigation measures (including controls, education and marina regulations) presented in Section 4, or can be managed effectively if they do occur.



In addition, the majority of construction and operational impacts would be expected to be very localised (i.e. contained within the immediate construction zone in Cattle Bay) or able to be contained, and short term in nature, given the large size of Twofold Bay and the high degree of mixing of waters which would occur resulting from ocean tides, waves and currents.

The CEMP and OEMP which have been developed for the proposed Cattle Bay Marina will outline the numerous mitigation and / or management measures outlined in Section 4 of this report which should be adhered to in regards to managing water quality impacts at the site.



4. WATER QUALITY MANAGEMENT / MITIGATION MEASURES

The mitigation and / or management measures for water quality which should be adopted during the construction and operational phases of the Cattle Bay Marina are provided in the Sections below. These should be contained within the CEMP and OEMP for the proposed Cattle Bay Marina.

The publications "*Environmental Action for Marinas, Boatsheds and Slipways*" (DECC 2007) (Appendix 2) and "*Best Practice for Marinas and Boat Repair Facilities*" (EPA 1999) (Appendix 3) provide information on managing water impacts from marinas and should also be referred to by construction personnel and marina management.

4.1 Construction Phase Mitigation

The following mitigation / management measures should be adopted during the construction phase:

- Timing of works should avoid periods of high rainfall or poor weather conditions to reduce the potential for water quality impacts and large increases in turbidity.
- Works occurring in shallow water should be undertaken during high tide to reduce the potential for disturbance of bottom sediments by construction vessels and to prevent unnecessary increases in turbidity or disturbance of sediments.
- Turbidity control barriers (i.e. silt curtains) are a widely used and effective method for containing sediments disturbed by construction activities. The use of silt curtains will be effective in reducing sedimentation on seagrasses, marine macroalgae and sessile invertebrates inhabiting subtidal and intertidal habitats.
- Water quality monitoring (of turbidity) during construction is recommended (refer to Section 5).
- Appropriate sediment control fencing should be utilised around any shore based works at the site.
- The marina will utilise the existing stormwater management system on site from the old cannery and include provision of an additional gross pollutant trap in it.
- Bunding of all chemical storage areas on site to prevent leakage into the waterway.
- Spill response kits should be located around the marina and on construction vessels.
- A spill response strategy should be included as part of any site induction.
- All excavation and demolition products generated during the construction process should be contained during works and then removed from the site and disposed of appropriately to prevent them from entering the marine environment.
- All general rubbish generated during the construction phase should be contained and disposed of appropriately.
- All equipment and vessels used during construction should be well maintained and serviced to reduce the likelihood of oil / fuel leaks and spills.



- Limit the use of anchor lines from construction barges / vessels where possible to limit disturbance of the seafloor.

4.2 Operation Phase Mitigation

The following operational phase mitigation / management measures should be adopted:

- Marina users should be educated about the risks associated with marine debris entering the waterway on the marine environment (i.e. risks to water quality and through ingestion and entanglement of fauna in marine debris).
- Boaters should be urged to adopt the concept of 'everything that is carried onto the boat comes back to shore'.
- Provision of readily accessible and visible waste facilities on pontoons and land will encourage marina users to dispose of their waste properly. These should be designed as not to allow rubbish to spill out into the waterway and be emptied regularly.
- Regular inspection and clearing of marine debris from the waters inside the marina and along the foreshore should be undertaken by management and / or subcontractors. The regular inspection should also include a periodic inspection of the seabed to remove any accumulated rubbish.
- Diversion of stormwater through a coarse filter (gross pollutant trap).
- Use of water sensitive urban design measures.
- Educate customers on best practice for boat washing. Where possible, rinse boat decks with water only or use detergents with low-phosphate content. Wipe off as much oil, fuel and dirt as possible from a motor before rinsing it.
- Prohibit boat owners from discharging contaminated bilge water into the waterway. Promote the use of oil absorbent products on all vessels.
- Provision of sewage pump-out facilities (a trolley mounted system is proposed).
- Educate customers about impacts of sewage pollution.
- Spill response kits should be readily available to marina users to mitigate any fuel or oil spills occurring from boats during operation. Staff should be trained in spill response. Customers should also be educated about spill response procedures.
- Provision of floating booms on site to contain spills.
- Keep oils and hazardous chemicals in bunded and covered storage areas.
- Ensure that any chemical spill or leak is contained and doesn't enter waterways, stormwater drains or soak into the soil.
- No fuel to be provided on site.
- Analysis of background water quality and sediment conditions at the site.
- Ongoing monitoring of water quality and surface sediments.
- Prohibit within water hull cleaning activities on the marina including scraping, scrubbing and wiping of anti-foul paints.

4.3 Mitigation Relating to Aquaculture Facilities

The following measures should be taken to reduce the potential for any water quality impacts on nearby aquaculture facilities:



- The Proponent shall notify the aquaculture permit holder(s) at least one week prior to commencement of any construction work (e.g. piling) that may result in the disturbance of any sediment.
- If any construction works cause water quality impacts that result in aquaculture lease area being closed to harvest by the NSW Food Authority, the Contractor must cease such works immediately and not recommence until the risk of adverse water quality impacts has been eliminated.
- If shellfish harvesting closure occurs as a result of water quality deterioration caused by construction works, the Proponent in cooperation with aquaculture permit holder(s) is to undertake testing, at the Proponent's cost, of the farmed shellfish to determine when shellfish is suitable for human consumption and the closure to harvest can be lifted; and,
- Fisheries NSW (1800 043 536) shall be immediately notified of any fish kills in the vicinity of the construction works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by Fisheries NSW.
- Implementation of the management / mitigation measures described for construction and operation above will reduce the potential for impacts on aquaculture facilities.
- Pre- and post-construction monitoring of water quality as per Section 5.

5. PROPOSED WATER QUALITY SAMPLING PROGRAM

5.1 Baseline and Post-Construction Water Quality Monitoring

Baseline water quality data for Cattle Bay should be collected prior to any construction works being undertaken. This will allow for any impacts following construction and operation of the marina to be detected. Differences in the water quality before and after construction may possibly occur due to;

- Changes to the terrestrial environment during and after construction.
- Changes to the marine environment during and after construction.

A before-after-control-impact assessment would be possible for the site considering that the marina is not yet built. We propose that water quality parameters in Table 5.1 are measured at two "impact" sites within Cattle Bay and at two nearby "control" sites (Figure 5.1).

"Impact" sites could be located over the inshore *Posidonia* bed and over the patchy *Heterozostera* beds under the proposed footprint of the marina berths. Control sites could be located on either side of Cocora Point.



Figure 5.1 Proposed water quality sampling sites.



Table 5.1 Proposed water quality parameters for baseline and post-construction sampling.

| Parameter | Reasoning | Current Data Available |
|--|---|--|
| Physico-chemical (temperature, salinity, pH, electrical conductivity, dissolved oxygen). | Basic water quality suite. Important for nearby mussel aquaculture. | Temperature and salinity data is collected under the NSW Shellfish Program. Other data need to be collected. |
| Turbidity (NTU) | To detect any increases in turbidity during construction activities and following construction. | Nil. Needs to be collected. |
| Nutrients (total P and total N) Chlorophyll-a (potential) | To test for eutrophication in case of increased stormwater runoff from the land after construction. In case of increases due to detergents etc. | Nil. Needs to be collected. |
| Phytoplankton | Phytoplankton growth is stimulated by increased nutrient input. Important for nearby mussel aquaculture. | Phytoplankton data is collected under the NSW Shellfish Program. This could be used for pre and post construction assessment. |
| Metals (basic suite + mercury) | To detect impacts associated with copper ablation from antifoul. | Nil. Needs to be collected. |
| Microbial faecal indicators (enterococci and faecal coliforms) | Need to show no input of faecal indicators due to marine operation (i.e. show that people aren't pumping their boat holding tanks at the berths and that spills from the proposed trolley system are not occurring). May relate to increased runoff (e.g. canine faecal matter). Important for nearby mussel aquaculture. | There is recent and ongoing faecal coliforms and enterococci data collection data from the Beachwatch and NSW Shellfish Programs. This data can be used for pre-and post-construction assessments. |
| Tributyltin (TBT) | Needed to show that there is no increase in TBT once the marina is operating. Although now banned in Australia many boats still have TBT antifoul on their hulls, especially those that were last slipped in a less environmentally regulated part of the world (e.g. the Caribbean). | Nil. Needs to be collected. |
| Total Petroleum Hydrocarbons (TPH) | To show that there has been no detectable increase in TPHs due to fuel/oil spills, leaks etc. once the marina is operating. Two-stroke outboard engines leak unburnt fuel/oil directly into the water through the exhaust so need to show that this isn't a problem in terms of water quality. | Nil. Needs to be collected. |

The pre- and post-construction water quality results should be compared to the appropriate water quality guidelines provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000). In particular, the Guidelines for Aquatic Ecosystems (Section 3) and Guidelines for Recreational Water Quality and Aesthetics (Section 5) should be referred to.



5.2 During Construction Monitoring

Monitoring of turbidity during construction should occur to ensure that the level of total suspended solids (TSS) within 1 m outside of any erected silt curtains / piling activities do not exceed the background TSS by more than 50 mg/l.

A turbidity meter should be used to measure nephelometric turbidity units (NTU). Readings of less than 25 NTU should be considered to be less than 50 mg/l TSS. In the event that turbidity levels exceed the background levels by 25 NTU a sample of the water would be taken to be analysed for TSS, and the NTU and TSS levels would be recorded in a logbook that would be made available to OEH on request.

“Stop work” protocols should be put in place for any occasions where turbidity values exceed those outlined above and in the CEMP, to be in place until turbidity levels return to less than 50 mg/L above background levels.



6. REFERENCES

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APPENDIX 1 – Phytoplankton Data

| Sampling Area | | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | TwoFold Bay 1 | |
|-----------------------|------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------|
| Sampling Site | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Collection Date | | 10/01/2012 | 23/01/2012 | NS | 27/02/2012 | 14/03/2012 | 27/03/2012 | 29/03/2012 | 17/04/2012 | 23/09/2012 | 30/04/2012 | 15/05/2012 | 29/05/2012 | 12/06/2012 | 26/06/2012 | 10/07/2012 | 24/07/2012 | 14/08/2012 | 28/08/2012 | 12/09/2012 | 25/09/2012 | 10/10/2012 | 29/10/2012 | 13/11/2012 | 27/11/2012 | 11/12/2012 | 18/12/2012 | |
| Sample Received | | 11/01/2012 | 24/01/2012 | 7/02/2012 | 29/02/2012 | 15/03/2012 | 28/03/2012 | 30/03/2012 | 18/04/2012 | 1/05/2012 | 2/05/2012 | 16/05/2012 | 30/05/2012 | 13/06/2012 | 27/06/2012 | 11/07/2012 | 25/07/2012 | 15/08/2012 | 29/08/2012 | 13/09/2012 | 26/09/2012 | 17/10/2012 | 31/10/2012 | 14/11/2012 | 28/11/2012 | 12/12/2012 | 19/12/2012 | |
| Report Date | | 11/01/2012 | 24/01/2012 | 8/02/2012 | 1/03/2012 | 15/03/2012 | 28/03/2012 | 30/03/2012 | 18/04/2012 | 2/05/2012 | 2/05/2012 | 16/05/2012 | 30/05/2012 | 13/06/2012 | 27/06/2012 | 11/07/2012 | 25/07/2012 | 15/08/2012 | 29/08/2012 | 14/09/2012 | 26/09/2012 | 17/10/2012 | 31/10/2012 | 14/11/2012 | 28/11/2012 | 13/12/2012 | 19/12/2012 | |
| Count Method | | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | |
| Salinity (ppt) | | | | | | | | | | | | | | 34.3 | 34.3 | 33.8 | 33.8 | 33.5 | 33.5 | 33.5 | 33.5 | 33.8 | 34.3 | 34.3 | 35.1 | 35.1 | | |
| Temperature (°C) | | | | | | | | | | | | | | 16 | 16 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 14 | 16 | 17 | 19 | 19 | |
| Results | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | |
| | | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | |
| Genus | Species | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Phytoplankton | | 1.2E+06 | 4.3E+05 | 2.5E+06 | 1.7E+07 | 2.3E+06 | 7.1E+05 | 2.1E+05 | 2.0E+06 | 9.7E+05 | 5.5E+05 | 1.1E+06 | 4.9E+05 | 1.9E+05 | 1.6E+05 | 2.1E+05 | 1.3E+06 | 6.0E+05 | 3.8E+05 | 4.3E+05 | 5.9E+05 | 7.1E+05 | 4.5E+05 | 5.3E+05 | 1.1E+06 | 7.1E+05 | 5.8E+05 | |
| Diatoms | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | delicatissima group | 8.6E+04 | 1.3E+05 | 7.0E+05 | 1.9E+04 | | | | 3.6E+04 | 6.1E+05 | 3.5E+03 | 1.5E+03 | 7.0E+03 | 1.5E+03 | | x | 1.5E+04 | 2.2E+05 | x | 2.1E+03 | | | 4.3E+04 | 7.5E+03 | 2.0E+04 | 1.5E+03 | 3.7E+03 | 4.5E+04 |
| Pseudo-nitzschia | fraudulenta/australis | | | | | | | 2.1E+05 | 8.0E+04 | | | | | x | | | | | | | 8.0E+02 | | 2.3E+04 | | | 7.5E+02 | 1.7E+04 | 4.0E+02 |
| Pseudo-nitzschia | galaxiae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | multistriata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | pungens/multiseris | | | | 1.5E+03 | | | x | | | | 1.1E+04 | 1.3E+04 | | | 1.8E+04 | 3.6E+04 | x | 1.8E+03 | | | | 3.8E+03 | | 5.0E+03 | | 1.2E+04 | 3.8E+03 |
| Pseudo-nitzschia | subcurvata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | subpacifica/heimii | | | | | | | x | | | | x | x | | | 8.0E+03 | 1.8E+04 | x | 6.0E+02 | | | 4.1E+04 | | 6.0E+03 | x | 1.9E+04 | | |
| Pseudo-nitzschia | turgidula | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinoflagellates | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Akashiwo | sanguinea | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | affine | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | catenella/fundyense | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | fraterculus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | margalefi | | | | | | | | | | | | | | | | | 5.0E+01 | | | | | | | | | | |
| Alexandrium | minutum | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | ostenfeldii | | | | | | | | | | | | | 5.0E+01 | | | | | | | | | 4.0E+01 | | | | | |
| Alexandrium | pseudogonyaulax | | | | | | | | | | | | | | | | | | | 7.5E+01 | | | x | 1.5E+02 | 3.0E+02 | 2.5E+02 | 3.5E+02 | 4.5E+02 |
| Alexandrium | tamarense | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | sp. | | | | | | | | x | | | | | | | | | | | | | | | | | | | |
| cf. Alexandrium | cyst | | | | | | | | | | | | x | | | | | | | | | | | | | | | |
| Amphidinium | carterae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coccolithus | monotis | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | acuminata | | | | | x | 1.0E+02 | 3.0E+02 | 5.0E+01 | x | | 5.0E+01 | | | | x | | 3.8E+01 | 1.5E+02 | 1.0E+02 | 5.0E+01 | 5.6E+02 | 1.1E+02 | x | x | 5.0E+01 | 5.0E+01 | |
| Dinophysis | acuta | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | caudata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | fortii | x | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | hastata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis/Phalacroma | mitra | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis/Phalacroma | rotundata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | tripos | x | | x | | | | | | | | | | | | | | | | | | | 8.0E+01 | | | | | |
| Dinophysis | truncata | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | brevis | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | mikimotoi | 1.0E+02 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | papilionacea | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | sp. | | | | x | | | | | | | | | | | 5.0E+02 | | | | | | x | | | | | 2.5E+02 | |
| Karlodinium | spp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Noctiluca | scintillans | 1.0E+02 | | | | | | | | | | | | | | | | | | | 1.1E+02 | | | x | 2.0E+02 | 2.0E+02 | | |
| Ostreopsis | sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | compressum | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | cordatum | 6.5E+03 | | | | | | | | | | | | | | 1.0E+03 | | | | | | | x | | 2.0E+02 | | | |
| Prorocentrum | dentatum | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | emarginatum | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | lima | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | rhathymum | | | | | | | | | | | | | | | | | | | | | | | | | | x | |
| Prorocentrum | sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Takayama | cf. pulchellum | | | | 5.0E+02 | | | | | | | | | | | | | | | | | | | | 1.5E+02 | 2.5E+02 | | |
| Takayama | sp. | | | | | | | | | | | | | | | | | | | | x | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chattonella | spp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibrocapsa | japonica | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heterosigma | akashiwo | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dictyocha | fibula | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dictyocha | octonaria | | | | | x | | | | | | | | | | | | | | | | | | | 5.0E+01 | x | 1.0E+02 | |
| Dictyocha | speculum | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lyngbya | sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oscillatoria | spp. (filaments) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phormidium | sp. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trichodesmium | erythraeum (filaments) | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Sampling Area | | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | |
|------------------------|------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| Sampling Site | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Collection Date | | 8/01/2013 | 22/01/2013 | 13/02/2013 | 26/02/2013 | 12/03/2013 | 25/03/2013 | 9/04/2013 | 24/04/2013 | 7/05/2013 | 28/05/2013 | 11/06/2013 | 25/06/2013 | 16/07/2013 | 29/07/2013 | 14/08/2013 | 27/08/2013 | 12/09/2013 | 23/09/2013 | 15/10/2013 | 29/10/2013 | 11/11/2013 | 26/11/2013 | 10/12/2013 | 16/12/2013 | |
| Sample Received | | 10/01/2013 | 23/01/2013 | 14/02/2013 | 27/02/2013 | 13/03/2013 | 26/03/2013 | 10/04/2013 | 26/04/2013 | 8/05/2013 | 30/05/2013 | 13/06/2013 | 27/06/2013 | 17/07/2013 | 30/07/2013 | 15/08/2013 | 28/08/2013 | 13/09/2013 | 24/09/2013 | 16/10/2013 | 30/10/2013 | 12/11/2013 | 27/11/2013 | 11/12/2013 | 17/12/2013 | |
| Report Date | | 10/01/2013 | 24/01/2013 | 14/02/2013 | 27/02/2013 | 14/03/2013 | 26/03/2013 | 10/04/2013 | 26/04/2013 | 8/05/2013 | 30/05/2013 | 13/06/2013 | 27/06/2013 | 17/07/2013 | 30/07/2013 | 15/08/2013 | 29/08/2013 | 13/09/2013 | 24/09/2013 | 16/10/2013 | 30/10/2013 | 12/11/2013 | 27/11/2013 | 11/12/2013 | 17/12/2013 | |
| Count Method | | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | |
| Salinity (ppt) | | 35.3 | 35.3 | 35.6 | 35.6 | 35.1 | 35.1 | 35.1 | 37.8 | 34.6 | 39.6 | 34 | 34.3 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 35 | | 35 | 35 | 35 | |
| Temperature (°C) | | 20 | 20 | 21 | 21 | 18 | 28 | 18 | 16 | 17 | 17 | 16 | 16 | 14 | 13 | 13 | 13 | 14 | 16 | 16 | 17 | | 18 | 18 | 18 | |
| Results | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | |
| | | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | |
| Genus | Species | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Phytoplankton | | 3.4E+06 | 1.6E+05 | 3.8E+05 | 5.2E+05 | 1.2E+05 | 9.1E+05 | 7.0E+05 | 3.1E+05 | 2.5E+05 | 1.6E+05 | 2.1E+05 | 4.9E+05 | 3.9E+05 | 7.0E+05 | 1.6E+05 | 1.4E+05 | 2.1E+05 | 1.3E+05 | 1.8E+06 | 1.4E+05 | 1.4E+06 | 6.0E+05 | 4.0E+05 | 2.2E+05 | |
| Diatoms | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | delicatissima group | 3.0E+03 | 7.6E+04 | 1.9E+05 | 3.2E+04 | 3.0E+03 | x | 1.0E+04 | | x | | | | x | 1.4E+04 | | | 2.0E+03 | | 1.2E+04 | | 7.9E+04 | | 4.5E+03 | 8.5E+03 | |
| Pseudo-nitzschia | fraudulenta/australis | | | 2.5E+03 | | | | | | | | x | | | 8.0E+03 | | | | 3.5E+03 | x | | x | | | | |
| Pseudo-nitzschia | galaxiae | | | | | | | | | | | | | | | | | | | | | 2.2E+04 | | | | |
| Pseudo-nitzschia | multistriata | | | | | | | | | | | | | | | | | x | | | | | | | | |
| Pseudo-nitzschia | pungens/multiseries | | | 1.5E+03 | x | | | | | | | x | x | x | 7.0E+03 | | x | | x | 4.5E+03 | | 1.1E+04 | | 4.5E+03 | 3.0E+03 | |
| Pseudo-nitzschia | subcurvata | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | subpacifica/heimii | | | | | | | | | | | x | | | 2.5E+03 | 7.5E+03 | | x | x | x | 1.5E+03 | | 8.5E+03 | x | x | x |
| Pseudo-nitzschia | turgidula | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinoflagellates | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Akashiwo | sanguinea | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | affine | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | catenella/fundyense | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | fraterculus | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | margalefi | | | | x | | | | | | | | | | | | | | | x | | | | | 2.0E+02 | |
| Alexandrium | minutum | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | ostenfeldii | | | | | | | | | | | x | | x | x | | | | | | | | | | | |
| Alexandrium | pseudogonyaulax | | | | 2.0E+02 | | | | | | | | | | | | | | | | | | | 5.0E+01 | 1.0E+02 | |
| Alexandrium | tamarense | | | | | | | | | | | | | | | | | x | | | | | | | | |
| Alexandrium | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| cf. Alexandrium | cyst | | | | | | | | | | | | | | | | | | | | | | | | | |
| Amphidinium | carterae | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coolia | monotis | | | | | | | 5.0E+01 | | | | | | | | | | | | | | | | | | |
| Dinophysis | acuminata | | | | 6.0E+02 | 1.5E+02 | | x | | x | 1.5E+03 | 1.6E+03 | x | 2.5E+02 | | x | x | | | 5.0E+01 | 2.5E+02 | x | 1.0E+02 | 5.0E+01 | | |
| Dinophysis | acuta | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | caudata | | | x | | | | | | | | x | | | | | | | | | | | | | | |
| Dinophysis | fortii | | | | | | | | | | | | | | | | | | | | | | x | x | | |
| Dinophysis | hastata | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis/Phalachroma | mitra | | | | | | | | | | | | | | | | | | | | | | | | 5.0E+01 | |
| Dinophysis/Phalachroma | rotundata | | | x | | x | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | tripos | | | | | | | 1.0E+02 | | | | x | | | | | | | | | | | | 5.0E+01 | | |
| Dinophysis | truncata | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | brevis | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | mikimotoi | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | papillonacea | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | sp. | | | | | | | 5.0E+01 | | | | | | | | | | | | | | | | | | |
| Karlodinium | spp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Noctiluca | scintillans | 2.0E+02 | 4.0E+02 | 5.0E+01 | | | 1.5E+03 | 1.2E+03 | x | x | 1.0E+02 | 5.0E+01 | x | | 1.5E+02 | 1.0E+02 | x | 1.0E+02 | 5.0E+01 | 2.0E+02 | 5.0E+01 | 2.5E+02 | 1.0E+02 | 2.0E+02 | 7.0E+02 | |
| Ostreopsis | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | compressum | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | cordatum | | | 5.0E+02 | | | | | | | | | | | | | x | | | | | | | | | |
| Prorocentrum | dentatum | | | | | 1.0E+03 | 7.5E+03 | | | | | | | | 5.0E+02 | | | | | | | | | | | |
| Prorocentrum | emarginatum | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | lima | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | rhathymum | | x | x | x | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Takayama | cf. pulchellum | | | 5.0E+01 | | | | | | | | | | | | | | | | | | | | | x | |
| Takayama | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chattonella | spp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibrocapsa | japonica | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heterosigma | akashiwo | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dictyocha | fibula | | | | | | | | | | x | x | | x | | | x | | | | | | | | | |
| Dictyocha | octonaria | | | | | | | 1.5E+03 | | | x | x | x | | x | | x | x | | | | | | | | |
| Dictyocha | speculum | | | | | | | | | | | | | | | | | | | x | | | | | | |
| Lyngbya | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oscillatoria | spp. (filaments) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phormidium | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trichodesmium | erythraeum (filaments) | | | | | | | | | | | | x | | | | | | | | | | | | | |

| Sampling Area | | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay | Two-fold Bay |
|-------------------------------|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Sampling Site | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Collection Date | | 7/01/2014 | 28/01/2014 | 11/02/2014 | 27/02/2014 | 11/03/2014 | 25/03/2014 | 11/09/2014 | 15/09/2014 | 7/10/2014 | 27/10/2014 |
| Sample Received | | 9/01/2014 | 29/01/2014 | 13/02/2014 | 28/02/2014 | 12/03/2014 | 26/03/2014 | 12/09/2014 | 16/09/2014 | 8/10/2014 | 28/10/2014 |
| Report Date | | 9/01/2014 | 29/01/2014 | 13/02/2014 | 28/02/2014 | 12/03/2014 | 26/03/2014 | 12/09/2014 | 16/09/2014 | 8/10/2014 | 29/10/2014 |
| Count Method | | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick |
| Salinity (ppt) | | 35 | 33 | 35 | 35 | 35 | 35 | 34 | 34 | 34 | 34 |
| Temperature (°C) | | 19 | 20 | 20 | 19 | 19 | 19 | 16 | 16 | 16 | 16 |
| Results | | | | | | | | | | | |
| | | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate |
| | | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L |
| Genus | Species | | | | | | | | | | |
| Total Phytoplankton | | 5.3E+05 | 5.5E+05 | 3.0E+05 | 5.2E+05 | 5.6E+05 | 3.4E+04 | 3.9E+05 | 9.6E+05 | 9.7E+05 | 9.1E+05 |
| Diatoms | | | | | | | | | | | |
| <i>Pseudo-nitzschia</i> | <i>delicatissima</i> group | 8.8E+04 | 3.4E+04 | 1.0E+03 | 4.4E+04 | 2.6E+04 | | | | | 1.4E+04 |
| <i>Pseudo-nitzschia</i> | <i>fraudulenta/australis</i> | 1.5E+03 | | | 1.5E+03 | | | | | | 6.5E+03 |
| <i>Pseudo-nitzschia</i> | <i>galaxiae</i> | | | | | | | | | | |
| <i>Pseudo-nitzschia</i> | <i>multistriata</i> | | | | x | 1.8E+04 | | | | | |
| <i>Pseudo-nitzschia</i> | <i>pungens/multiseries</i> | 2.0E+03 | | | | 2.0E+03 | | 4.0E+03 | 1.4E+04 | x | 1.2E+04 |
| <i>Pseudo-nitzschia</i> | <i>subcurvata</i> | | | | | | | | | | |
| <i>Pseudo-nitzschia</i> | <i>subpifica/heimii</i> | | 1.8E+03 | | | | | x | 7.0E+03 | 1.5E+03 | 3.9E+04 |
| <i>Pseudo-nitzschia</i> | <i>turgidula</i> | | | | | | | | | | |
| Dinoflagellates | | | | | | | | | | | |
| <i>Akashiwo</i> | <i>sanguinea</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>affine</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>catenella/fundyense</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>fraterculus</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>margalefi</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>minutum</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>ostenfeldii</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>pseudogonyaulax</i> | 5.0E+01 | | | | | 1.0E+02 | 5.0E+01 | | | 1.5E+02 |
| <i>Alexandrium</i> | <i>tamarense</i> | | | | | | | | | | |
| <i>Alexandrium</i> | <i>sp.</i> | | | | | | | | | | |
| <i>cf. Alexandrium</i> | <i>cyst</i> | | | | | | | | | | |
| <i>Amphidinium</i> | <i>carterae</i> | | | | | | | | | | |
| <i>Coolia</i> | <i>monotis</i> | | | | | | | | | | |
| <i>Dinophysis</i> | <i>acuminata</i> | | | | 5.0E+01 | x | x | | | | |
| <i>Dinophysis</i> | <i>acuta</i> | | | | | | | | | | |
| <i>Dinophysis</i> | <i>caudata</i> | | | | | | 5.0E+01 | | | | |
| <i>Dinophysis</i> | <i>fortii</i> | | | | | | | | | | |
| <i>Dinophysis</i> | <i>haslata</i> | | | | | | | | | | |
| <i>Dinophysis/Phalachroma</i> | <i>mitra</i> | | | | | | | | | | |
| <i>Dinophysis/Phalachroma</i> | <i>rotundata</i> | x | | | | | | | | | |
| <i>Dinophysis</i> | <i>tripos</i> | | 5.0E+01 | 1.5E+02 | | x | 1.5E+02 | | | | |
| <i>Dinophysis</i> | <i>truncata</i> | | | | | | | | | | |
| <i>Karenia</i> | <i>brevis</i> | | | | | | | | | | |
| <i>Karenia</i> | <i>mikimotoi</i> | | | | | | | | | 2.0E+02 | |
| <i>Karenia</i> | <i>papilionacea</i> | x | | | | | | | | | |
| <i>Karenia</i> | <i>sp.</i> | | | | | | | | | | |
| <i>Karlodinium</i> | <i>spp.</i> | 5.5E+02 | | | 6.5E+03 | | | | 1.0E+03 | | |
| <i>Noctiluca</i> | <i>scintillans</i> | x | x | 2.0E+02 | 1.0E+02 | 1.0E+02 | 2.5E+02 | | 1.5E+02 | 2.0E+02 | |
| <i>Ostreopsis</i> | <i>sp.</i> | | | | | | | | | | |
| <i>Prorocentrum</i> | <i>compressum</i> | | | | | | | | | | |
| <i>Prorocentrum</i> | <i>cordatum</i> | | | | x | 1.5E+03 | | | | | |
| <i>Prorocentrum</i> | <i>dentatum</i> | | | | 6.5E+03 | | | | | | |
| <i>Prorocentrum</i> | <i>emarginatum</i> | | | | | | | | | | |
| <i>Prorocentrum</i> | <i>lima</i> | | | | | | | | | | |
| <i>Prorocentrum</i> | <i>rhathymum</i> | | | x | | | | | | | |
| <i>Prorocentrum</i> | <i>sp.</i> | | | | | | | | | | |
| <i>Takayama</i> | <i>cf. pulchellum</i> | | | | | 6.0E+02 | | | | | x |
| <i>Takayama</i> | <i>sp.</i> | | | | | 4.0E+02 | x | | | | |
| Other | | | | | | | | | | | |
| <i>Chattonella</i> | <i>spp.</i> | | | | | | | | | | |
| <i>Fibrocapsa</i> | <i>japonica</i> | | | | | | | | | | |
| <i>Heterosigma</i> | <i>akashiwo</i> | | | | 3.5E+03 | | | | | 1.5E+03 | 5.0E+02 |
| <i>Dictyocha</i> | <i>fibula</i> | | | | | | | | | | |
| <i>Dictyocha</i> | <i>octonaria</i> | | | x | 3.0E+03 | x | | | 5.0E+02 | | |
| <i>Dictyocha</i> | <i>speculum</i> | | | | | | | | | | |
| <i>Lyngbya</i> | <i>sp.</i> | | | | | | | | | | |
| <i>Oscillatoria</i> | <i>spp. (filaments)</i> | | | | | | | | | | |
| <i>Phormidium</i> | <i>sp.</i> | | | | | | | | | | |
| <i>Trichodesmium</i> | <i>erythraeum (filaments)</i> | | | | | | | | | | |

[illegible]

| Sampling Area | | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | | |
|------------------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|---------|
| Sampling Site | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | |
| Collection Date | | 8/01/2013 | 22/01/2013 | 13/02/2013 | 26/02/2013 | 12/03/2013 | 25/03/2013 | 9/04/2013 | 24/04/2013 | 7/05/2013 | 28/05/2013 | 11/06/2013 | 25/06/2013 | 16/07/2013 | 29/07/2013 | 14/08/2013 | 27/08/2013 | 12/09/2013 | 23/09/2013 | 15/10/2013 | 29/10/2013 | 11/11/2013 | 26/11/2013 | 10/12/2013 | 16/12/2013 | |
| Sample Received | | 10/01/2013 | 23/01/2013 | 14/02/2013 | 27/02/2013 | 13/03/2013 | 26/03/2013 | 10/04/2013 | 26/04/2013 | 8/05/2013 | 30/05/2013 | 13/06/2013 | 27/06/2013 | 17/07/2013 | 30/07/2013 | 15/08/2013 | 28/08/2013 | 13/09/2013 | 24/09/2013 | 16/10/2013 | 30/10/2013 | 12/11/2013 | 27/11/2013 | 11/12/2013 | 17/12/2013 | |
| Report Date | | 10/01/2013 | 24/01/2013 | 14/02/2013 | 27/02/2013 | 14/03/2013 | 26/03/2013 | 10/04/2013 | 26/04/2013 | 8/05/2013 | 30/05/2013 | 13/06/2013 | 27/06/2013 | 17/07/2013 | 30/07/2013 | 15/08/2013 | 29/08/2013 | 13/09/2013 | 24/09/2013 | 16/10/2013 | 30/10/2013 | 12/11/2013 | 27/11/2013 | 11/12/2013 | 17/12/2013 | |
| Count Method | | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | |
| Salinity (ppt) | | 35.3 | 35.3 | 35.6 | 35.6 | 35.1 | 35.1 | 35.1 | 37.8 | 34.6 | 39.6 | 34 | 34.3 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 35 | | 35 | 35 | 35 |
| Temperature (°C) | | 20 | 20 | 21 | 21 | 18 | 28 | 18 | 16 | 17 | 17 | 16 | 16 | 14 | 13 | 13 | 13 | 14 | 16 | 16 | 17 | | 18 | 18 | 18 | |
| | | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | |
| Results | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | |
| | | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | |
| Genus | Species | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Phytoplankton | | 3.0E+06 | 2.7E+05 | 3.6E+05 | 2.5E+05 | 9.5E+04 | 1.5E+06 | 5.5E+05 | 4.1E+05 | 1.9E+05 | 1.0E+05 | 3.4E+05 | 5.3E+05 | 2.8E+05 | 8.7E+05 | 1.3E+05 | 1.0E+05 | 1.4E+05 | 1.4E+05 | 2.4E+05 | 8.0E+04 | 1.3E+06 | 3.5E+05 | 3.2E+05 | 1.7E+05 | |
| Diatoms | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pseudo-nitzschia | delicatissima group | 8.5E+03 | 6.1E+04 | 1.6E+05 | 2.9E+04 | 6.0E+03 | x | 1.1E+04 | | | | | | x | 1.4E+04 | | | x | 3.0E+03 | | | 8.9E+04 | 1.5E+03 | 3.5E+03 | 2.0E+04 | |
| Pseudo-nitzschia | fraudulenta/australis | | 1.3E+03 | | | | | | x | | | | | | 6.0E+03 | | | x | 3.0E+03 | | | 3.0E+03 | | | | |
| Pseudo-nitzschia | cf. galaxiae | | | | | | | | | | | | | | | | | | | | 1.3E+04 | | | | | |
| Pseudo-nitzschia | multistriata | | | | | | | | | | | | | x | | | 1.0E+03 | | x | | | | | | | |
| Pseudo-nitzschia | pungens/multiseries | | | | | x | | | | | | x | x | 2.0E+03 | 1.1E+04 | | | | 3.0E+03 | 3.0E+03 | | | 2.5E+03 | 5.5E+03 | 3.5E+03 | 2.0E+03 |
| Pseudo-nitzschia | subcurvata | | | | | | | | | | | | | | | | | | | | | 3.0E+03 | | | | |
| Pseudo-nitzschia | subpacifica/heimii | | | | | | | | | | | x | | | 9.0E+03 | | | x | 2.5E+03 | 2.0E+03 | | | 1.4E+04 | 5.0E+03 | | 3.0E+03 |
| Pseudo-nitzschia | turgidula | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rhizosolenia | imbricata group | | | | | | | | | | | | | | | | | | | | | | 5.0E+02 | | | |
| Dinoflagellates | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Akashiwo | sanguinea | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | affine | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | catenella/fundyense | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | fraterculus | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | margalefi | | | | | | | | | | | | | | | | | | | | | | | | 2.0E+02 | |
| Alexandrium | minutum | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alexandrium | ostenfeldii | | | | | | | | | | | | | x | x | | | | | 5.0E+01 | | | | | | |
| Alexandrium | pseudogonyaulax | 1.0E+02 | | | | | | | | | | | | | | | | | | 5.0E+01 | x | | | 1.0E+02 | 1.0E+02 | |
| Alexandrium | tamarense | | | | | | | | | | | | x | | | | | | | | | | | | | |
| Alexandrium | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| cf. Alexandrium | cyst | | | | | | | | | | | | | | | | | | | | | | | | | |
| Amphidinium | carterae | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cochlodinium | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | acuminata | | | | 7.5E+02 | 5.0E+01 | | 2.0E+02 | | 5.0E+01 | 9.5E+02 | 8.5E+02 | | 5.0E+01 | x | x | x | | | x | 3.0E+02 | 5.0E+01 | 2.0E+02 | x | x | |
| Dinophysis | acuta | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | caudata | | | 1.0E+02 | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis | fortii | | | | | | | | | | 5.0E+01 | | | | | | | | | | | | | | | |
| Dinophysis | hastata | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis/Phalachroma | mitra | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dinophysis/Phalachroma | rotundata | | | | x | | | | | | | | | | | x | | | | | | | | | | |
| Dinophysis | tripos | | | | 2.0E+02 | 5.0E+01 | | 1.0E+02 | | x | x | | | x | | | | | | | | | x | | | |
| Karenia | brevis | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | mikimotoi | | | | | | | | | | | | | | | 1.5E+02 | | | | | | | | | 1.5E+02 | |
| Karenia | papillonacea | | | | | | | | | | | | | | | | | | | | | | | | | |
| Karenia | sp. | | | | | | | | | | | | | | | x | | | | | | | | | | |
| Karlodinium | spp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Noctiluca | scintillans | 1.5E+02 | 3.5E+02 | 5.0E+01 | | | 1.6E+03 | 1.9E+03 | 5.0E+01 | 5.0E+01 | 1.5E+02 | x | | | 1.0E+02 | x | x | 5.0E+01 | x | x | | 1.5E+02 | 5.0E+01 | 1.5E+02 | 4.5E+02 | |
| Ostreopsis | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | cordatum | | | | | | | | | | | | | | | | x | | | | | | | | | |
| Prorocentrum | dentatum | | | | | | 1.4E+04 | | | | | | | | x | | | | x | | | | | | | |
| Prorocentrum | emarginatum | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | lima | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prorocentrum | rhathymum | | x | | | | | | | | | | | | | | | | | x | | | | | | |
| Prorocentrum | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Takayama | cf. pulchellum | | | | | | | | | | | | | | | | | | | | | | 2.5E+02 | | 3.5E+02 | |
| Takayama | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chattonella | spp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibrocapsa | japonica | | | | | | | | | | | | | | | | | | | | | | | | | |
| cf Haramonas | sp. | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heterosigma | akashiwo | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dictyocha | fibula | | | | | | | | | | x | | | x | | | | | | | x | | | | | |
| Dictyocha | octonaria | | | | 5.0E+02 | | | 2.0E+03 | | | | x | | x | x | x | | x | | x | | | | | | |
| Oscillatoria | spp. (filaments) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trichodesmium | erythraeum (filaments) | | | | | | | | | | | | | | | | | | | | | | | | | |

| Sampling Area | | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay | Twofold Bay |
|------------------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Sampling Site | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Collection Date | | 7/01/2014 | 28/01/2014 | 11/02/2014 | 27/02/2014 | 11/03/2014 | 25/03/2014 | 11/09/2014 | 15/09/2014 | 7/10/2014 | 27/10/2014 |
| Sample Received | | 9/01/2014 | 29/01/2014 | 13/02/2014 | 28/02/2014 | 12/03/2014 | 26/03/2014 | 12/09/2014 | 16/09/2014 | 8/10/2014 | 28/10/2014 |
| Report Date | | 9/01/2014 | 29/01/2014 | 13/02/2014 | 28/02/2014 | 12/03/2014 | 26/03/2014 | 12/09/2014 | 16/09/2014 | 8/10/2014 | 29/10/2014 |
| Count Method | | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick | Sedgewick |
| Salinity (ppt) | | 35 | 33 | 35 | 35 | 35 | 35 | 34 | 34 | 34 | 34 |
| Temperature (°C) | | 19 | 20 | 20 | 19 | 19 | 19 | 16 | 16 | 16 | 16 |
| | | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected | Detected |
| Results | | | | | | | | | | | |
| | | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate | Estimate |
| | | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L | Cells/L |
| Genus | Species | | | | | | | | | | |
| Total Phytoplankton | | 4.0E+05 | 6.8E+05 | 2.3E+05 | 3.7E+05 | 5.7E+05 | 1.1E+05 | 5.9E+05 | 8.6E+05 | 9.2E+05 | 7.6E+05 |
| Diatoms | | | | | | | | | | | |
| Pseudo-nitzschia | delicatissima group | 6.4E+04 | 4.2E+04 | | 1.4E+04 | 9.5E+03 | | | 2.5E+03 | 2.5E+03 | 1.5E+04 |
| Pseudo-nitzschia | fraudulenta/australis | 1.0E+03 | | | 5.0E+03 | | | | 6.0E+03 | x | 1.6E+04 |
| Pseudo-nitzschia | cf. galaxiae | | | | | | | | | | |
| Pseudo-nitzschia | multistriata | | | | | 4.8E+04 | | | | | |
| Pseudo-nitzschia | pungens/multiseries | | | | 2.0E+03 | 1.0E+03 | | 5.0E+03 | 2.1E+04 | x | 1.8E+04 |
| Pseudo-nitzschia | subcurvata | | | | | | | | | | |
| Pseudo-nitzschia | subpacific/heimii | | x | | 2.0E+03 | | | x | 12000 | x | 4.1E+04 |
| Pseudo-nitzschia | turgidula | | | | | | | | | | |
| Rhizosolenia | imbricata group | | | | | | | | | | |
| Dinoflagellates | | | | | | | | | | | |
| Akashiwo | sanguinea | | | | | | | | | | |
| Alexandrium | affine | | | | | | | | | | |
| Alexandrium | catenella/fundyense | | | | | | | | | | |
| Alexandrium | fraterculus | | | | | | | | | | |
| Alexandrium | margalefi | | | | | | | | | | |
| Alexandrium | minutum | | | | | | | | | | |
| Alexandrium | ostenfeldii | | | | | | | | | | |
| Alexandrium | pseudogonyaulax | | | | 5.0E+01 | | 2.0E+02 | | | | |
| Alexandrium | tamarense | | | | | | | | | | |
| Alexandrium | sp. | | | | | | | | | | |
| cf. Alexandrium | cyst | | | | | | | | | | |
| Amphidinium | carterae | | | | | | | | | | |
| Cochlodinium | sp. | | | | | | | | | | 1.0E+02 |
| Dinophysis | acuminata | | | 5.0E+01 | | 5.0E+01 | | 5.0E+01 | | | |
| Dinophysis | acuta | | x | | | | | | | | |
| Dinophysis | caudata | | | | | | x | | | | |
| Dinophysis | fortii | | | | | | | | | | |
| Dinophysis | hastata | | | 5.0E+01 | | | | | | | |
| Dinophysis/Phalachroma | mitra | | | | | | | | | | |
| Dinophysis/Phalachroma | rotundata | | | | | | 5.0E+01 | | | | |
| Dinophysis | tripos | | 1.5E+02 | | | 1.5E+02 | 3.0E+02 | | | | |
| Karenia | brevis | | | | | | | | | | |
| Karenia | mikimotoi | | | | | | | | | | |
| Karenia | papilionacea | | | | | | 5.0E+01 | | | | |
| Karenia | sp. | | | | | 5.0E+01 | | | | | |
| Karlodinium | spp. | 1.7E+03 | | | 8.5E+03 | | | | | | |
| Noctiluca | scintillans | x | 5.0E+01 | 5.5E+02 | 2.0E+02 | x | 3.5E+02 | x | 5.0E+01 | 5.0E+01 | 5.0E+01 |
| Ostreopsis | sp. | | | | | | | | | | |
| Prorocentrum | cordatum | | | | 5.0E+02 | | | | | x | |
| Prorocentrum | dentatum | | | | 2.0E+03 | | | | | | |
| Prorocentrum | emarginatum | | | | | | | | | | |
| Prorocentrum | lima | | | | | | | | | | |
| Prorocentrum | rhathymum | x | x | x | | | | | | | |
| Prorocentrum | sp. | | | | | | | | | | |
| Takayama | cf. pulchellum | | | | | 2.0E+02 | 5.0E+01 | | | 5.0E+01 | 1.0E+02 |
| Takayama | sp. | | | | | 3.5E+02 | | | | | |
| Other | | | | | | | | | | | |
| Chattonella | spp. | | | | | | | | | | |
| Fibrocapsa | japonica | | | | | | | | | | |
| cf. Haramonas | sp. | | | | | | | | | | |
| Heterosigma | akashiwo | | | | 1.0E+03 | | | | | 5.0E+02 | 1.0E+03 |
| Dictyocha | fibula | | | | | | | | | x | |
| Dictyocha | oconaria | | x | x | 1.5E+03 | | x | 5.0E+02 | 1.5E+03 | x | x |
| Oscillatoria | spp. (filaments) | | | | | | | | | | |
| Trichodesmium | erythraeum (filaments) | | | | | | | | | | |



APPENDIX 2 – Environmental Action for Marinas, Boatsheds and Slipways (DECC 2007)

ENVIRONMENTAL ACTION FOR MARINAS, BOATSHEDS AND SLIPWAYS



ACKNOWLEDGMENTS

This information for marinas, boatsheds and slipways was prepared by the Department of Environment and Climate Change NSW (DECC), which incorporates the NSW Environment Protection Authority (EPA).

DECC acknowledges the help of the following organisations in completing this guide:

- Boating Industry Association of NSW
- Manly Council
- North Sydney Council
- Sutherland Shire Council
- Fenwicks Marina

Please note:

This guide provides information relevant at the time of publication. It is not a regulatory document and does not provide legal advice. If you need more information regarding legal obligations, consult a lawyer, the legislation, DECC or your local Council.

While reasonable efforts have been made to ensure the contents of this guide are factually correct, DECC does not accept responsibility for the accuracy or completeness of the contents and is not liable for any loss or damage that may occur directly or indirectly through the use of, or reliance on, the contents of this guide.

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DECC 2007/108
ISBN 978 1 74122 401 6
June 2007
Printed on recycled paper (elemental chlorine free).

CONTENTS

| | |
|--|---|
| Priority actions for marinas, boatsheds and slipways | 2 |
| Overview and opportunities | 4 |

INFORMATION SHEETS

| | |
|--|----|
| Information sheet 1: | 8 |
| Environmental compliance – meeting your legal responsibilities | |
| Information sheet 2: | 14 |
| Resource Efficiency | |
| Information Sheet 3: | 18 |
| Managing water quality | |
| Information sheet 4: | 28 |
| Managing air quality | |
| Information sheet 5: | 34 |
| Hazardous materials and liquid waste | |
| Information sheet 6: | 42 |
| Solid waste and resource recovery | |
| Information sheet 7: | 46 |
| Managing noise | |
| Information sheet 8: | 48 |
| Bringing it all together – planning | |

USEFUL TOOLS

Self-assessment checklist

Environmental action plan

Checklists: daily and weekly

Useful contacts

ABBREVIATIONS

| | | | |
|------|---|----------|--|
| EPA | Environment Protection Authority – part of the Department of Environment and Climate Change NSW | OH&S | Occupational Health and Safety |
| | | POEO Act | <i>Protection of the Environment Operations Act 1997</i> |
| DECC | Department of Environment and Climate Change NSW | VOCs | Volatile Organic Compounds |
| MSDS | Material Safety Data Sheet/s | EHC Act | <i>Environmentally Hazardous Chemicals Act 1985</i> |

PRIORITY ACTIONS

FOR MARINAS, BOATSHEDS AND SLIPWAYS

1. MARINAS AND JETTIES



- Bund and cover fuel dispensing facilities and regularly inspect and maintain fuel tanks, bowzers, nozzles and hoses to ensure they are not leaking
- Ensure your first flush catchment system is of sufficient capacity and is regularly maintained
- Discourage boat owners from discharging bilge water
- Provide pump out facilities for your customers and encourage their use
- Encourage boat owners to take steps to avoid polluting waters when washing their boats

2. SLIPWAY AND HARDSTAND



- Ensure all slipways, hardstands, and work areas are graded, bunded and are fitted with catch drains to collect waste water and chemical spills
- Carry out all work above catch drains
- Keep slipway work areas clean at all times. Ensure the area is cleaned up before leaving the site
- Ensure sumps and pits are clean and pumps are operating on their float switches
- Ensure you have an Environmentally Hazardous Chemicals licence if you deal with any organotin wastes, including tributyltin

3. BUILDINGS AND SITE MANAGEMENT



- Obtain all necessary consents, permits and licences, and maintain compliance with their conditions
- Ensure car parks and gardens are free from litter
- Ensure drains and collection pits are clear of debris
- Place spill clean-up kits at likely spill locations and train all staff in their use
- Erect signage to remind clients of your commitment to reduce noise and protect the environment

4. WORKSHOP



- Connect cutting and sanding machines to dust extractors – collect dust close to source
- Keep workshop floors clean of materials and waste
- Ensure all staff are properly trained in the correct use of hazardous materials
- Carry out outboard motor tests in tanks located in a bunded and covered area
- Carry out all spray-painting inside a booth that complies with Australian Standards

5. HAZARDOUS MATERIALS AND WASTE STORAGE



- Store hazardous materials, including fuel, oils and chemicals, in correctly segregated, bunded and covered areas
- Ensure all containers have lids on and are in good condition
- Ensure your wastes (solid and liquid) are sent to facilities that can lawfully take them
- Develop an emergency response procedure for chemical spills and train all staff on how to prevent and manage spills
- Regularly check the integrity of underground storage tanks

6. NOISE



- Avoid excessive idling and revving of engines
- Carry out sanding, grinding and other noisy activities in an area where noise can be muffled
- Fit silencers to air compressors
- Ask your customers to keep noise to a minimum, especially at night

OVERVIEW AND OPPORTUNITIES

This guide is part of a series prepared by the Department of Environment and Climate Change NSW (DECC) that provides information to help businesses improve their environmental performance.

Similar guides for other business sectors are available through the DECC Environment Line, on 131 555 and from the DECC website –

www.environment.nsw.gov.au

THE INDUSTRY

The boating and marina industry covers a wide range of operations. The industry has a potential to impact on the environment because of its waterfront location, activities, the raw materials and chemicals used and the waste generated. As well, the industry depends on clean waterways for people to enjoy their boating and fishing.

This guide applies to owners and operators of:

- Marinas
- Boatsheds
- Slipways



WHAT IS THE PURPOSE OF THIS GUIDE?

This guide is designed to help NSW marinas, boatsheds and slipway operators to:

- Understand the environmental risks and responsibilities associated with the boating industry.
- Take action to improve the environmental management of their operations.
- Take advantage of the business benefits that result from improved environmental practices.

This guide provides information for owners, managers and staff. It will also be useful to environmental officers employed by local government. The guide does not provide legal advice but will provide the reader with an understanding of regulatory requirements under environment protection laws.



WHAT ARE THE KEY ISSUES?

Key environmental issues for marinas, boatsheds and slipways are:

- Water pollution caused by allowing any material other than rainwater to enter waterways.
- Air pollution and land contamination caused by releasing:
 - volatile organic compounds (VOCs) into the environment due to solvent or paint use
 - dust, including particles that may contain organic compounds, metals and metal complexes, due to sanding and blasting.
- Handling and disposing of dangerous goods such as solvents, fuel and paint wastes.
- Waste management, including reuse, recycling and disposal.
- Noise affecting the amenity of the surrounding community.
- Water use.
- Greenhouse gas emissions from energy use.
- Design, installation and operation of underground petroleum storage systems.



The 'Useful tools' section (pp 50 to 68) contains templates to help you develop your own environmental management tools, such as checklists and an action plan. For example, the 'Self-assessment checklist' contains the types of questions that an officer from your local Council or the EPA could ask when visiting your premises. You can use this self-assessment tool to evaluate your environmental performance and identify areas for improvement.

Occupational health and safety

Many of the issues addressed in this guide are also relevant to occupational health and safety (OH&S). In fact, many businesses with good OH&S procedures are also excellent performers with respect to the environment. This publication does not address OH&S issues in detail so it's important that you contact WorkCover NSW for more information.

ENVIRONMENTAL MANAGEMENT – RISKS AND OPPORTUNITIES

For marinas, boatsheds and slipways, improving environmental performance is about managing risk and taking advantage of opportunities that will boost efficiency and profits.

A good starting point is to identify and prevent risks to your business from poor environmental management. High levels of dust from abrasive blasting or surface coating operations for example, could pose the risk of:

- Environmental prosecutions and fines
- Damage to company reputation
- Harmful effects on the health, safety and productivity of staff.

A chemical spill or other pollution could also harm the local marine and land environment, which belongs to all members of the local community and impacts on their quality of life.

Improving environmental management also provides opportunities to make a business more profitable and viable in the long-term. Even small changes can save money. For example, many marinas and boatsheds have cut electricity costs by installing or cleaning skylights and regularly fixing leaks in air compressors. Some of these simple actions are described in more detail in 'Information Sheet 2: Resource efficiency'.

The benefits of a high standard of environmental management go beyond 'housekeeping' and efficiency. They also include benefits from:

- An enhanced reputation as a company that is well managed and a valuable long-term business partner.
- A 'supplier of choice', particularly to corporate and government clients who are starting to consider environmental performance of suppliers and products as part of their green procurement policies.
- Improved employee satisfaction, retention and productivity. Companies with a good environmental record are more likely to win the 'battle for talent' in attracting and retaining staff. As well, employees are generally happier and more productive in a workplace that is clean, healthy and environmentally responsible.

For further information visit
www.environment.nsw.gov.au



Successful marina and boatshed operators are coming to understand that good environmental practice is a business opportunity. These opportunities are maximised when management of environmental issues is integrated with other business planning and becomes part of continuous improvement. Better results are also likely when staff at all levels are involved in identifying and delivering environmental projects.

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au
- Your local Council
- Boating Industry Association of NSW – phone (02) 9438 2077 or www.bia.org.au
- Australian Greenhouse Office – phone (02) 6274 1888 or www.greenhouse.gov.au

ENVIRONMENTAL COMPLIANCE – MEETING YOUR LEGAL RESPONSIBILITIES

NSW has a number of laws to help protect the environment and provide guidance to business.

The *Protection of the Environment Operations Act 1997 (POEO Act)* is the main piece of NSW environmental legislation covering water, land, air and noise pollution and waste management.

In some cases breaking environmental law carries serious penalties. If you end up in court, the prosecutor may not have to prove that you intended to cause the damage or pollution. Even accidents can result in prosecution and penalties.

Everyone involved in your business (including owners, managers, supervisors, operators, contractors and subcontractors) needs to be aware of environmental laws that apply to your operations. Individuals are required to minimise the risk of an environmental incident by implementing precautionary and control measures.

By gaining awareness of environmental laws, and how your business has the potential to affect the environment, you will be in a better position to manage risk in your business.

Managers and directors can be prosecuted for offences committed by their company, unless they can demonstrate that they exercised all due diligence to prevent the contravention of the POEO Act or that they could not influence the conduct of their company in relation to the contravention. They cannot use lack of knowledge about the contravention as a defence.

A comprehensive approach to addressing regulatory requirements includes:

- Developing a plan that incorporates environmental management
- Undertaking staff training and supervision
- Completing a self-assessment or independent audit.

These ideas are discussed in this guide.



Preventing debris entering water is a constant challenge for the industry

WATER POLLUTION

Under section 120 of the POEO Act it is illegal to pollute or cause or permit pollution of waters.

Under the Act, 'water pollution' includes introducing anything, including litter, sediment, fuel, oil, grease, wash water, debris, detergent, paint, etc. into waters or placing such material where it is likely to be washed or blown into waters or the stormwater system or percolate into groundwater.

An individual guilty of water pollution under section 120 of the POEO Act may be fined up to \$250,000, plus up to \$60,000 per day for a continuing offence. A company committing the same offence may be fined up to \$1,000,000, plus up to \$120,000 per day for a continuing offence.

Alternatively, on-the-spot fines of \$750 for individuals and \$1500 for corporations may be issued where pollution could enter or has entered gutters, drains or waterways.

You should take all practicable steps to make sure that unforeseen events, such as spills or leaks, do not result in polluted water entering the stormwater system or groundwater. This means keeping chemicals in a properly maintained and operated bunded and covered storage area, having adequately stocked spill kits on hand and making sure staff know how to use them. Under no circumstances should you hose a chemical spill down the drain.

AIR POLLUTION

Air pollution means emitting any impurities into the air, including odours, volatile organic compounds (VOCs), smoke, dust, gases, fumes and solid particles of any kind.

Under the POEO Act (Sections 124-126), businesses must maintain and operate equipment and deal with materials in a proper and efficient manner to prevent air pollution at all times.

Under Section 129 of the POEO Act, marinas, slipways or boatsheds licensed by the EPA, must not cause or permit the emission of any offensive odour from the premises.

LAND POLLUTION

Under section 142 of the POEO Act it is an offence to pollute land. Additionally, section 116 of the POEO Act makes it an offence to wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment.

HAZARDOUS MATERIALS AND WASTE

When handling hazardous materials and waste, keep in mind that it is an offence to cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment (POEO Act section 116).

Make sure you're aware of the legal requirements before using, storing, transporting and disposing of hazardous materials (e.g. dangerous goods and chemicals). The laws relating to chemical storage vary depending on the amount that you are storing. For more information contact WorkCover NSW.

The movement of most hazardous waste must be tracked during its transport to a facility for treatment, recycling or disposal. Waste may be tracked 'online' – for more information contact the DECC Environment Line on 131 555.

The most effective way of dealing with hazardous materials is to:

- Avoid them by replacing them with less toxic materials
- Use work practices that minimise their use.

INFORMATION SHEET 1



Slipway with waste water catch drain

Legal requirements for the handling, storing, treating, processing or reprocessing of any organotin wastes, including but not limited to tributyltin wastes, are prescribed in the *Environmentally Hazardous Chemicals Act* (EHC Act) 1985, your EHC Licence and the Chemical Control Order (CCO) in relation to organotin wastes.

OFFENSIVE NOISE

By law (POEO Act sections 139 and 140), you must not allow noise from your premises to be generated as a result of the failure to maintain or operate machinery or deal with materials in a proper and efficient manner.

Regulatory authorities can also issue notices and directions requiring you to reduce or cease noise from your premises that could be found offensive. 'Offensive noise' means that by reason of its level, nature, character, quality or the time at which it is made, or any other circumstance, the noise is harmful or interferes unreasonably with the comfort of people who are outside your premises.

WASTE

Under the POEO Act there are heavy penalties for unlawful disposal of waste. The owners of waste (as well as the transporters and receivers) have a responsibility to ensure their waste is managed, transported and disposed of appropriately.

The *Waste Avoidance and Resource Recovery Act 2001* encourages the most efficient use of resources, to reduce environmental harm and to provide for an ongoing reduction in waste generation.

The following hierarchy for managing waste is recommended:

- 1 Avoid unnecessary resource consumption
- 2 Recover resources (including reusing, reprocessing and recycling) and recover energy
- 3 As a last resort, dispose of the material safely and lawfully.

Are you required to report your emissions to air, land and water?

The National Pollutant Inventory (NPI) is an internet database that displays information about the annual emissions from industrial facilities and diffuse sources of 90 different chemical substances. Your facility may be required to report to the NPI if there is an industry handbook published that reflects the activities on your site (for example *Shipbuilding, Repair and Maintenance, Maritime Operations, Fuel and Organic Liquid Storage*) and if you trip any of the other reporting thresholds such as using 10 tonnes or more of any of the NPI listed substances.

For more information visit the NPI website: www.npi.gov.au or phone the DECC Environment Line on 131 555.

WHO 'POLICES' ENVIRONMENTAL LAW?

Environmental laws are policed by the 'appropriate regulatory authority' – generally the EPA (part of the Department of Environment and Climate Change NSW) or the local Council.

The EPA regulates the activities listed in Schedule 1 of the POEO Act, usually large companies and industries that have the potential to seriously affect the environment. See 'Do you need an Environment Protection Licence?' on page 12.

Note: Some larger marinas and vessel maintenance facilities are scheduled activities under the POEO Act (see p12).

Local Councils regulate other, usually smaller, businesses through notices and prosecutions. They can also regulate using development consents.

The POEO Act gives the appropriate regulatory authority the power to enter and inspect premises and issue clean-up or prevention notices and on-the-spot fines. The regulatory authority can also prosecute a business where environmental laws have not been complied with.

You must report incidents that harm the environment

If a pollution incident occurs and it causes or threatens material harm to the environment, by law you must tell the appropriate regulatory authority – either your local Council or the EPA.

You must contact Council or the DECC as soon as you become aware of the incident. This 'duty to notify pollution incidents' extends to employers, the person carrying out the activity, employees, occupiers, contractors and agents.

For more information call the DECC Environment Line on 131 555 or visit www.environment.nsw.gov.au

You must report land contamination

You must notify the EPA of any land contamination that poses a significant risk of harm to human health or the environment (*Contaminated Land Management Act 1997*). This 'duty to notify contamination' falls on the owner of the property and on the person whose activities have caused the contamination.

For more information call the DECC Environment Line on 131 555, or refer to *Guidelines on the Significant Risk of Harm from Contaminated Land and the Duty to Report* (1999). You can find these guidelines on the DECC website – www.environment.nsw.gov.au

What are the penalties for environmental offences?

The most serious offences (Tier 1 offences) are wilful breaches of the law that harm or are likely to harm the environment. These carry penalties of up to \$5 million for a company or \$1 million for an individual and/or seven years imprisonment.

Where breaches are negligent, the penalties for the most serious offences are up to \$2 million for a company or \$500,000 for an individual and/or four years imprisonment.

Most other offences (Tier 2 offences) carry penalties of up to \$1 million (plus a daily penalty of up to \$120,000 for continuing offences) for companies or \$250,000 (plus a daily penalties of up to \$60,000 for continuing offences) for individuals.

Less serious breaches can result in an 'on the spot' fine (penalty notice) with a penalty of \$750 for individuals and \$1500 for companies.

ENVIRONMENT PROTECTION NOTICES

Clean-up Notices

A clean-up notice may be issued by the EPA or local Councils when a pollution incident has occurred or is occurring. Clean-up notices may direct an occupier of a premises, or the polluter, to take clean-up action. An administration fee (currently \$320) is payable to the EPA or local Councils for the issuing of a clean-up notice. There is no right of appeal against a clean-up notice.

Prevention Notices

Prevention notices can be issued if an activity has been or is being carried out in an environmentally unsatisfactory manner. Prevention notices require that actions specified in the Notice are carried out. Prevention notices can include directions – such as installing bunding within one month around a chemical storage area. An administration fee (currently \$320) is payable to the EPA or local Council for the issuing of a prevention notice. There is a right of appeal against a prevention notice to the Land and Environment Court.

Noise Control Notices

Noise control notices can be issued to prohibit an activity, or the use of equipment, from emitting noise above a specified noise level. There is a right of appeal against a noise control notice to the Land and Environment Court.



LICENCES AND PERMITS

Do you need an Environment Protection Licence?

The EPA is the appropriate regulatory authority for activities listed in Schedule 1 of the POEO Act and is responsible for issuing Environment Protection Licences to conduct those activities.

Marinas and boat repair facilities need a licence if they comprise:

- (1) pontoons, jetties, piers or other structures (whether water-based or land-based) designed or utilised to provide moorings or dry storage (other than swing moorings) for 80 or more vessels (excluding rowing boats, dinghies or other small craft), or
- (2) works such as slipways, hoists or facilities for the repair and maintenance of vessels (other than boat repair facilities that are not adjacent to waters) at which 5 or more vessels (being vessels other than rowing boats, dinghies or other small craft) or any vessel 25 metres or longer is handled or capable of being handled at any one time.

A licence may also be required if certain waste activities are carried out on your facility, such as generation and storage of certain hazardous waste.

Licences are usually issued with conditions. These conditions may include requirements for pollution limits, monitoring, mandatory environmental audit programs, pollution studies, pollution reduction programs or financial assurances.

To find out if you require a licence:

- Call the DECC Environment Line: phone 131 555, or
- Refer to *Guide to Licensing* and check Schedule 1 of the POEO Act which can be downloaded from the DECC website – **www.environment.nsw.gov.au**

Businesses that do not require a licence are still required to comply with environmental laws.

Trade waste permit or agreement

Generally, businesses must have a written agreement or permit to discharge trade wastewater to the sewer. You must negotiate a trade waste permit with your water authority (either Sydney Water, Hunter Water Corporation or your local Council) before discharging any trade waste to the sewer. The permit establishes the discharge conditions for the wastewater.

Dangerous goods

Dangerous goods include flammable, toxic or corrosive substances, such as solvents, which should be stored in containers displaying the relevant diamond-shaped label. Since 1 September 2005 businesses that store dangerous goods in their premises may have to notify WorkCover NSW – the need to notify depends on the amount stored.

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or **www.environment.nsw.gov.au** for:
 - Guide to Licensing Under the POEO Act 1997*
 - Recent significant changes to legislation administered by DECC
 - Noise Guide for Local Government*
 - Local Government Air Quality Toolkit*
- Your local Council
- Environmental Defender's Office – phone (02) 9262 6989 or – **www.edo.org.au** for the *Environmental Law Fact Sheets*.
- WorkCover NSW – phone 13 10 50 or **www.workcover.nsw.gov.au** for:
 - NSW Code of Practice for the Storage and Handling of Dangerous Goods*
 - Notification of Dangerous Goods on Premises
- Sydney Water – phone 13 20 92 or **www.sydneywater.com.au**
- Hunter Water Corporation – phone (02) 4979 9589 or **www.hunterwater.com.au**
- New South Wales Consolidated Acts – text of all NSW Acts on line – **www.legislation.nsw.gov.au**

RESOURCE EFFICIENCY

Good managers understand that an efficient business is a profitable business.

Efficiency in running a business includes reducing the use of resources (raw materials, water and energy) and lowering the volume and toxicity of waste and other emissions. This efficiency is often referred to as 'LEAN manufacturing', 'cleaner production' or 'resource efficiency'. It involves finding ways to reduce costs and environmental impacts along the entire production or service delivery process, from the supply of raw materials to operations and distribution.

Identifying and implementing resource efficiency measures is 'easy' for managers who know their business and are prepared to have a close, systematic look at inefficiencies. It is an opportunity to profit from:

- Reducing the use of energy, water and raw materials.
- Avoiding waste and reusing and recycling materials.
- Minimising waste volumes and reducing waste toxicity to lower the cost of treatment and disposal.
- Implementing process changes to increase production and reduce spoilage.
- Reducing the use of hazardous and dangerous materials to minimise dangerous goods storage and environmental and OH&S liability risks.
- Providing a safe, clean and pleasant work environment that leads to increased staff productivity.

WHERE DO I START?

Plan and organise

Dozens of success stories prove that a team approach to resource efficiency is best. With management support, establish an environment team that includes staff from different areas of the business. Appoint a 'champion' or team leader and consider inviting suppliers or customers to join the team on occasions. Ideally, the environmental champion will have the full support of management and other staff.

From the outset, identify how you will integrate resource efficiency into business planning and staff responsibilities.

Assess and measure

The environment team needs to assess the processes, material flows and costs within the business, and identify any internal barriers that may be preventing the implementation of more efficient practices.

The team should start by collecting baseline data on resource use and waste – what gets measured gets considered! The team should also complete an initial business and process assessment, which could include brainstorming sessions, a facility 'walk-through' or a more formal audit. It's also wise to involve an outside person with technical expertise who can provide a 'fresh pair of eyes' and ideas from other companies.

The initial assessment and data will provide you with a benchmark against which to measure ongoing improvement.



Costs savings can be achieved by installing skylights and roof insulation and by using energy-efficient lighting



Avoid loss of raw materials and reduce VOC emissions by keeping lids on chemical containers and fitting taps

Identify opportunities and implement priority actions

Your assessment of resource use will almost certainly identify immediate opportunities for cost savings, and these should be implemented as quickly as possible. These 'small wins' will help to maintain the team's enthusiasm. Other ideas may need further research and assessment and may take longer to implement.

The team should record ideas and options and prepare a simple action plan outlining opportunities, issues requiring further investigation, priorities, timeframes and staff responsibility for actions. As a starting point, the team could use the environmental action plan template in the 'Useful tools' section of this guide, and adapt it to suit your business.

Document results and evaluate success

Record financial investment in resource efficiency projects and the time taken to recover these costs – known as the 'payback' period. Set up simple

spreadsheets or other tools to document project results in terms of their financial, environmental and other outcomes. Take the time to note 'qualitative' results such as staff enthusiasm, improved working relationships with suppliers and comments from customers. These records will help to justify further resource efficiency projects.

Reward and revisit

The work of the environment team should be acknowledged and the team should be encouraged to continue to look for new ideas. Consider 'refreshing' the group by alternating leaders and inviting new team members. Remember, efficiency is a continuous process and the resource efficiency plan should be regularly revisited.

What if my business is too small for an environment team?

Simply follow this suggested process on your own or with one or two workmates.

INFORMATION SHEET 2

OPPORTUNITIES FOR MARINAS, BOATSHEDS AND SLIPWAYS

Cost-effective resource efficiency opportunities can be found in several areas:

Managing waste

- Make sure vessel facilities include waste bins for domestic waste, hazardous substances, fish waste, waste oil, oily mixture, scrap metal and wastewater (including bilge water).
- Segregate waste for recycling. Mixing wastes may make them unsuitable for reuse or recycling. For example don't mix waste oil and solvents.
- Encourage staff to use metal /steel recycling bins for offcuts and waste scrap.
- Return empty drums to suppliers.

Saving energy

- Check the efficiency of electrical equipment and machinery regularly – this may reduce your energy consumption.
- Check your compressed air system for leaks and fix them. They make compressors run unnecessarily and result in higher electricity use.
- Operate air compressors with variable speed drives at minimal pressure to reduce air leaks and energy use. Turn off air compressors on non-working days and during breaks.
- Switch off lighting when it's not required and install energy-efficient lighting on marina walkways and areas that need permanent lighting. Install skylights and use natural lighting where possible, and keep skylights and lights clean.
- Increase the thermostat setting on your air conditioner by 1 to 2°C in warm weather, and decrease it slightly in cool weather.
- Check the efficiency of the workshop dust extraction system and clean filter bags regularly.

- Improve building insulation and enclose and ventilate heat-generating equipment.
- Use high efficiency electric motors and install electricity usage meters to measure the amount of electricity used in different parts of the business.
- Ask your electricity supplier about using power factor correction equipment. This will regulate the power received in your premises and may result in substantial cost savings.
- Regularly check fuel tanks for leaks – this will avoid fuel loss.

Saving water

- Fit a rainwater tank and use rainwater to clean boats, irrigate your gardens and supply toilets.
- Check taps, toilets and showers for leaks and drips and repair them promptly. Ensure all taps are turned off when not in use.
- Fit water minimising controls where possible, e.g. spray nozzles on hoses, AAA-rated low-flow taps or tap aerators, water-efficient showerheads (which also save energy by reducing hot water use), low-flush toilets and sensors for urinal flushing.
- Keep water-using equipment well-maintained and check it periodically for leaks. Make sure staff are encouraged to report leaks and repair them promptly.
- Use water meter data to identify leaks.

Reducing hazardous materials and waste

- Reduce use of hazardous materials. Conduct an inventory of all the chemicals you use and assess if you can stop using some of them.
- Consider using less toxic chemicals. For instance, consider using water-based paints, water-based or biodegradable strippers, cleaners or degreasers.

- Switch to long-lasting, low-toxicity antifouling paint. Recommend antifouling paints to your customers that are effective but contain the minimum amount of toxin.
- Stay informed about antifouling products, like Teflon, silicone, polyurethane, and wax that have limited negative impacts. Pass on the information to your customers.
- Organise your chemical storage area so that older chemicals are readily accessible and used before they become 'out of date'.
- Keep lids on the containers of solvents and solvent-based chemicals and fit taps to reduce evaporation and unnecessary loss of product.
- Segregate recyclable liquids for collection by a licensed waste contractor.



Trigger nozzles save water

Working with suppliers and customers

- Encourage suppliers to provide materials in bulk, collect empty containers and take back their packaging for reuse or recycling.
- Ask your chemical suppliers for less toxic alternative products.
- Promote the benefits of being an environmentally responsible marina to your staff, suppliers and customers. This could enhance your reputation and you could gain extra publicity.
- Provide recycling bins that are easily accessible.

Technology upgrades

- Fit all hoses with a trigger nozzle – they can reduce water use by 30 to 50%.
- Use sensor-activated lighting in buildings and areas where permanent lighting is not required.

DON'T FORGET THE FEEDBACK

Don't forget to regularly communicate resource saving successes to your staff, customers and suppliers.

FURTHER INFORMATION

- Boating Industry Association of NSW – phone (02) 9438 2077 or www.bia.org.au for: Clean Marinas Program
- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au for: *Profits from Cleaner Production: A Self-help Tool for Small to Medium-sized Businesses*
Water and energy saving ideas

- Your local Council
- Sydney Water – phone 13 20 92 or www.sydneywater.com.au for information on the 'Every Drop Counts' program (a water saving program for business) and water saving ideas

MANAGING WATER QUALITY

As most people in the boating industry are well aware, pollution of waterways is bad for tourism and for boating. The boating and marina industry has a vested interest in maintaining and improving the quality of our waterways by ensuring that its activities, and those of its customers, do not contaminate the environment.

PROTECTING WATERWAYS

Most activities carried out by marinas, boatsheds and slipways are adjacent to waterways and have the potential to pollute waters. Every activity must therefore be carried out in a way that protects the environment.

Polluting stormwater or waterways, whether intentional or not, is a serious offence and can

lead to fines and legal proceedings. For more information, refer to 'Information sheet 1: Environmental compliance'.

The information in this section is designed to complement the DECC environmental guidelines *Best Management Practice for Marinas and Slipways*. For a copy of these guidelines call the DECC Environment Line on 131 555.



Hardstand area fitted with an effective catch drain

The drain is just for rain!

Stormwater is rainwater that flows directly across outside surfaces into stormwater drains or directly into waterways. Stormwater should not contain any pollution from your business activities. If pollutants such as antifouling, lead-based paint, solvents, oil, dust or other substances are allowed to enter the stormwater system or waterways they can cause serious damage to the environment and pose a health hazard for humans.

The following measures will help you reduce the chance of polluting waterways:

- Make sure staff know that chemicals including paint, solvents or other toxic substances must not be poured on the ground, into stormwater drains or waterways.
- Allocate responsibility for keeping outdoor surfaces free of debris.

First flush

'First flush' is the term used for the first 15 mm of rain that falls on the operational work areas of your site. To avoid water pollution, it is recommended that you catch and treat this water.

To calculate the size of the tank required to hold your first flush, multiply 15 mm by the square metre area of your operational catchment areas. Your catchment and treatment system must be large enough to hold or treat this quantity. If you are using a filtration system the plant must be switched on at all times so that, in the event of a storm, float switches will activate the system and start the plant. For more information on first flush systems, check the DECC web site or call the DECC Environment Line on 131 555.

Can dust pollute stormwater?

Yes – dust and sediment accumulation can pollute stormwater. This can occur when dust is swept, hosed or left to be washed by rain into gutters or the stormwater system. Dust in the water can starve fish, frogs and other aquatic life of oxygen (oxygen is depleted because the dust increases the carbon load on the water), as well as potentially carrying oils and metals into the environment.



Wastewater catch drain. The drain collects and then directs waste liquids, paints and solids to a collection pit / silt trap. The collected wastewater is pumped through a filter to a holding tank for reuse or disposal to the sewer.

Sweep and collect paint chips (don't hose) immediately after scraping or sanding.

INFORMATION SHEET 3

WHAT SHOULD YOU DO TO PREVENT WATER POLLUTION?

Ensure antifouling paint and marine incrustation scraped or blasted from hulls and other pollutants are not allowed to enter waterways as they may contain toxic substances and increase nutrient levels.

- Avoid working over tidal areas.
- Regularly clean and maintain work areas.
- Install a floating boom around the slipway to stop flotsam entering the waterway.
- Use tarpaulins on slip rails to catch falling particles.
- Cover work areas or, if possible, move work into the workshop.
- For information on fuel dispensing refer to Information sheet 5 on page 38.

As part of the water treatment plant on the slipway, install filtration technology capable of filtering hull fouling and marine biota (with an average diameter of 60 microns and greater) to minimise the risk of introducing or translocating pests.

Vessel maintenance on slipways and hardstand

To prevent water pollution from vessel maintenance on slipways and hardstands:

- Make sure all work carried out on the slipway is situated above a catch drain so all waste is captured and cannot enter the waterway.
- Investigate whether you can improve the way antifouling build-up is removed from boat hulls. New technologies, such as fully contained grit blasting or chemical stripping, can help contain residues. For details about these services look in the Yellow Pages under 'Paint Removal', or contact the Boating Industry Association of NSW.
- Large-scale antifouling removal or sanding should be done in an enclosed shed or workshop and on hard stand. If this is not possible, construct an enclosure (tent) with tarpaulins to capture the dust generated.
- Follow a regular maintenance program to check whether measures designed to minimise water pollution are working effectively or could be improved.
- When carrying out shipwright repairs to the structure of vessels, ensure that dust from sanding timber, fibreglass or paint is collected and is not released into the atmosphere.



Water treatment and filtration equipment that recycles washdown water



Large-scale antifouling removal and sanding done in an enclosed shed. Tarpaulin is used to contain droppings and spilled materials.

- Use appropriate machinery and work practices to control dust, such as sanders fitted with dust bags or an extraction system. Moveable screens and shields can also help. During high winds, some tasks may need to be rescheduled to prevent the risk of pollution.
- Glues, resins and paints should be used with care. Avoid spills by using a proper containment system and drop sheets under your work area. Follow the correct procedures for their disposal (refer to 'Information sheet 5: Hazardous materials and liquid waste').
- When servicing outboard motors or stern drives, make sure all work is carried out above catch drains. When draining oil from gearboxes use a container that can be sealed once full and place it in a larger plastic box to contain spills.
- When using roller trays on the slipway, place the tray inside a plastic container or fish box. This makes a full roller tray easier to carry around a work site, acts as a bund to contain spills and provides a flat support surface when putting the tray on a narrow plank or cradle.
- Make sure waste bins are conveniently located around the slipway. Use small 'wheelie bins' on slipways and hardstands – they are easy to move around the site and their lids contain rubbish in windy conditions and keep rain out.
- Mix paints and solvents away from the water and prevent dripping into the water.
- Avoid mixing paint or cleaning brushes on open floats or other structures over the water.

INFORMATION SHEET 3

Tidal slipways

If you use a tidal slipway it is imperative that you take all possible precautions for capturing waste materials and wastewater before they fall on the sand or water. For example:

- Time work activities to coincide with low water levels.
- Place a tarpaulin under the vessel being serviced to capture 'fall out'. Sweep and collect up the waste captured by the tarp and dispose of it correctly (refer to 'Information sheet 5: Hazardous materials and liquid waste'). When the tarp is not in use, roll it up and store it in a covered area.
- Regularly clean and maintain the work areas. Make sure that particles or wastewater from cleaning or maintenance work cannot fall or drain into stormwater, onto foreshores or into the marine environment.
- Do not use water blasters, solvents, detergents or acids where the run-off is not captured and could enter the waterway.

VESSEL MAINTENANCE ON MARINAS AND WORK BERTHS

In-water mechanical repairs

- When servicing larger vessels in water, take care when moving fluids and parts to and from the boat. Seal all fluids in secure containers. Transport dirty oil filters in buckets with a sealed lid.
- Place spare parts, oil filters, etc. in drip trays.
- Oil filters cannot be disposed of in normal waste bins, i.e. sent to landfill. If properly drained, metal filters can be sent to scrap metal recyclers.

Outboard motors and trailer boats

Do not clean or repair engines or parts in outdoor areas where they could contaminate the ground, the foreshore or the water.

All outboard motor test tanks should be located in a covered and bunded area so that they cannot overflow and discharge oily water during rain. See 'Information sheet 5: Hazardous materials and liquid waste' for further information on bunding.



Debris and dust must not enter water



Outboard motor test tank in a bund

Cleaning boats and motors

Prevent pollutants discharging into the water when cleaning boats and motors:

- Where possible, rinse boat decks with water only. This may mean more frequent rinsing to avoid dirt and grime build-up.
 - Use detergents with a low phosphate content. Stop sudsy water from washing off the deck by using a broom or mop and collecting the wash water in a bucket. Empty the wash water onto a landscaped area, or into your wastewater system.
 - Wipe off as much oil, fuel and dirt as possible from a motor before rinsing it.
 - Wash or rinse outboard motors in a work area where run-off drains to a pit and wastewater is properly treated, reused or disposed of to a trade waste system.
 - Prohibit in-water bottom cleaning, hull scraping or any underwater process that could remove antifouling paint from the boat hull. It is impossible to contain the debris that end up in the water.
- If in-water bottom cleaning is allowed, insist that customers and contractors use only soft sponges to clean marine growth and use stainless steel pads or brushes only on unpainted metal areas (never on bottom paint). Coloured plumes of paint near underwater cleaning activity should not occur.
 - When working on boats in the water, fix masking (plastic sheeting) from under your work area to the wharf or pontoon to catch dust, shavings, paint and other drips.
 - Always have a waste bin on site while carrying out repairs. Wood shavings, paint flakes or masking materials can easily blow into the waterway if they're not contained.
 - Keep a vacuum cleaner on site to clean dust and shavings at regular intervals.
 - When working on a timber wharf, always place a drop sheet or old carpet under your tools and materials so nothing can fall between the planks and into the waterway.
 - Place spare parts in a drip tray.



Boat being repaired with masking from the hull to the wharf

INFORMATION SHEET 3

WORKSHOP REPAIRS

When dismantling engines in the workshop, make sure this is carried out in an area where any residual oil and coolant that escapes from the engine does not drain on soil or into the waterway. A metal workbench with a small lip works well. Drill a small hole in the middle or at the lowest point and place a bucket under it to catch any fluid.

You should also:

- Place oil absorbent pillows under each engine.
- Make it a routine part of your servicing procedure to clean and repaint engines on completion. This practice makes it easy to spot oil leaks so they can be fixed before oil laden bilge water is pumped into waterways.
- When the engine service is complete, clean and wipe down the engine bay and dispose of oily water in a liquid waste tank or the oil/water separator.

TRADE WASTEWATER

Trade waste is any liquid, and any substances contained in it, produced by an industrial or commercial activity at a business premises.

Trade wastewater from marinas, boatsheds and slipways may contain pollutants such as sediment, particles and chemicals and must not enter the stormwater system or waterways. Trade wastewater includes blast water but doesn't include wastewater from toilets, bathrooms or non-commercial kitchens or laundries.

There are several options for dealing with wastewater captured from your slipway, hardstand and other work areas:

- Contact your local water authority about wastewater pre-treatment and setting up a trade waste agreement which allows you to discharge wastewater into the sewerage system.

- Collect run-off in a storage tank and arrange for a licensed waste contractor to remove it for treatment off-site.
- Invest in appropriate filtration equipment and hold wastewater in a storage tank for reuse in the water blaster.

Discharging to the sewer – legal requirements

You must have a trade waste agreement or permit from your local water authority to discharge trade wastewater to the sewer.

The two main water authorities in NSW are Sydney Water in the Sydney, Blue Mountains and Illawarra areas, and Hunter Water in the Newcastle region. Outside these areas, local Councils are the local water authority and manage trade wastewater.

Your agreement or permit will set out the discharge conditions for trade waste. Most water authorities require businesses to treat trade waste before discharging it to the sewer. As a guide, the minimum treatment often required for discharge to the sewer is a coalescing (corrugated) plate interceptor (CPI). A CPI directs wastewater to a tank in which the solids and liquids separate. If they meet the requirements set by the local water authority the liquids can be discharged to the sewer.

Sydney Water and Hunter Water have trade waste officers who can help you fill out an application form for your trade wastewater permit.

MANAGING SEWAGE FROM VESSELS

The discharge of untreated sewage from vessels is prohibited in all NSW waters and there are also 'no discharge zones' for treated sewage. NSW regulations require that all commercial vessels with toilets that operate in Sydney Harbour, the Murray River or other inland waters have holding tanks for sewage and galley waste. It is an offence if the contents of this holding tank are not discharged to an approved facility.

Marinas in Sydney Harbour must provide pump-out facilities if the marina has nine or more berths. Similar requirements apply in other areas. Mobile pump-out facilities are available on most NSW waterways.

- Contact NSW Maritime for more information about managing sewage waste from vessels and the requirements for installing holding tanks (see details in 'Further information' below).
- Provide pump-out facilities for your customers. Prepare a couple of quotes for different types of holding tank systems and offer these to customers whose boat is not fitted with an appropriate system.
- Include toilets and their associated systems in the annual service you offer to your customers. This can increase your business and will protect the environment.



Promote the use of sewage pump-out and facilities

BILGE WATER

Discourage boat owners from discharging contaminated bilge water into the waterway. Promote the use of oil absorbent products on all vessels. For example, there are many products available for dealing with discharge from the bilge, such as absorbent pillows that retain oil but not water. These can be purchased from most ship chandlers.

To avoid automatic pumps activating and discharging oily water, remove bilge water before slipping a vessel.

EDUCATING YOUR CUSTOMERS

Keep your customers informed about the environmental improvements you make to your business. Let them know what is expected of them as customers of an environmentally aware business. Give them a copy of your company's Environmental Policy and provide simple step-by-step procedures on how to use facilities.

Take the time to show new customers around your marina and show them how you have set up recycling and waste systems. Ask them to pass this information on to their families and guests.

Encourage customers to be environmentally responsible and dispose of liquid and solid wastes in designated areas. Clearly label waste containers and locate them in convenient areas to encourage use.

INFORMATION SHEET 3

KEEPING COSTS DOWN

The following ideas may help reduce your running costs:

- Install a rainwater tank. Clean stormwater is also a valuable resource – capture it where possible and use it for watering grounds or connect it to toilet blocks.
- Find out if your wastewater can be treated for reuse.
- Save money by conserving water. Check taps and toilets for leaks and drips. Replace washers where required. Install AAA-rated low-flow taps or tap aerators, dual flush toilets and water-efficient showerheads.
- Investigate the cost-benefit of recycling thinners and cleaning fluids.

WHAT THE LAW SAYS

Environmental laws require that you do not pollute waters or the land. In practice this means that operators of marinas, boatsheds and slipways should:

- Keep oils and hazardous chemicals in bunded and covered storage areas.
- Ensure that any chemical spill or leak is contained and doesn't enter waterways, stormwater drains or soak into the soil.
- Maintain all plant and equipment in a proper and efficient manner.
- Ensure that dust and other debris do not enter waterways or stormwater drains.
- Ensure liquid waste is sent to a facility that can lawfully take it.
- Never hose chemical spills down the drain.

Any spills or pollution incidents that cause material harm to the environment must be reported to the appropriate regulatory authority – either the EPA on 131 555 or the local Council.



To minimise spills, ask your staff to supervise customers using fuel bowzers



FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au for:
 - Best Management Practice for Marinas and Slipways*
 - Information on bunding and spill management
 - Information on stormwater ‘first flush’ systems
 - Take charge of you discharge – A Guide to Responsible Use of Marine Toilets*
- Australian Government Department of the Environment and Water Resources – www.deh.gov.au for:
 - Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance* (ANZECC)
- NSW Maritime – phone 9563 8511 or www.maritime.nsw.gov.au for:
 - A list of pump-out facilities
 - Environmental information for you and your customers
- Your local Council
- Sydney Water – phone 13 20 92 or www.sydneywater.com.au for:
 - Trade waste agreements
 - Water saving ideas
- Hunter Water – phone (02) 4979 9589 or www.hunterwater.com.au for:
 - information on trade waste agreements and water saving ideas
- WorkCover NSW – phone 13 10 50 or www.workcover.nsw.gov.au

MANAGING AIR QUALITY

Dust, fumes and smoke generated by boat maintenance and marina activities can cause air pollution and should be an ongoing management issue.

MANAGING DUST

Removing antifouling build-up from boat hulls is one of the more environmentally challenging tasks performed by slipways.

To reduce dust when removing antifouling and paint make sure you take the following precautions:

- Fit sanding machines with a dust bag or extraction system. Collect dust as close to the source as possible.
- Ensure that no dust leaves your boundary. Because dust is difficult to control, especially on windy days, this really means that no dust should leave your building. An efficient extraction system and effective housekeeping will address this.
- For antifouling removal or sanding on a larger scale, place the boat in an enclosed shed or workshop. If this is not possible, construct an enclosure (tent) with tarpaulins to capture the dust you are generating. It is common practice to connect a mobile dust extraction system to these enclosures to extract and capture the dust. After completing the work, vacuum up any remaining dust before removing the enclosure.
- Sandblasting is not recommended for removal of antifouling paint. If sandblasting is necessary, see information on 'Abrasive Blasting' below.
- Always use a suitable dust mask when sanding. Check with WorkCover NSW concerning occupational health and safety requirements.
- Regularly sweep or vacuum work areas.

Removing antifouling and paint

Antifouling paints are toxic to marine life and can be absorbed by edible fish and shellfish. The toxicants in antifouling paint can be passed up the food chain from mussels and worms to fish, birds, and humans. The toxins in antifouling paints enter the environment through spillage, sanding, sand blasting, or scraping. Antifouling paint chips and dust left on the ground or driveway can be transported into the water by stormwater runoff.



Antifouling removal. This method of antifouling removal uses a chemical sprayed on the surface to soften the coating. It can then be scraped off and caught on a plastic drop-sheet.



Machinery fitted with a dust extraction and collection system



Antifouling removal or sanding is best conducted in a shed or workshop

Experienced contractors with mobile units can come to your site and perform antifouling removal and gelcoat stripping for osmosis repairs. Ask the Boating Industry Association of NSW for a list of contractors in your area.

Abrasive blasting

If abrasive blasting is required, all wastes generated (e.g. blast agent and paint debris) should be contained and collected. Abrasive blasting can be conducted in commercially built booths, blasting yards or inside temporary enclosures erected on-site.

To manage dust and particles resulting from abrasive blasting, make sure you take the following precautions:

- Ensure the booth or enclosure is properly sealed.
- Use a filtration system that is capable of dealing with the amount of particulates and dust produced.
- Regularly maintain the filtration system

and blasting equipment (blast hoses and nozzles) to avoid excessive production of particulates and dust.

- Sweep or vacuum the spent abrasive material and place it in a bin with a closed lid.

New technologies

In recent years new technologies have emerged and better methods are available to the industry. These new systems are clean, contained and environmentally safe. For instance, antifouling removal can be done with a stripper contained within a plastic film.

For details of these services look in the Yellow Pages under 'Paint removal Services and/or Supplies' or contact the Boating Industry Association of NSW: www.bia.org.au

Use dust-collecting sanders when sanding anti-fouling paint.

INFORMATION SHEET 4



Airless spray guns, high-volume low-pressure spray guns and rollers minimise air emissions

MANAGING AIR EMISSIONS

Applying paint

To reduce air emissions, restrict outside painting and respraying to minor repair and detailing work and only at times where the weather conditions do not promote the release of pollutants to the air. Consider wind direction and velocity and ambient air temperature.

Consider changing your work practices when applying paint. In order of preference, apply paint by using:

- Rollers or brushes
- Airless spray guns
- High-volume low-pressure spray guns – these reduce the amount of over spray, paint usage, release of volatile organic compounds (VOCs) and odours.

Spray painting

If vessel spray painting is required, spraying should be conducted:

- Inside designated structures with ventilation and filter systems.
- At designated shore-side areas or zones away from open water, with temporary structures or plastic sheeting provided to minimise the spreading of overspray.
- In covered slips, with tarps and sheeting installed with a tight seal between the vessel being worked on and the floats or walkway surface.
- Away from the water. If an emergency repair on a vessel is required, use protective sheeting and ensure that it is removed with care to prevent loss of accumulated waste material into the water.

Consider your location and neighbours. For example, don't spray if it is windy or on weekends.

For further information on Spray Painting refer to the *DECC Local Government Air Quality Toolkit – Spray Painting Operations* guidance notes. See page 37 for information on solvent use.

Fibreglassing

The processes involved in fibreglassing, whether using epoxy, polyester, or vinylester resins for small or big jobs, can release harmful emissions and odour. Ensure you take the following precautions:

- Fibreglassing spray lay-up should be carried out in a booth or enclosure fitted with appropriate environmental controls. Where this is not practical, odours and other emissions must be controlled by other means, including the use of buffer zones to avoid impact on neighbours.
- Store drums, brushes and containers of resin and other chemicals used for fibreglassing in a bunded and covered storage area.
- Place fibreglass mat off cuts that cannot be used in production or the repair job in sealed plastic bags before disposal.
- Implement dust control measures.
- Take special care when decanting resin. The storage containers should be sealed immediately.

For larger fibreglassing jobs further information can be found in the *DECC Local Council Air Quality Toolkit – Composite Structural Products* guidance notes.

Liquid petroleum gas (LPG) and petrol

Petrol Sales

Marinas that sell petrol may require vapour recovery systems, although diesel does not require vapour recovery.

Vapour recovery

Up to 50% of all the vapours lost at a petrol distribution system are lost when the tanker deliveries the fuel.

Vapour recovery means that during fuel deliveries vapours from the underground tanks are transferred back to the delivery tanker during the fill. The tanker vapours are re-captured and returned to fuel at the terminal.

Marinas located in the Sydney Metro area that have petrol storage tanks with a capacity of 8 to 150 kilolitres are required to have vapour recovery.

The Sydney Metropolitan Area covers the area constituted by the local government areas of Ashfield, Auburn, Bankstown, Baulkham Hills, Blacktown, Botany Bay, Burwood, Camden, Campbelltown, Canterbury, Concord, Drummoyne, Fairfield, Holroyd, Hornsby, Hunters Hill, Hurstville, Kogarah, Ku-ring-gai, Lane Cove, Leichhardt, Liverpool, Manly, Marrickville, Mosman, North Sydney, Parramatta, Penrith, Pittwater, Randwick, Rockdale, Ryde, South Sydney, Strathfield, Sutherland, Sydney, Warringah, Waverley, Willoughby and Woollahra.

Marinas that sell less than 600 kilolitres of fuel per year can apply to the DECC for an exemption. However the DECC encourages all marinas to install vapour recovery for the environmental benefits, hazard reduction and occupational health and safety benefits.

If you require additional information on vapour recovery refer to the *Environmental Action for Service Stations* on the DECC web site. If you wish to report non-use of vapour recovery equipment contact the DECC Environment Line on 131 555.

To minimise vapour leaks and spills of gas and petrol:

- Check your gas cylinders daily to make sure there are no minor leaks and bottles have not been left partially open.
- Fence-in large tanks to prevent tampering.

INFORMATION SHEET 4

REFRIGERANT GASES – DO YOU NEED A LICENCE?

Marinas

Marinas and boat sheds that install, service or decommissions vessel air conditioners or refrigerators that use ozone depleting or synthetic greenhouse gas refrigerants, must hold a national Refrigerant Trading Authorisation. They must conform to requirements and standards detailed in the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995. Technicians must hold a national Refrigerant Handling Licence. You can apply for an authorisation or licence through the Australian Refrigeration Council at www.arctick.org or by phoning 1300 884 483. Further information on the national system is available at www.deh.gov.au.

KEEPING COSTS DOWN

The following ideas may help reduce your running costs:

- Check that containers of solvent and paint are stored with their lids closed to avoid evaporation and loss of materials.
- Use spray equipment with high transfer efficiency. Paint guns used in spray booths should be either High Volume Low Pressure (HVLP) or High Efficiency Low Pressure (HELP). HVLP guns can reduce overspray by 25% to 50%.
- Electrostatic spraying also requires less pressure, produces little overspray and uses relatively little paint, but the system needs to be properly earthed.

WHAT THE LAW SAYS

It is an offence to cause air pollution (which includes dust and odours) through the inefficient operation or maintenance of equipment or handling of materials.

In practice, this means you need to:

- Conduct spray-painting under cover or in conditions that are not likely to result in paint drifting.
- Make sure lids are kept on chemicals containers so vapour cannot escape unnecessarily.
- Never use evaporation as a method of disposing of solvents.
- Control dust by setting up an effective dust collection and extraction system and ensure that no dust leaves your premises.
- Ensure odours generated by your operations are not detectable beyond your boundary. If odours are affecting any person outside the boundary of your premises then you may be issued with a notice requiring you to carry out work to prevent the odour or be open to other regulatory action.
- Open air burning and incineration of wastes is illegal in most local Council areas, unless you are expressly permitted to do this by an Environmental Protection Licence or by an approval under the *POEO (Control of Burning) Regulations*.



Antifouling removal using a dust collecting sander

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au for:
The Local Government Air Quality Toolkit
Draft Policy Assessment and Management of Odour from Stationary Sources in NSW
Best Management Practice for Marinas and Slipways
Spray Painting Safety Guide
- WorkCover NSW – phone 13 10 50 or www.workcover.nsw.gov.au for:
- Your local Council
- Yellow Pages – www.yellowpages.com.au.
Look under 'Environmental and/or Pollution Control Consultants', 'Air Filters', 'Air Pollution Monitoring Equipment':
- Boating Industry Association of NSW – phone (02) 9438 2077 or www.bia.org.au

HAZARDOUS MATERIALS AND LIQUID WASTE

Spill prevention and appropriate storage of chemicals will benefit your staff, customers and the environment.

STORING AND USING CHEMICALS

The most common chemicals used by marinas, boatsheds and slipways are thinners, turps, solvents, resins, acetone, acids and antifoul.

Fire hazard prevention and occupational health and safety (OH&S) are important considerations affecting how you store, use and dispose of chemicals. You need to comply with the WorkCover NSW requirements relating to chemical hazards in the workplace. WorkCover NSW publishes a range of useful guides about this.

Chemicals present a risk, not only to health and safety, but also to the environment. Chemical spills that reach stormwater drains can pollute local creeks, rivers and waterways. Fires involving chemicals can spread toxic fumes.

Note: In this guide 'hazardous waste' refers to wastes classified as hazardous, industrial or Group A in accordance with the DECC *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*.

To reduce risks to the environment:

- Store all chemicals and liquid waste awaiting collection for off-site treatment in bunded and covered areas (see information on bunding – page 35). Seal the drums, store them upright and have them removed as soon as possible.
- Store each type of chemical in a separate container and non-compatible chemicals or materials well away from each other. Inspect storage containers regularly and replace them if they are rusted, damaged or likely to leak. Allow yourself easy access.
- Clearly label each container with the name of the chemical it contains. Keep an up-to-date register of all chemicals on site, including Material Safety Data Sheets (see page 35).
- If you use or store flammable liquids, you must comply with Australian Standard (AS) 1940–2004: *The storage and handling of flammable and combustible liquids*.
- Where chemicals are in constant use, place drip trays where leakage is likely to occur. Regular equipment maintenance and careful handling will help prevent leaks and spills.
- Make sure all staff know about the potential hazards of the chemicals on-site.

Tributyltin oxide (TBT) anti-fouling paints are no longer registered in Australia and their use is now illegal. For more information go to the Australian Pesticides and Veterinary Medicines Authority (APVMA) web site – www.apvma.gov.au

Labels on chemicals

Make sure staff read the labels on all the chemical products they use. Labels on chemical products help to identify the product, its ingredients, and its hazards or dangers. Labels also contain important health and safety information.

Material Safety Data Sheets

A Material Safety Data Sheet (MSDS) is an information sheet about the safe handling, storage, transport and disposal of a material. It is just as important as any tool or piece of equipment in your business. The information on the MSDS can save lives in an emergency and you should:

- Make sure you receive an MSDS for every hazardous substance you buy or use. If you don't have one for a material, ask your supplier.
- Make sure all relevant MSDS are readily accessible and check they are up-to-date.
- Make sure all staff have read the labels on all the chemical products they use. Labels on chemical products help to identify the product, its ingredients, and the hazards or dangers of the product. Labels also contain important health and safety information.

WorkCover NSW also has some useful publications on managing chemical hazards in the workplace. Phone 13 10 50 for more information.

PREVENTING AND CONTAINING SPILLS

Chemical spills can pollute waterways, contaminate soil and make your business open to prosecution and clean-up costs. To reduce the risk of spills:

- Minimise the movement of chemicals or other liquids.
- Fit taps to chemical containers so that hand pouring is not required.
- Where you have to pour by hand, use a funnel.
- Regularly check your fuel tanks for leaks.
- Regularly check fuel lines and bowisers on wharf areas.

Bunding

Chemicals should be stored in a bunded area to prevent spills reaching waterways or soaking into the ground. Bunding is secondary containment of stored materials.

The main type of bunding for bulk liquids is a solid concrete or brick wall made of any impervious material (i.e. liquids can't flow through). Bunding must be appropriate for the type of liquid contained, as some chemicals can permeate concrete and brick. Bunded chemical storage units can be purchased for smaller chemical storage needs or bunding can be constructed in situ. The volume of the bund should be large enough to hold the contents of the largest container plus 10% of its volume.

Outdoor bunded areas should be roofed to prevent rain entering them and washing pollutants out or rusting metal drums. Check with WorkCover NSW regarding safety considerations before installing a roof over bunded chemicals.

A bund should be regularly maintained and appropriately operated.

INFORMATION SHEET 5



Storing chemicals in a bunded and covered area will contain spills

The following containment practices are recommended:

- Store oils and potentially hazardous liquids on plastic pallets or trays and in a bunded and covered area isolated from stormwater run-off. Make sure spill response materials are on hand at all times.
- If the walls and workshop floor are well sealed, an impervious hump can be installed at all doors of the workshop. Oils and chemicals can be stored anywhere inside a workshop that is fully bunded in this way.

- Any liquids collected in the bunded area should be pumped or drained out as quickly as possible.
- The liquids should be collected by a licenced waste contractor.
- If you drain the bund, don't forget to reset the drain tap.

Additional information on bunding and spill management is available from the DECC web site: www.environment.nsw.gov.au

Store all hazardous liquids, such as paints and solvents, in a properly maintained and operated bunded area with a roof that excludes rain.

Dealing with spills

Clear signs outlining spill clean-up procedures and emergency contact numbers should be prominently displayed on your site.

All chemical and other spills should be cleaned up immediately – no matter how small. Spill kits should be appropriate for the operation and the materials stored on-site. They should include booms to contain liquid, material to block drains, and material to absorb spills.

Spill kits should be kept stocked with relevant absorbent and clean-up materials.

If a spill occurs that causes or threatens 'material' harms to the environment, you must tell DECC or your local Council immediately.

Under no circumstances should you hose a chemical spill down a drain or into the water.

The general response to spills is:

- 1 Eliminate the source of the spill immediately if it is safe to do so.
- 2 Contain the spill. Use the materials in the spill kit to contain the spill and control its flow. If necessary, stop the spill from entering waterways by using a boom, or block the stormwater drain inlets.
- 3 After referring to the relevant MSDS, clean up the spill promptly. It is important to clean up all spills quickly, even small ones, as they can easily flow into waterways or stormwater drains or be washed there by rain.
- 4 For major spills, call the Fire Brigade on 000.
- 5 Store all waste generated from spill clean up in a sealed vessel (limiting emission of odorous or volatile compounds) and in a bunded and covered area.
- 6 Contact a waste contractor who is licensed to dispose of the absorbents used in the spill clean-up.

Make sure all staff are aware of emergency telephone numbers to call in the case of a spill. A template of emergency contacts is included in the 'Useful Tools' section of this guide.

Prepare and practice a spill clean-up plan. Staff should know what to do, where to find emergency equipment and how to use it.

SOLVENTS

Solvents used in strippers and cleaning products evaporate into the atmosphere and contribute to photochemical smog and contaminate land and water. Solvents tend to be highly volatile and flammable.

To reduce risks to the environment:

- Store solvents away from heat, naked flames, direct sunlight, oil or other flammable liquids.
- Avoid unnecessary evaporation and loss of solvents by storing them in a sealed container with a tap (to avoid the need to pour). Keep containers closed when they are not in use.
- Use water-based or biodegradable strippers, cleaners or degreasers wherever possible.

When handling solvents always wear the protective equipment recommended on the MSDS, such as gloves, protective eyewear and respiratory gear. Keep the storage area well-ventilated.



Spill kits should be located where they are readily accessible, such as on the wharf

INFORMATION SHEET 5

DISPENSING FUEL

If your marina or boatshed dispenses fuel, make sure your staff and customers follow correct procedures in relation to health, safety and the environment when refuelling.

To avoid the risk of a fuel spill:

- Regularly inspect and maintain fuel storage and dispensing facilities.
- Avoid overfilling, and discourage customers from topping up fuel tanks once the automatic cut-off shows the tank is full.
- Make sure all nozzles cut off automatically when back-pressure reaches a certain level, and cannot be locked in the 'on' position.
- Use drip trays on fuel pumps so spills and leaks cannot contaminate the environment.
- Cover fuel pumps to keep rain out.
- Keep a spill kit, with clear instructions visible, accessible from every pump.
- Fit an emergency shut-off button next to each pump and on the land side of the wharf so that the pump can be stopped easily if the pipe hose fails.
- Develop and implement a fuel spill avoidance plan.



A bunder and covered fuel bowser

AVOIDING LAND CONTAMINATION

You must not allow any material, including hazardous substances or other chemicals to soak into the ground. For example, the ground should never be used as a means of disposing of unwanted substances. Chemicals can accumulate within the soil and may eventually seep into and degrade waterways or groundwater and may also affect people who come into direct contact with contaminated soil.

Leaking underground petroleum storage systems (including the tanks and pipework) are a significant potential source of soil and groundwater contamination. They often remain undetected until expensive clean-up operations are required. To avoid costly loss of fuel, install leak prevention measures and leak detection devices with all underground storage tanks. For example:

- install double walled tanks and pipework
- implement primary leak detection systems (such as statistical inventory analysis)
- install groundwater monitoring wells.

Refer to the Australian Institute of Petroleum Code of Practice: *The Design, Installation and Operation of Underground Petroleum Storage Systems CP4 – 2002* for the full range of preventative measures.

Pre-acquisition contaminated site audits are commonly undertaken on industrial land before it is purchased and are likely to detect any contamination that is present. Any contamination will significantly reduce the value of the land, as clean-up costs are often substantial.

When soil and groundwater contamination is identified, special procedures need to be implemented to manage and remove the contamination. For further information refer to the DECC's *Guidelines for Assessment and Management of Groundwater Contamination March 2007* and advice on selecting contaminated land consultants available on the DECC's web site

Contact your local Council or the DECC if your land has areas where chemicals have soaked into the soil.



Used batteries awaiting collection in a covered and bunded store



Waste oil on a mobile bund

MANAGING HAZARDOUS WASTES

Storing hazardous liquid waste requires extra care. It should be stored in a bunded, covered and secure area so that any spillage cannot enter stormwater drains or gutters (see page 35 for information on bunding).

If you are a generator of hazardous waste you are responsible for ensuring that it is transported to a facility that is licensed to receive and/or treat that type of waste. Your waste contractor should be able to provide advice on these issues.

To be accepted at a licensed liquid waste facility, hazardous waste must be assessed and classified according to the *DECC Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*. When sending hazardous waste for treatment or disposal, make sure that:

- The transporter is appropriately licensed.
- The waste is being sent to a facility that can lawfully take it.
- You keep all collection receipts.

The movement of most hazardous waste must be tracked during its transport to a facility for treatment, recycling or disposal. Wastes can be tracked on line.

Generally, if you store more than two tonnes of hazardous waste you are required to hold an Environment Protection Licence.

You must have an Environmentally Hazardous Chemicals Act Licence prior to generating, handling, storing, treating, processing or reprocessing any quantity of organotin wastes, including but not limited to Tributyltin wastes.

All organotin wastes must be dealt with in accordance with the requirement specified on your Environmentally Hazardous Chemicals Act Licence or in the Chemical Control Order in relation to organotin wastes.

For information about 'online' waste tracking or your need for a licence, contact the DECC Environment Line on 131 555.

INFORMATION SHEET 5

Dealing with common types of hazardous and liquid wastes

Marinas, boatsheds and slipways can generate large quantities of hazardous and liquid wastes that are likely to have special storage, handling, transport and disposal requirements. To meet the requirements of the *Protection of the Environment Operations Act (1997)* and waste regulations you should:

- Store used engine oils in a bunded tank for collection by a licensed contractor.
- Store used solvent from the workshop in a sealed drum, until collected, reused or recycled. The drum should be stored in a bunded, covered area. Under no circumstances should evaporation be used to dispose of spent solvents.
- Filter and reuse slipway or hardstand wash-down water, or collect and store it for disposal by a waste contractor.
- Provide pump-out facilities to your customers so they can dispose of sewage from their boats. You could increase your business by offering to do it for them during the week.
- Provide a covered and bunded area for the collection of batteries.

Contact your local water authority to find out if any of your liquid wastes are suitable for disposal to the sewer under a trade waste agreement (refer to 'Information sheet 3: Managing water quality').

Liquid wastes that cannot be reused or recycled should be segregated by type. This will help your waste contractor to recycle liquid waste. Mixed waste is more difficult to handle and is usually more costly to treat.

KEEPING COSTS DOWN

The following ideas may help reduce your running costs:

- Mix only enough paint necessary for a job.
- Save excess or unused antifouling paint for future uses.
- To cut your waste bill, check with your chemical supplier to see if empty containers can be returned.
- Use the 'first in first out' procedure for chemical supplies. Date the chemicals you buy and use them in the order in which they arrive. This will conserve their quality and minimise waste from out-of-date chemicals.
- Collect used thinners and solvents in a suitable container and reuse them, or arrange for a liquid waste contractor to collect them from your site for recycling. Save money by purchasing recycled solvents for the general clean-up of spray equipment.
- If you use a lot of solvents, consider installing a solvent recycling unit on site.
- To avoid loss of fuel, ensure fuel pipes are adequately protected against accidental damage and are fitted with automatic shut-off equipment.

WHAT THE LAW SAYS

Environmental laws require that marina, boatshed and slipway operators do not pollute waters or the land. In practice, this means you should:

- Ensure that pollutants from your operations and leaks or spills of chemicals are contained and cannot enter the sea, waterways and the stormwater system.
- Store oils and chemicals in properly maintained bunds.
- Report spills or leaks causing or threatening material harm to the environment to either the EPA or your local Council.
- Ensure liquid waste is sent to a facility that can lawfully take it.



Hazardous waste awaiting collection

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au for:
 - Liquid Waste Facts Sheets – Information on the handling, storage and disposal of liquid waste*
 - Bunding and Spill Management*
 - Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*
 - NSW Waste Tracking Requirements – An Update*
 - Guidelines for Assessment and Management of Groundwater Contamination March 2007*
- Information on engaging a contaminated land consultant
- Hazardous materials (Hazmat) register of suppliers who provide resources, equipment, products and advice to

minimise the environmental effects of hazardous materials incidents

- Your local Council
- Workcover NSW – phone 13 10 50 or www.workcover.nsw.gov.au, for information on storing dangerous goods
- Standards Australia – phone 131 242 or www.standards.org.au for:
 - AS 1940–2004 The storage and handling of flammable and combustible liquids
- Yellow Pages – www.yellowpages.com.au. Look under 'Chemical Spill Equipment', 'Waste Reduction and Disposal Services' and 'Environmental and Pollution Consultants'.
- NSW Fire Brigade – www.nswfb.nsw.gov.au
- Fire Protection Association of Australia – www.fpaa.com.au

SOLID WASTE AND RESOURCE RECOVERY

Waste disposal can be expensive and businesses able to reduce the volume of waste sent to landfill enjoy considerable cost benefits.

Refer to the 'Information sheet 5: Hazardous materials and liquid waste' for information about managing liquid wastes.

MANAGING WASTES

The best way to manage waste is to minimise the quantities of waste generated in the first place.

AVOIDING WASTE

Waste is best avoided in the first place. To reduce waste in your workplace:

- Investigate how you can reduce the amount of raw materials you use.
- Avoid spoilage of raw materials. For example, consider whether savings from buying in bulk outweigh the costs of spoilage. Would 'just-in-time' purchasing yield similar savings? Could storage of raw materials be improved?
- Use chemicals on a first-in-first-out basis to reduce their chance of becoming out-of-date.
- Reduce waste disposal costs by purchasing products with less packaging.
- Service equipment regularly to reduce spoilage from equipment malfunction.

The best ideas for reducing use of materials will come from the people who know your business better than anyone else – you and your staff. Encourage your staff to think about this and put forward their suggestions.

KEEP REUSING MATERIAL

When avoiding waste is not possible, consider reusing waste in your business.

- Reuse roller trays on your slipway. Use plastic trays and have one for each antifouling colour used. When you get a build-up of dried paint in the tray, flex the tray to break the bond between the paint and tray, remove the dry paint and start over again.
- Reuse paint brushes. Keep one for each colour. If you store the brush in a tin of water, the paint on the brush will not harden and the same brush can be reused time after time.



Glass recycling containers should be conveniently located for customers, but not be too close to the water

RECYCLING WASTE

There are companies who will supply recycling bins for glass, paper, plastic and aluminium and collect them without charging you. Your customers will be in the habit of recycling at home so encourage them to do the same on the marina.

- Marinas with public access should consider providing waste and recycling bins with lids to avoid contamination of waterways. Place recycling bins where they are easily accessible – on the way to the car park, where people get off their vessels, next to the general waste bin or close to places where people eat.
- Label litter bins to avoid contamination and ensure that bins are emptied regularly.
- Encourage staff to recycle metals by placing any money generated into a staff amenity fund and asking them what they would like it spent on.

- Send a newsletter to your customers telling them about your company's commitment to the environment and asking them to help by using the recycling bins.

Investigate local recycling opportunities:

- Assess all wastes generated in your business, including paper, cardboard, toner cartridges, glass, plastic bottles and drink cans.
- Contact your local Council about recycling services.
- Talk to your waste contractor about your wastes – perhaps they have a cheaper rate that may apply to some of your wastes.
- Establish a return system for used containers.
- Talk to your suppliers about options for collecting and reusing pallets.
- Look in the Yellow Pages under 'Recycling' or 'Waste Reduction and Disposal': www.yellowpages.com.au

INFORMATION SHEET 6

DISPOSING OF WASTE

To keep costs down, consider waste disposal as a last resort.

- Material that you put in your waste bin will generally go to landfill. Place only dry, solid, inert wastes in industrial waste bins. Do not put liquid or hazardous waste in such bins.
- Collect all solid wastes that cannot be reused or recycled and dispose of them appropriately. These wastes may include scrapings of marine growth, rags that can't be cleaned, empty containers that cannot be reused, brushes and blasting material.
- Collect used abrasive blasting material and paint chips (particularly if they contain poisonous antifouling or lead-based paints) by sweeping or vacuuming, and reuse the abrasive material where possible.
- Solid wastes, such as sweepings, filters, spent abrasive material, containers and rags contaminated with chemicals such as antifouling and paint, are generally classified as hazardous waste. They must be transported to a facility that is licensed to receive and/or treat that type of waste. For more information contact the DECC Environmental Line on 131 555.
- Never burn wastes on site, not even timber wastes, unless you are expressly permitted to do so by your Environmental Protection Licence or local Council. The burning of some forms of chemically treated timber is prohibited by regulation.

STORING WASTE

It is important to make sure waste storage areas do not pollute the environment by:

- Storing waste under cover to prevent rain running through the waste and polluting the soil and waterways
- Making sure wind can't blow unsecured waste around, causing litter or potential water pollution.

KEEPING COSTS DOWN

The following ideas may help reduce your running costs:

- Conduct a waste audit to identify where you can save on waste disposal costs.
- Recycle old zinc anodes and other metal that scrap metal merchants will buy from you.
- Review work practices with your staff. Is it possible to create less waste and save on the cost of raw materials?

Review work practices with your staff – is it possible to use less raw materials?



A waste bin with the lid on and stored under cover



Make sure wind can't blow waste into waterways

WHAT THE LAW SAYS

Under the POEO Act penalties apply for unlawful disposal of waste. Both the person who dumps the waste and the person who owned the waste may be liable – so it's important that you make sure your waste is managed, transported and disposed of appropriately.

Other legal considerations include:

- Do not bury wastes or pour liquid wastes onto the ground.
- Wastes awaiting removal should be stored so that they cannot blow on the foreshore and wash into waterways.
- Hazardous wastes have special storage, transport and disposal requirements and you may have to use a licensed waste transporter – refer to 'Information sheet 5: Hazardous materials and liquid waste'.

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au
- Your local Council for a list of recyclers
- NSW Waste Contractors and Recyclers Association – phone (02) 9604 7206 or www.wcra.com.au
- Yellow Pages – www.yellowpages.com.au
Look under 'Waste Reduction and Disposal Services' and 'Recycling services'

INFORMATION SHEET 7

MANAGING NOISE

Noise generally becomes 'pollution' when someone finds the noise offensive.

Typical noise issues for neighbours include:

- Overall noise from your operation – such as vehicle and boat movements, sanding, grit blasting, shouting, public address or telephone systems, filling and emptying waste bins (especially if early in the morning) or machinery noise generated inside or outside buildings (grinding and cutting).
- Specific units or machines located outside buildings and close to neighbours, such as air conditioners, air compressors, extraction systems and fans.
- Rattling or ringing that can sometimes be generated from exhaust stack vibrations.
- Noise made by your customers – such as idling and engine revving.

IMPROVING NOISE MANAGEMENT

To improve noise management:

- Consider your neighbours. Restrict your operating hours during the week to normal business hours. Remember that background noise levels can be reduced after normal business hours and the noise of your operation could therefore seem louder to neighbours.
- If there is a reason to work outside your normal work hours, call your immediate neighbours and let them know when it will happen and how long the job will take. If neighbours know what is happening, and know that you have considered them, they are less likely to make a complaint.



Maintain equipment to reduce noise and minimise electricity/fuel use

- If a particular job or machine generates noise, consider whether you are carrying out this activity in the right location and using all practical means to reduce the noise. Can the job be moved indoors to lessen the impact? Is there another machine you can use which is quieter?
- Make contact with your neighbours – build a working relationship so that any concerns about your operations that may arise in the future can be readily addressed. However, agreement from affected neighbours does not mean that you can operate outside of the approved operating hours in relevant consents or licences.
- Avoid excessive idling and revving of engines.
- Avoid using extension telephone bells and public address systems.
- Limit vehicle movement, especially heavy vehicles, to normal work hours.

- Control the volume of radios used by staff.
- Where possible, carry out sanding and grinding activities in an area where noise can be muffled, but check occupational health and safety requirements first.
- Fit effective inlet and exhaust silencers to air compressors.
- Consider introducing noise reduction measures such as shielding or muffling for noisy equipment and machinery. An acoustic consultant can help you do this.
- Locate noisy equipment away from doorways.
- Find out about low-noise options when purchasing new equipment.
- Educate your customers about noise on the marina. Ask them to keep noise to a minimum after hours and to pass this on to their guests. Also encourage customers to avoid excessive idling and engine revving.
- Erect a simple sign on the land end of the marina saying something like 'Consider our neighbours – please leave quietly'.
- Take a regular walk around your premises and the neighbouring area to monitor noise from your business activities, especially hums or rattles from units located on the outside of your building.

making offensive noise. It is an offence to continue the noise in breach of the notice or direction.

You may be committing an offence if noise is emitted from your premises due to your failure to maintain or operate equipment efficiently, or to deal with materials in a proper and efficient manner.

Your local Council is responsible for dealing with noise complaints about your premises (unless you hold an Environment Protection Licence). Check your development consent for conditions relating to noise and hours of operation.

If necessary, Council officers can work with you and your neighbours to help resolve noise issues. However, Council or EPA officers can also issue notices and directions to reduce noise from your premises.

Working with Customers

The POEO (Noise Control) Regulation 2000, Part 3 outlines noise related requirements for marine vessels, including the sounding of sirens, offensive engine noise, proper maintenance of noise control equipment and restrictions on the use of sound systems on vessels. Ensure all customers are aware of these rules.

KEEPING COSTS DOWN

Equipment that is making more noise than usual could be running inefficiently and using excess electricity or fuel. Make sure your equipment is regularly serviced – you'll benefit from safer, quieter and more efficient performance, and reduced energy costs.

WHAT THE LAW SAYS

The POEO Act provides regulatory authorities with powers to require that offensive noise be ceased. If someone can hear your business activities and they have reasonable grounds to be annoyed by this, then you may be creating offensive noise and could be issued with a notice or direction to cease

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au for: Noise legislation
Noise Guide for Local Government
- Your local Council
- Yellow Pages – www.yellowpages.com.au Look under 'Noise Control', 'Noise Control Equipment', 'Noise Insulation' and 'Acoustic Materials and/or Services'

BRINGING IT ALL TOGETHER – PLANNING

This information sheet is about the use of good planning to help you minimise risk and achieve best practice.

There are many steps along the path to best practice. Here are some suggestions:

- Make a commitment to yourself and your staff to consider the environmental impact of your business in your day-to-day decision-making. This can apply to simple things such as the selection of lights, fitting sanding machines with dust bags or providing tarpaulins to capture debris from serviced vessels.
- Commit yourself to increasing your environmental awareness. Reading this guide and providing staff with time to read it can help in this process.
- Create an environment team or committee to identify environmental issues and propose solutions, or identify someone as a 'champion' who can foster the adoption of good environmental practices.
- Make contact with your local Council and industry association to tell them what you are doing. They may have some advice or may know of programs that could help you.
- Make contact with your neighbours. Build a working relationship so that any concerns about your operations that might arise in the future can be readily addressed.
- Directors and managers may have a defence in the event of an environmental pollution offence committed by their company, if they can demonstrate 'due diligence' to prevent the offence.
- Taking active steps to prevent pollution occurring means it is less likely that you will commit an environmental offence and may reduce your culpability if an offence does occur. If an environmental incident occurs on your site, providing documentation that shows that you have been acting responsibly and actively trying to avoid such incidents could reduce your culpability.
- Customers may have a preference for businesses that are able to demonstrate their environmental credentials.
- Planning and reviewing allows you to be systematic in improving your environmental performance and documenting your cost savings.

DOCUMENTING YOUR PROGRESS

There are several advantages to planning and documenting measures to improve the environmental performance of your business.

Types of documents you can keep

If you are already considering environmental issues on your site, regularly checking and maintaining your equipment to minimise pollution, and planning improvements, then why not document it?

Helpful documents include:

- An environmental policy
- An environmental action plan
- Records of staff training, staff inductions, waste disposal receipts and maintenance and inspection schedules.

An environmental policy could be as simple as a one paragraph or one page statement that articulates your commitment to complying with environmental laws and implementing best practice wherever possible.

An environmental action plan sets out environmental risks and opportunities and what is being done to address them. It doesn't have to be a large document and could be part of your OH&S documentation. The important thing is that somewhere you have a document that:

- Contains **actions** for environmental improvement (both ongoing and planned)
- Indicates **who** is responsible for carrying out each action
- Indicates **when** (by what date or how often) these actions will be carried out
- Contains quantified **reduction targets** (in volume, weight or costs) for resource efficiency savings and other environmental impacts.
- Using recycled timber (or Forestry Stewardship Council certified timber) and recycled content products.
- Selecting less toxic paints – they 'off gas' lower amounts of harmful VOCs.
- Energy efficiency ideas such as building orientation, wall and ceiling insulation, efficient heating, cooling, hot water, lighting and equipment to reduce energy consumption.
- Water conservation methods such as including a rainwater tank or planting low water usage gardens.
- Waste management plans may be required as part of the planning process. Many local Councils have incorporated the Waste Not Development Control Plan into their local environmental plan.

The local Council will also have requirements and conditions that will need to be satisfied as part of the development application process.

It's a good idea to review and change your environmental action plan regularly. A sample action plan is included in the 'Useful tools' section of this guide.

Examples of daily and weekly checklists are also included in the 'Useful tools' section. You can adapt these to suit your business and incorporate OH&S issues as well.

DEVELOPING OR REDEVELOPING A NEW SITE

If you are relocating or starting up a business at a new site, you have a good opportunity to factor better environmental management into the design of your new workplace.

Ask your architect for ideas on reducing the environmental impact of your facilities and reducing costs. This might include:

FURTHER INFORMATION

- DECC Environment Line – phone 131 555 or www.environment.nsw.gov.au
Cleaner production case studies
*Profits from Cleaner production:
A Self-help Tool for Small to
Medium-sized Businesses*
- Your local Council
- Yellow Pages – www.yellowpages.com.au
Look under 'Environmental and/or
Pollution Control Consultants'
- Queensland EPA has a free 'ecoBiz' tool that can help in identifying cost savings – www.epa.qld.gov.au
- Standards Australia – phone 131 242 or www.standards.org.au for:
*AS 3962-2001 Guidelines for design
of marinas*

SELF-ASSESSMENT CHECKLIST

This checklist can help you evaluate your environmental performance and identify areas for improvement.

You can use this as a starting point and refine it, where needed, to best suit your business. It's strongly recommended that you complete some form of environmental self-assessment for your business on a regular basis.

This checklist is comprehensive and may take over an hour to complete.

Date of assessment: _____

Company name: _____

Property address: _____

Person conducting assessment: _____

Area/building being assessed: _____

What types of activities are carried out in this area/building? _____

Is a site plan available?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed: _____

If yes, please attach a copy of the site plan.

The following questions are designed to help you determine whether your business could be harming the environment, breaking the law or be vulnerable to prosecution and fines under environmental legislation.

Once you have completed this checklist, take a look at the questions that you consider require further investigation or action. Use these questions to develop an environmental action plan. A sample 'Environmental action plan' is included in the 'Useful tools' section of this guide.

REGULATORY ISSUES

Are you aware of the environmental laws and regulations relating to your operations?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you comply with the conditions of consent provided in your development approval?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you hold an Environment Protection Licence?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

If so, do you comply with the environmental obligations specified in your Environmentally Hazardous Chemicals Act Licence?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you hold an Environmentally Hazardous Chemicals Licence?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

If so, do you comply with the environmental obligations specified in your Environmentally Hazardous Chemicals Act Licence?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

ENVIRONMENTAL MANAGEMENT

Are daily or weekly checks carried out to make sure correct procedures are being followed to protect the environment? (Refer to the sample daily and weekly checklists in the 'Useful tools' section of this guide.)

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you have an environmental policy?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you have an environmental action plan?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

If so, does the environmental action plan have objectives, targets, responsibilities and budgets (where applicable)?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you have an emergency response plan (including a spill management plan and emergency response plan)?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Have all staff been trained in environmental responsibility (such as minimising VOCs emissions, avoiding spills, minimising waste, etc.)?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you have formal reporting requirements in place for recording accidents and spills that harm or may harm the environment (i.e. an incident report form)?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you have a procedure in place to deal with complaints from the public, regulatory authorities or staff regarding environmental issues?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Are your staff aware of your commitment to improving the environment?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Are your customers aware of your commitment to improving the environment?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

WATER QUALITY MANAGEMENT

Do you know where the stormwater drains are located on and surrounding your premises?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Is stormwater run-off from your site always kept free of pollutants, such as litter, dust and oil?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you have structures – such as a first flush, collection traps, silt traps and bunded storage area – or procedures in place to prevent stormwater and waterways pollution?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Are stormwater drains, the foreshore and waterways protected from accidental spills?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you have measures in place to prevent dust and solid wastes from washing or blowing into stormwater, the foreshore and waterways?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Are staff aware that it is illegal to sweep or hose dust, oil or any waste into stormwater drains and waterways?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Is the fuel dispensing area covered by a roof and bunded?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

WASTEWATER MANAGEMENT

Are antifouling, paint, oils, cleaning liquids or other chemicals discharged to the sewer?

Yes* ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you have a trade waste agreement or permit?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Is wastewater treated before it goes to the sewer?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Is your first flush system regularly maintained?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

SOIL AND GROUNDWATER MANAGEMENT

Are there or has there ever been underground storage tanks on this site?

Yes* ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Are your fuel tanks doubled lined?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you monitor the quantity of fuel received and dispensed to check fuel tank leakage?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you pressure test underground fuel pipes for leaks?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Is there any evidence of ground contamination?
(e.g. visual stains, odours, affected vegetation)

Yes* ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

AIR QUALITY MANAGEMENT

Have all potential sources of air emissions and odours been reviewed, for example dust from sanding and odours from spraying?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Have you received complaints about dust, fumes or odours from staff or neighbours?

Yes* ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you use dust collection equipment to contain dust from sanding and grinding?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you train staff to keep outdoor work areas clean to prevent dust from blowing into waterways or onto other premises?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

If you do spray painting, is it always carried out indoors in well-ventilated areas?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

If you do spray painting outdoors, do you have controls in place to prevent spray drift?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

If you do spray painting, do you use low-pressure/high-volume or airless spray equipment?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Are lids kept on chemical containers when not in use?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Are solvents, antifouling and paints stored and applied using methods that minimise air emissions and odours?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

HAZARDOUS MATERIALS AND DANGEROUS GOODS MANAGEMENT

Does the hazardous materials storage area comply with dangerous goods regulations and appropriate Australian Standards? For example, is the area bunded, covered and fireproofed and are non-compatible materials separated?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Have you notified WorkCover NSW of the dangerous goods stored and handled on the premises?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you keep an up-to-date register of all of the chemicals stored at the site?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Is the content of containers identified and labelled?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do you keep copies of all relevant Material Safety Data Sheets (MSDS)?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do staff know where to find Material Safety Data Sheets (MSDS) on site?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do staff know how to prevent, contain and clean up spills?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Are spill kits available?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Do the spill kits contain the correct materials to deal with spills from all of the hazardous materials and dangerous goods kept on site?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

Are spill kits regularly checked and refilled?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed:

HAZARDOUS AND SOLID WASTE MANAGEMENT

Has a waste review been carried out?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Complete the following to obtain baseline information on your wastes:

Landfill waste _____ kg/month disposal cost \$ _____ per month

Hazardous waste _____ kg/month disposal cost \$ _____ per month

Liquid waste _____ L/month disposal cost \$ _____ per month

Do you dispose of liquids into the general waste bins?

Yes* ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you generate, handle, store, treat, process or reprocess any organotin wastes, including tributyltin wastes?

Yes* ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Are all your hazardous waste (e.g. waste solvents, oil, cleaning chemicals, batteries, antifouling and lead paint contaminated debris, etc.) collected by a licensed waste contractor and taken to an appropriate waste facility?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Contractor name: _____

Waste facility name: _____

Actions needed: _____

Does your disposal of hazardous wastes comply with your licence requirements?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you store all your hazardous waste awaiting collection in appropriate containers and in a bunded and covered area to avoid contamination of the environment?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you keep your solid waste bins with the lid on and stored in a covered area to prevent the wind blowing waste away?

Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you separate different types of waste so they can easily be reused, recycled or returned to the supplier?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you encourage your suppliers to take back packaging wastes, such as crates and plastic drums?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Have you talked to your waste company about recycling options?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Actions needed:

Do you reuse or recycle:

Paper/Cardboard/Glass

Yes ☐

No ☐

N/A ☐

Don't know ☐

Contractor name:

Actions needed:

Metal, such as aluminium, copper and steel?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Contractor name:

Actions needed:

Solvents?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Contractor name:

Actions needed:

Wood, such as pallets and boxes?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Contractor name:

Actions needed:

Plastic drums and containers?

Yes ☐

No ☐

N/A ☐

Don't know ☐

Contractor name:

Actions needed:

NOISE MANAGEMENT

Are there noise limits contained in your consent, licence or approvals that are applicable to your operation. Are you satisfying your noise limits?

Yes ☐No ☐N/A ☐Don't know ☐

Actions needed:

Are you aware of the effects of your noise on your neighbours?

Yes ☐No ☐N/A ☐Don't know ☐

Actions needed:

Are noise complaints followed up?

Yes ☐No ☐N/A ☐Don't know ☐

Actions needed:

Do you regularly check and maintain noisy equipment, such as compressors?

Yes ☐No ☐N/A ☐Don't know ☐

Actions needed:

Are any pieces of equipment, motors or fans left running after business hours?

Yes* ☐No ☐N/A ☐Don't know ☐

Actions needed:

RESOURCE EFFICIENCY

Complete the following to obtain baseline information on your utility use:

Cost of electricity \$ _____ per month

Cost of water \$ _____ per month

Cost of waste \$ _____ per month

Other \$ _____ per month

Total \$ _____ per month

Do you have a team or 'champion' looking at on-going efficiency improvements? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you monitor electricity, water use and waste disposal? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you have energy and water saving procedures and targets in place? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you use energy efficient motors? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you use water saving devices, such as fitting trigger nozzles on hoses? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you have a preventive maintenance program to make sure all machines are operating efficiently? For example, are air compressors regularly checked for leaks? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Have you installed insulation to avoid heating or cooling energy loss (e.g. insulation of roof, wall, piping, etc.)? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Do you use water-based strippers, cleaners and degreasers wherever possible? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

Have you investigated alternatives to the hazardous materials or dangerous goods? Yes ☐ No ☐ N/A ☐ Don't know ☐

Actions needed: _____

FOLLOW-UP

Do you have a system in place to follow up any concerns or actions that need to be addressed following this self-assessment?

Yes ☐No ☐N/A ☐Don't know ☐

Actions needed:

When you have completed this self-assessment checklist, go back over it and highlight the questions that you have answered with a:

'No'

'Don't know' or

'Yes*' (with an asterisk)

You have identified these questions as areas where you need to undertake further research, make improvements, or take immediate follow-up action. It's recommended that you:

- Refer back to any of the relevant information sheets within the guide to find more information
- Develop an environmental action plan
- Get started on an environmental improvement program that will be good for your business, your staff and your clients.

It's a good idea to keep completed self-assessment checklists for your own records.

NOTES

This image shows a single page of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings present.

NOTES

[illegible]

ENVIROMENTAL ACTION PLAN

MARINAS, BOATSHEDS AND SLIPWAYS

Sample only – expand and adapt this to your situation.

| ENVIRONMENTAL ISSUE/ AREA | ACTION OR MEASURE | WHO IS RESPONSIBLE? | WHEN? |
|-------------------------------------|---|-----------------------------------|-----------|
| 1. COMPLIANCE | | | |
| | Ensure copies of licence and approvals are kept at hand. | Marina Manager | Continual |
| | Develop daily and weekly checklists. | Marina Manager | January |
| | Train staff to carry out daily and weekly checks on environmental compliance. | Marina Manager | Continual |
| | Store all chemicals, oils and batteries in a bunded and covered area. | Marina Manager | May |
| | Train staff and contractors/subcontractors on their environmental responsibilities while at work. This will include spill prevention, what to do in case of a spill and how to use a spill kit. | Marina Manager | March |
| 2. WATER AND AIR QUALITY MANAGEMENT | | | |
| Workshops | Check all dust collection equipment is operational and dust bags are emptied. | Workshop Foreman | weekly |
| | Check all equipment and machinery is operating correctly and not causing excessive noise. | Workshop Foreman | weekly |
| | Ensure oils, fuel or chemicals are stored in a bunded area or placed on spill trays when in use. | Workshop Foreman | weekly |
| | Check content of spill clean-up kits. | Workshop Foreman | monthly |
| Slipway | Check work area is clean and tidy. | Slipway Foreman | Daily |
| | Ensure all paints and solvents are returned to the store after use. | Slipway Foreman | Daily |
| | Develop a maintenance schedule for the slipway and hardstand area. | Marina Manager Slipway Foreman | January |

| ENVIRONMENTAL ISSUE/ AREA | ACTION OR MEASURE | WHO IS RESPONSIBLE? | WHEN? |
|--|--|-----------------------------------|----------|
| 2. WATER AND AIR QUALITY MANAGEMENT (CONTINUED) | | | |
| | Check wastewater collection and treatment system is operating within specifications. | Slipway Foreman | Weekly |
| | Ensure no overspray escapes from site. | Slipway Foreman | Daily |
| | Implement a bunding system or equipment to capture any spills. | Marina Manager Slipway Foreman | January |
| Marina | Check all boats are secure and are not pumping dirty bilge water into the bay. | Marina Manager | Daily |
| | Ensure all hoses are turned off and taps are not dripping. | Marina Manager | Daily |
| | Ensure all rubbish has been removed from the marina and placed into appropriate bins. | Marina Manager | Daily |
| | Ensure fuel hoses are secure and are not leaking, drip trays are empty and emergency shut-offs are operational. | Marina Manager | Daily |
| | Setup a leak detection and monitoring system for fuel underground fuel tanks | Marina Manager | July |
| | Install a groundwater monitoring system | Marina Manager | December |
| 3. SOLID AND LIQUID WASTE MANAGEMENT | | | |
| Common to all areas | Ensure recycling bins are clearly identified. | Marina Manager | January |
| | Make sure waste collection points are clean and all bins have secure lids fitted. | Marina Manager | Daily |
| | Develop a system for recycling solvents. | Workshop Foreman | February |
| | Develop a system for recycling brushes. | Workshop Foreman | February |
| | Carry out a monthly audit on all areas to ensure systems and plans are being followed. | Marina Manager | Monthly |
| | Carry out a waste audit to find out how much waste is being generated and identify cost saving opportunities. | Marina Manager | March |
| | Review results of the waste audit and work out how waste can be eliminated, minimised, separated, reused or recycled | Manager (with designated staff) | May |

| ENVIRONMENTAL ISSUE/ AREA | ACTION OR MEASURE | WHO IS RESPONSIBLE? | WHEN? |
|--|--|--|-------------------------------------|
| 3. SOLID AND LIQUID WASTE MANAGEMENT (CONTINUED) | | | |
| | Set quantified waste reduction targets (in volume, weight or costs). | Manager (with designated staff) | June |
| | Make sure waste transporters are provided with information on the nature of the hazardous waste you are disposing of. Make sure waste goes to an appropriate and legal waste processing facility, and that waste tracking information is kept in the office. | Workshop Foreman | February |
| 4. HAZARDOUS MATERIALS | | | |
| Common to all areas | Store all chemicals, oils and batteries in a bunded and covered area. | Marina Manager | May |
| | Improve bunding so that it is sufficient to hold the volume of the largest container plus 10%. Ensure both floor and bund are completely impermeable. | Marina Manager (with designated staff) | May |
| | Train staff place chemicals they are using in a larger container (bund). | Marina Manager | May |
| | Provide training to all staff on: <ul style="list-style-type: none"> the use of solvents and acids. maintenance of bunded hazardous goods storage areas. | Workshop Foreman | Annually and in new staff induction |
| | Ensure MSDS are current and easily accessible to all staff. | Workshop Foreman | annually |
| | Place spill clean-up kits in store and work areas, inspect regularly and keep stocked. | Workshop Foreman | monthly |
| | Ensure all solvents (including recycled) are kept in sealed containers, clearly labelled and placed in designated areas | Workshop Foreman | weekly |

| ENVIRONMENTAL ISSUE/ AREA | ACTION OR MEASURE | WHO IS RESPONSIBLE? | WHEN? |
|------------------------------|---|------------------------------------|-----------|
| 5. RESOURCE EFFICIENCY | | | |
| Reduce resource use | Join the Boating Industry Association and take advantage of the information on resource efficiency developed for your industry. | Marina Manager | January |
| | Investigate ways you can reduce waste from your business. | Marina Manager and all staff | March |
| | Educate your clients about recycling wastes and show them the system you have in place to achieve this. | Marina Manager | January |
| | Ensure the compressed air system is working efficiently and has no leaks. | Marina Manager Workshop Foreman | March |
| | Fit trigger nozzles to all hoses on the site. | Marina Manager | March |
| | Recycle water from your wash down. | Marina Manager | January |
| | Investigate options for reducing energy and water use. | Marina Manager | March |
| | Fit low energy lighting to common areas. Fit motion sensors to lights in areas that do not need to be permanently lit. | Workshop Foreman | March |
| | Keep up-to-date with new technologies. Investigate options for more efficient machinery. | Manager (with designated staff) | Quarterly |
| | Set quantified reduction targets for resource efficiency savings (e.g. raw materials, energy and water). | Manager (with all staff involved) | June |

DAILY AND WEEKLY CHECKLISTS

Sample only – expand and adapt these checklists to your situation.

| DAILY CHECKLIST | TICK |
|--|------|
| All stormwater drains are clear from debris. | |
| Car park and gardens are clean and free of rubbish. | |
| Slipway is clean and all drains and catchment pits are free of debris. | |
| All boats are securely moored and bilges are not discharging into the bay. | |
| Taps are turned off and are not leaking. All paints and materials are returned to the secure storeroom before leaving the site. All glues, resins, oils etc. are returned to the relevant safe storage area after use. | |
| Water around fuel bowsers is clean (no hydrocarbons are visible) | |
| Checks carried out by: Signed: _____ Date: _____ | |

| WEEKLY CHECKLIST | TICK |
|--|------|
| Daily checklists have all been completed and problems addressed. | |
| Workshop machinery is operating correctly and within specifications. | |
| All bunds are clean and intact. | |
| Paint and hazardous material stores are clean and tidy. | |
| Emergency spill kits are intact and re-stocked. | |
| Compressed air system is free of leaks. | |
| Water hoses and connections are not leaking. | |
| All gas cylinders have been checked for leaks. | |
| Fuel storage tanks have been checked for leaks and integrity. | |
| Noise from business activities has been checked by doing a walk around the premises and the neighbouring area. | |
| Lighting time switches are set correctly. | |
| Checks carried out by: Signed: _____ Date: _____ | |

USEFUL CONTACTS

Sample only – expand and adapt this list for your business.

| ORGANISATION | PHONE NO. |
|--|-----------|
| Emergency services: ambulance, fire, police | 000 |
| Local council | |
| Department of Environment and Climate Change (NSW) | 131 555 |
| NSW Workcover Authority | 131 050 |
| Poisons Information Centre | 131 126 |
| Local water authority/trade waste contact | |
| Waste solvent recycler | |
| Waste disposal contractor | |
| General recyclers | |





APPENDIX 3 – Best Practice for Marinas and Boat Repair Facilities (EPA 1999)



**BEST MANAGEMENT PRACTICE FOR
MARINAS AND BOAT REPAIR FACILITIES**

**BEST MANAGEMENT PRACTICE FOR
MARINAS AND BOAT REPAIR FACILITIES**

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ISBN 0 7313 0249 4

EPA 99/60

June 1999

Printed on recycled paper



Contents

| | | |
|----------|---|-----------|
| 1 | INTRODUCTION | 1 |
| | Purpose and scope | 1 |
| | Background | 2 |
| | Applying these guidelines to new and upgraded facilities | 3 |
| | Environment Protection Licences | 3 |
| | Applying these guidelines to existing facilities | 4 |
| 2 | ENVIRONMENTAL MANAGEMENT OF VESSEL MAINTENANCE AND REPAIR OPERATIONS | 5 |
| | Managing operations on slipways and other hardstand areas used to maintain vessels | 5 |
| | General management | 5 |
| | Liquid wastes | 6 |
| | Solid wastes | 6 |
| | Spray operations | 6 |
| | Stormwater | 7 |
| | Excessive noise | 8 |
| | Environmental safety and emergency response | 9 |
| | Managing the collection of wastes from vessels | 9 |
| | Sewage and greywater | 9 |
| | Bilge water | 10 |
| | Marina safety and fuel management | 10 |
| | Treating timber wharf piles | 11 |
| | Choosing mooring types | 11 |
| | Managing litter collection | 11 |
| | Control of stormwater during construction/upgrading activities | 11 |
| | Appendix 1: Appropriate Regulatory Authority | 13 |
| | Appendix 2: Other approvals that might be needed for developing or upgrading marinas | 15 |
| | Appendix 3: Restrictions on the use of tributyltin antifouling paints | 16 |

Introduction

PURPOSE AND SCOPE

The NSW Government has an ongoing interest in ensuring that marinas and boat repair facilities operate so that the environmental quality of waterways near these operations can be assured. The government wants to make sure that the industry is sustainable, and that it continues to operate in a way that maintains and enhances the natural resources on which it is based.

These guidelines apply to all new marina and boat repair facility proposals and also to proposals for the redevelopment and upgrading of existing facilities on inland and coastal waters of NSW.

They are intended to be educational and advisory—they do not set mandatory standards. They outline the best management practices that designers and operators of boat repair facilities and marinas should consider. The guidelines aim to:

- ▲ **provide guidance** on the environmental issues that should be considered in the planning, design and operation of marina and boat repair facilities
- ▲ **reduce the potential impacts** of the operation of marinas and boat repair facilities on the environment
- ▲ indicate the types of **statutory environmental protection requirements** for marinas and boat repair facilities in New South Wales
- ▲ encourage **waste minimisation and re-use** of effluents and materials used on site.

These guidelines do not cover site selection, site-specific considerations or environmental monitoring requirements. These issues are addressed in the publication *Marinas and Related Facilities—Preparation of an Environmental Impact Statement* (Department of Urban Affairs and Planning, 1996). There is more information on the development of marinas and boat repair facilities below under 'Applying these guidelines to new and upgraded facilities'.

The guidelines are intended to provide a benchmark that operators of existing facilities can work towards by making progressive environmental improvements. The EPA and local councils will negotiate on a site-specific basis with operators of activities with the potential to pollute waters as to how these guidelines will be applied—see 'Applying these guidelines to existing facilities'. These guidelines may be used by local councils as a reference for making improvements to older facilities or new marinas and boat repair facilities, in line with best management practices.

It is intended that these guidelines will in no way compromise the safety of the people who work at or visit marinas or boat repair facilities. Requirements under the *Dangerous Goods Act 1975* and/or the *Occupational Health and Safety Act 1983* must be met, and if any conflicts are identified they should be brought to the attention of the EPA.

In these guidelines, *marinas* are defined as the buildings, wharves and surroundings in which vessels are stored and maintained (adjacent to water). *Boat repair facilities* are defined as slipways, hoists or facilities for the repair and maintenance of vessels. Both public and private facilities are covered for inland and coastal waters. *Wastewater* includes all process water, cleaning water and contaminated stormwater.

BACKGROUND

In the past, standard operational practices have allowed wastes such as paint and organic matter removed from the hulls of vessels to fall into the flood or tidal zone. These wastes are then transported into receiving waters by the receding tide, or washed into the surrounding waters by hosing. As a consequence, marinas and boat repair facilities can be a significant source of local contamination in sediments unless steps are taken to reduce the pollution risks.

Reports of pollution emanating from marinas and boat repair facilities commonly refer to either paint flakes or soluble paint in the water, sand or grit blasting operations, fuel or oil spills, discharges of emulsified oils (incorporating degreasers), overspray from painting operations and excessive noise levels. Other pollutants (which are not as obvious or visible but are of equal concern) are contaminants such as heavy metals, other toxicants and solvents. These are toxic to most life forms. Because organic solvents and other hydrocarbons are in common use at most premises, it is important that the work area is designed and operated in such a way that all pollutants are captured or suitably treated.

Although commercial marinas and boat repair facilities have a higher level of activity than small private boat repair facilities, and so have a greater potential to pollute the local environment if they are poorly managed, the smaller boat repair facilities can also contribute significant pollutant loads to the receiving waters. This is particularly so if they discharge contaminated water into small tributaries or embayments that are poorly flushed. Consequently, these guidelines outline practices that need to be observed at **all** boat repair and maintenance facilities.

There are a number of approvals and legislative requirements relating to marinas and boat repair facilities, and they involve a range of State and local authorities. The EPA has primary responsibility for legislation that prevents or minimises pollution in NSW. The key legislation is the *Protection of the Environment Operations Act 1997* (POEO Act), which commenced on 1 July 1999. The EPA is responsible for issuing environment protection licences under the POEO Act. These licences control all aspects of the environmental impacts of an activity, including air, noise, water and waste pollution. Other bodies are responsible for issuing planning or building approvals under environmental planning, local government or waterways management legislation. Designers and operators will therefore also need to seek advice from agencies such as the relevant local council, ports authorities and local sewerage authorities regarding planning and building approvals. The Waterways Authority, the Department of Land and Water Conservation (DLWC), the property owner, NSW Fisheries and the Department of Urban Affairs and Planning (DUAP) must also be contacted regarding development approval.

Environmental Impact Statement (EIS) requirements should be confirmed with the Department of Urban Affairs and Planning. In summary, the Environmental Planning and Assessment Regulation 1994 states that a marina (or other related land and water shoreline facilities) is a designated development (and thus requires an EIS) when:

- ▲ it has an intended capacity of 80 or more vessels, or
- ▲ it repairs or maintains vessels out of the water and has an intended capacity of one or more vessels 25 metres or longer, or five or more vessels at any one time. (This classification includes slipways, hoists and other facilities.)

Even when an EIS is not required, the consent authority must be given sufficient information on the likely impacts and proposed measures for managing those impacts to enable the consent authority to make an

informed decision on the proposed development.

The local council should be the first point of contact for anyone seeking information about the development or redevelopment of a marina or boat repair facility. The EPA will give advice to consent authorities on proposals if asked.

Marina owners and operators can get further information in material produced by the industry, such as the Boating Industry Association of NSW *Code of Practice* (1995). For guidance on marina design not related to environmental concerns, Australian Standard AS 3962–1992 *Guidelines for Design of Marinas*, and *Marina Guidelines* (NSW Public Works, 1987) both provide further information.

APPLYING THESE GUIDELINES TO NEW AND UPGRADED FACILITIES

Environment protection licences

Activities listed in Schedule 1 to the POEO Act require a licence from the EPA. These ‘scheduled activities’ include the following:

‘Marinas and boat repair facilities comprising:

- (a) pontoons, jetties, piers or other structures (whether water-based or land-based) designed or utilised to provide moorings or dry storage for 80 or more vessels (excluding rowing boats, dinghies or other small craft), or
- (b) works such as slipways, hoists or facilities for the repair and maintenance of vessels (excluding rowing boats, dinghies or other small craft) at which 5 or more vessels or any vessel 25 metres or longer is handled or capable of being handled at any one time.’

Any marina or boat repair facility that has a capacity or threshold equal to or above that set out in Schedule 1 will require an environment protection licence. Those below this capacity or threshold will not require a licence. However, the owner or operator of a marina or boat repair facility smaller than those described in the Schedule may apply to the EPA for a licence to control pollution to waters. The EPA believes that in general, these facilities should be able to manage their operations to avoid pollution of waters by following these guidelines and should not need to apply to the EPA for a licence.

The EPA can provide further information on licensing requirements under the POEO Act.

Any work done in order to enable a scheduled activity to be carried on (called ‘scheduled development work’) will also require an environment protection licence. The licence must be obtained before the works are commenced. The EPA can clarify any licence requirements and provide the necessary licence application form.

The EPA regulates all scheduled activities and scheduled development work as well as non-scheduled activities where they are subject to a licence to control water pollution, or are carried out by a State or public authority. All other non-scheduled activities are regulated by a relevant local authority.

Where a marina or boat repair facility does not need or hold a licence from the EPA, the local council will usually be the appropriate regulatory authority. See Appendix 1 for a table on the appropriate regulatory authority.

The environmental best management practices recommended in these guidelines should provide a benchmark for all regulatory authorities administering marinas and boat repair facilities.

APPLYING THESE GUIDELINES TO EXISTING FACILITIES

The principles outlined in this booklet provide a sound basis for environmental management at all operational sites. These guidelines should be taken into account whenever the environmental performance of an existing operation is being reviewed.

The need for and nature of improvements to an existing site will be a function of:

- ▲ the existing site characteristics
- ▲ the pollution threats of the activities conducted at the site, and
- ▲ the sensitivity of the receiving environment around the site.

The EPA is aware that some existing facilities could find it technically and economically difficult to comply with some aspects of the guidelines in the short term. In some cases, existing marinas might not be able to achieve full compliance with the guidelines, or the initial cost might be an unreasonable burden. In these cases, a best management approach to minimising impacts will be taken, and improved practices will be negotiated with the EPA or relevant local council over a reasonable time frame.

If an existing operation holds a licence and needs improvements to its environmental performance, the EPA might negotiate a program of works and a time frame for their completion. These conditions are attached to the licence, often as a pollution reduction program (PRP).

The highest priority is likely to be given to the way the facility will trap, collect and dispose of waste generated during its regular vessel maintenance activities.

Environmental management of vessel maintenance and repair operations

This section proposes best practice design, operation and maintenance strategies for eliminating pollution arising from vessel maintenance and repair activities. Environment management practices that differ from those outlined here might be acceptable, provided that they offer a similar or higher level of environmental protection and satisfy the requirements of the EPA and other statutory authorities. Careful consideration must be given to the sensitivity of the local and regional environment, and to relevant site features, to determine the most appropriate controls for individual sites.

The Department of Urban Affairs and Planning recommends that marinas that are designated developments should prepare the outline of an environmental management plan as one component of the EIS.

An environmental management plan would be a useful way of giving details of the environmentally sound management practices proposed for the site in order to prevent pollution. The plan could set objectives; specify the controls and work practices needed to prevent pollution; establish how to monitor the success of the controls; and identify what needs to be done to meet the stated objectives. The plan would therefore determine the most cost-effective ways of meeting the environmental outcomes specified below, and could also give supporting arguments for any methods used that might differ from existing best practice.

MANAGING OPERATIONS ON SLIPWAYS AND OTHER HARDSTAND AREAS USED TO MAINTAIN VESSELS

General management

This section applies to all types of vessel repair and maintenance operations done at marinas, boatsheds and clubhouse facilities. All facilities must provide appropriate controls to prevent materials or wastes from discharging to the environment. Such controls might include putting bunding around storage drums, separating hazardous materials and providing absorbent materials. A bund will help to contain any spills to a defined area.

All work on vessels that could lead to pollution of waters must be done over a hardstand or impervious area that is not inundated during high tide. It is recommended that the hardstand area is higher than 2.44 m above 0 datum at Fort Denison (Indian Springs Low Water). This equates to a level of 1.52 m above the Australian Height Datum.

The floor design of all indoor workshop facilities should allow for the collection of water, oils and other liquids from the workplace area. If the existing floor is made from wooden planks, a new floor should be put down over the top of it, or an impermeable liner can be placed over it. Provide a sump for the collection of liquid waste.

All wastewater and solid waste must be collected on site for further management. Clean the hulls of vessels over a collection system that is capable of capturing and/or treating the volume of water to be used. The area may be bunded or graded to a collection pit or sump to stop run-off polluting the receiving waters.

If the hardstand surface slopes towards the receiving waters, use multiple level off-takes for the collection system.

Place the wastewater collection system at a level that allows for the 'maximum' or 'king high tide' (Indian Springs High Water) and the action of waves to prevent tidal inundation. If this height is unknown, use a high water level of at least 2.44 m (1.52 m above the Australian Height Datum).

In non-tidal waters such as inland rivers or lakes, consult the local authority to find out the precautionary high water level above which all work should be done. If this information is not available, put the wastewater collection system at the level that will be inundated only in a 5-year-average recurrence interval flood.

Work that does not generate wastes may be done in the tidal range. Examples are working inside the boat, work on the engines that does not generate pollution, and changing a sacrificial anode.

During the slipping process the angles at which a vessel is placed can lead to spillage of fuel from the engines, or bilge water. Oil and fuel are highly visible. Before slipping boats, take care to make sure that spillages of oil or fuel will not occur.

All waste collected must be disposed of in a way that does not pollute waters.

Liquid wastes

Liquid waste that has been collected on the site may be handled in one of four ways:

- ▲ It may be treated and discharged to the sewer under an agreement with the sewerage authority.
- ▲ It may be treated and discharged to the environment, in accordance with provisions outlined in an EPA licence.
- ▲ It may be recycled on site.
- ▲ A registered waste contractor for disposal at a liquid waste facility may remove it.

When wastewater is discharged to sewer, the local sewerage authority will set limits on the concentration of pollutants that may be discharged. If the discharge is to be to the environment, the discharge effluent quality will be specified on a licence. Treatment methods might consist of using a settling tank or pit followed by a corrugated plate interceptor, and then filtering the wastewater through an acceptable medium.

Solid wastes

Solid wastes must be disposed of at an appropriate facility. Removed paint and organic material may be disposed of at an approved local waste disposal facility, provided they do not contain any tributyltin (TBT), and provided any necessary treatments are made. Special restrictions apply to the use of paint containing TBT; Appendix 3 outlines the special conditions relating to the use of TBT paints.

All activities that generate dust (including particles from blasting, sanding and grinding) must be done in such a way that they do not pollute the air or waters. To achieve this you might need to use grit collectors, dust filters or total enclosure by buildings or tarpaulins. The EPA does not advocate the use of copper slag as a grit blasting material.

Spray operations

Overspray and odours must be controlled in spray operations. Low-pressure high-volume spray guns are

preferred to the more traditional high-pressure low-volume ones. It is better to use brushes and rollers than spray equipment.

High-pressure liquid cleaners that operate with water, detergents, solvents, caustic or acids may be used only if you have a system for collecting all wastewater generated. With this equipment it is better to use high temperature water than chemicals. Using degreasers is discouraged, since emulsified oils are harder to trap and treat, and they can have a greater environmental impact than oils alone.

Any wet paints (especially water-based ones) that are spilled or dripped on hardstand surfaces should be left to dry—not washed into the collection system—since treatment of water contaminated with soluble paint is difficult and can be costly. Otherwise, use a drop sheet. Remember that the discharge of polluted water to the environment is an offence under the POEO Act.

Where possible, separate grit from blasting operations from the waste and re-use it, and filter or treat the water and re-use it.

Stormwater

Practise waste and water minimisation and recycling wherever possible. Development proposals should include plans for ensuring that stormwater is effectively controlled and recycled where appropriate; consult the consent authority to find out what you need to do in this regard. Discuss the use of stormwater pollution control devices with the local council or the EPA.

Fit litter retention devices to the stormwater systems of all hardstand areas (including car parks and loading bays) to improve the quality of stormwater before it discharges into the waterway. Local government requirements might include trash racks over stormwater inlets, settling pits with overflow–underflow outlets, gross pollutant traps and sand filters. These will need to be cleaned on an ‘as needs’ basis to be effective.

Any part of the slipway operations exposed to the weather and where contaminants may be present will require a rainwater collection system. All uncontaminated stormwater should be diverted around the slipway site to minimise the amount of water requiring treatment.

The collected water must be treated before discharge. The method of disposal will depend on the quality of the treated water. Any collection, treatment and disposal system will require proper design, installation and maintenance for it to be effective.

The collection system must be capable of capturing any contaminated run-off from the exposed area. The system must be emptied within a time frame that allows the capture of any contaminated water flowing from the exposed area during subsequent rain events. A first-flush system might be appropriate for this. This system uses the principle that for small catchments the first flush of water during a rain event will transport most of the pollutants from the surface. This first flush is directed to a sump that:

- ▲ is capable of holding the entire first flush, or
- ▲ acts as a collection sump from which the entire first flush is pumped to a holding tank.

The system is designed so that once the sump or holding tank is full, the relatively uncontaminated water that follows bypasses the system and is discharged without treatment. The sump or holding tank should be capable of collecting all contaminated water. As a rule of thumb, for small industrial yards with a concrete surface, the first 15 mm of rain should be captured (this equates to a capacity of 15 litres per square metre of surface area). Every catchment area will differ, depending on site-specific characteristics such as the

surface roughness and size of catchment. The storage capacity of the system should be capable of treating and releasing captured water before the work area becomes recontaminated.

Examples of suitable treatment systems for captured stormwater are:

- ▲ corrugated plate interceptor (CPI)—a CPI must have a capacity big enough to meet the standards required by the appropriate regulatory authority. CPIs are often recommended by sewage authorities to treat stormwater before it is discharged to the sewer.
- ▲ sand filter—the filter must have a capacity big enough to meet the standards required by the appropriate regulatory authority. The rate of discharge should be high enough to ensure that the collection system can receive subsequent rain events.
- ▲ settling tank—this will require the incorporation of an oil absorbent material and possibly the use of coagulants and flocculants. These tanks are suitable only for small-scale private operations where sufficient settling times will be available.

Discharge from these systems can be:

- ▲ to sewer—this will require an agreement with the local sewerage authority. The authority will require a particular level of treatment before discharge into the sewer. It might not permit discharge for a fixed period after a rain event ceases. This period will depend on the hydraulic characteristics of the particular sewerage system.
- ▲ to a waterway—if the treatment system is capable of achieving a very high standard the treated water may be discharged to a waterway. This may require an EPA licence incorporating strict conditions.
- ▲ to land—if adequate vegetated land is available, treated water may be used for irrigation purposes. This would probably be suitable only for small-scale private operations.

Excessive noise

For existing operations, as a general rule, the noise level from the operation must not exceed the existing background noise level by more than 5dB(A) at any affected residence. If the noise contains annoying characteristics (for example, tonality and impulsiveness), stricter requirements could apply.

Noise control requirements will need to be addressed when seeking local government planning consent. New developments or upgraded facilities could be subject to more rigorous requirements to prevent or minimise increasing noise levels than have been placed on existing operations in the past.

If an EIS is needed it should give full details of the noise impact likely to result from the proposed changes to the site. The Department of Urban Affairs and Planning will give advice on what the EIS needs to address. The assessment should consider the hours of operation; the existing background noise levels at nearby residential areas; the expected departure and arrival times for vessels using the facility; the noise levels from patrons while on the premises and in the vicinity of the marina if they park in adjoining streets; and the likely noise levels from the repair and testing of vessels and motors.

Engine idling and testing at marinas should be minimised to avoid excessive noise. Impacts due to excessive noise levels can also be reduced by matching work schedules to less sensitive times, displaying signs indicating noise restrictions and requirements, and informing patrons of the hours of operation.

For detailed information on planning noise levels, consult the EPA for its current policy on stationary noise sources.

Environmental safety and emergency response

Procedures for protecting the environment in an emergency should go hand-in-hand with those for preserving safety at the site.

Every marina must have an environmental safety and emergency response plan that gives details of regular marina safety checks and the emergency procedures that will be used. This needs to be specific for the type and scale of your operation. If the facility is commercial, all workers should know of this plan and be proficient at operating the emergency equipment. If the facility is private, anyone using the facility regularly should know how to follow the emergency procedures. Equipment should be inspected and tested periodically in accordance with the manufacturers' recommendations and/or yearly, during training of marina employees. Marina managers should keep records of training. (For emergency response to spills of fuel and oil see the section on 'Marina safety and fuel management' below.)

Summarise your environmental safety and emergency response plan and display it on the marina premises. It should describe recommended actions and should provide 24-hour telephone contacts for fire hazards, spillages, boat collisions, damage to equipment and personal injury.

For more safety requirements see Australian Standard AS3962 *Guidelines for design of marinas* (1992).

MANAGING THE COLLECTION OF WASTES FROM VESSELS

Sewage and greywater

In accordance with the Management of Waters and Waterside Lands Regulations 1997, administered by the Waterways Authority, all marinas that have more than nine berths and are located within Sydney Harbour must provide access to facilities for the control of wastes coming from vessels. There are also special requirements for some vessels in different areas of the State to install holding tanks for storage of waste and greywater; these requirements are likely to change in late 1999 and the Waterways Authority will have further information.

Mobile pump-out facilities can also be considered as an option.

The Government's Waterway Program, administered by DLWC and delivered in partnership with local councils and other agencies, provides funding towards the capital cost of these facilities. For further information on the location of existing facilities and the requirements of new ones, consult your local waterways authority.

Pump-outs should be designed to accept sewage, sullage, greywater, galley waste and portable toilet waste. If you need approval to include provisions for pumping out bilge waters that are to be discharged to sewer, consult the responsible sewerage authority.

Display information on the correct use of each system on an easy-to-read sign next to the operating controls. Provide a drip bucket for the end of the pump-out hose when it is not being used. Make sure a wash-down hose with a back-flow preventer is available for rinsing out portable toilets and cleaning up any spillages. Dispose of rinse water appropriately.

For more information on ways to dispose of all liquid wastes generated at the marina and pumped ashore, see the section above on 'Managing operations on slipways and other hardstand areas used to maintain vessels'.

Bilge water

Many vessels are fitted with automatic bilge pumps that are activated by water level switches to prevent sinking after rain. These pumps can contribute to frequent oily-water discharges. Marina and vessel owners and operators are responsible for making sure that contaminated bilge water is not discharged to the environment.

Remember that bilge water containing fuel can be hazardous; it should be collected and disposed of as soon as possible.

Encourage the use of oil-absorbent products on all vessels with inboard motors. Actively discourage vessels from discharging oil-contaminated bilge waters within the marina or mooring site. Discharging oil-contaminated bilge water is an offence under the POEO Act and degrades our aquatic environment.

MARINA SAFETY AND FUEL MANAGEMENT

The potential for hydrocarbons (such as fuel) to spill from vessels at marinas and fuelling wharves is a cause of concern because of their toxicity to aquatic life. The safe storage and handling of fuel is important, not only to prevent environmental damage but to prevent harm to people and property.

Current fuel tank designs, and common methods for filling them, can lead to the pollution of waters, so instruct customers how to refuel their vessels without discharging spills to the environment and without compromising safety. Provide a hydrocarbon-adsorbent material to contain and absorb petroleum products spilt on land, and another for spills on water. Dispose of contaminated absorbent material in a way that does not result in the pollution of waters or air. Consult the EPA or your local council to find out the appropriate local disposal methods.

Any marina dispensing fuel and conducting maintenance operations must have an environmental safety and emergency response plan as well as the appropriate equipment to contain and capture (or otherwise treat) any spills. Equipment used to combat oil, diesel and petrol spills might include a boom and hydrocarbon-absorbent material. All captured hydrocarbon material must be stored appropriately in order to minimise risks to safety, or disposed of immediately.

All spills in coastal waters should also be reported to the Local Ports Authority in accordance with the *Marine Pollution Act 1987*. All spills on inland waters should be reported to the EPA Pollution Line.

Report large spills immediately to the fire brigade, police and appropriate waterways authority. Dispersants may be applied only by designated waterways authority officers. The marina manager should keep a log of all environmental incidents, and it should be available for inspection by EPA officers.

Make sure pipes transporting fuel to the distribution point are adequately protected against damage, and make sure they have automatic shut-off equipment. Use drip trays or other devices to ensure that drips from refuelling operations do not enter waters. Fit bowsers with fuel filling nozzles that are manually held open to dispense fuel. Do not use devices that allow the nozzle to remain open or allow the operator to move away. Fuel dispensers must be attended at all times while in use. An automatic cut-off action should be installed and should operate when the tank is full to stop fuel overflowing. For refuelling larger vessels such as fishing boats, hand-held systems might not be practicable; automatic systems may then be used with appropriate care.

The marina operator or owner should inspect and maintain fuel storage and dispensing facilities regularly.

He/she should also keep a log of these inspections and any repairs completed.

Collect sump oil and oil in bilges and remove it for recycling or disposal at an approved facility.

TREATING TIMBER WHARF PILES

The treatment of timber piles should be done in such a way that waters are not polluted.

The publication *Design Guidelines for Wharves and Jetties* (DLWC, 1990) contains information on construction materials, preservation techniques and maintenance issues.

To stop timber preservatives from leaching into the water, make sure that treated timber for piles has time to stabilise before it is put in the water. Alternatively, there are materials other than timber available that are environmentally acceptable.

CHOOSING MOORING TYPES

Moorings (the traditional chain-anchored type) can disturb the bottom when they are dragged across it in storms and tidal changes. If moorings are proposed in or adjacent to seagrass beds, a permit is required from NSW Fisheries.

Methods that incorporate a flexible connection between the mooring and the vessel are preferable, as they might not cause the same environmental damage as chain moorings.

MANAGING LITTER COLLECTION

Encourage recycling. Educating patrons about the right way to dispose of non-recyclable and recyclable materials is the most effective way to minimise litter problems around marinas. Provide recycling facilities at convenient locations for patrons getting off their vessels. Provide separate containers for glass, aluminium, PET and paper. Make sure signs encouraging waste separation and recycling are visible.

Put clearly labelled litter bins, fitted with self-closing hinged lids, in prominent positions and near recycling bins. Keep several spare bins on site to replace full bins, unless you have a central garbage hopper. Put signs on the sides of all bins, informing patrons that there are on-the-spot fines for littering. Fit a hinged lid to the main garbage hopper to exclude rainwater, and make sure it is made of impervious materials.

Make sure that bins and recycling containers are emptied regularly, and that collected material is removed frequently from the site and disposed of in an environmentally acceptable manner, or recycled at a recycling facility.

CONTROL OF STORMWATER DURING CONSTRUCTION / UPGRADING ACTIVITIES

This section provides advice on basic stormwater management techniques for use during work that involves the disturbance of soil at the site.

Construction activities that disturb soil can lead to the discharge of polluted stormwater during rain. This section provides advice on methods of settling out sediment to prevent sediment pollution from construction sites entering waterways. For more detailed information see the NSW Government booklet *Managing Urban Stormwater: Soils and Construction*.

Soil erosion and pollution can be prevented or reduced using good site work practices. The choice of

practice is always site-specific, and what is best at one site might not be best at another. Any practices chosen for a particular site should therefore best reflect the specific characteristics of that location. Management of stormwater and land disturbance during site works generally involves the combined use of two approaches: prevention and treatment.

Prevention source control techniques and practices can include:

- ▲ reducing the time that land is left in an exposed unstable condition
- ▲ strictly minimising the area disturbed, with a well-disciplined approach to clearing and site access
- ▲ diverting 'clean' stormwater around the exposed site
- ▲ staging the work and restabilising quickly for each stage
- ▲ using a two-stage stabilisation: a quick cover and soil binder followed by a longer-term revegetation.
- ▲ monitoring and correcting if practices are not working
- ▲ auditing and enforcing requirements.

Polluted run-off waters from sites can be treated using various devices and methods in sequence. Devices that slow stormwater and allow sedimentation of larger soil particles to occur include sediment fences, straw, and hay bales. Where clay and finer soils have been disturbed, holding ponds will aid the sedimentation of fine, suspended colloidal soil particles. Gypsum or other flocculants can be added to increase the rate at which the particles will settle out. In some cases, it might be acceptable to dispose of stormwater into landscaped or vegetated areas.

Appendix 1

Appropriate Regulatory Authority

A key aim of the POEO Act is to differentiate more clearly between the regulatory responsibilities of the EPA and those of local authorities, such as councils.

Table 1 summarises the appropriate regulatory authority (ARA) for marinas and boat repair facilities. Table 2 shows more generally the ARAs and their responsibilities.

The ARA is responsible for:

- (a) the whole of the premises, and
- (b) all aspects of environmental impacts of an activity, including air, water, noise and waste issues.


Table 1: Appropriate Regulatory Authorities for marinas and boat repair facilities

| Activity | Appropriate Regulatory Authority |
|---|---|
| Scheduled marinas and boat repair facilities | EPA |
| Non-scheduled marinas and boat repair facilities | Relevant local authority (usually local council) |
| Non-scheduled marinas and boat repair facilities holding a licence to control pollution to waters | EPA |

Table 2: Appropriate Regulatory Authorities and their responsibilities

| Appropriate Regulatory Authority | Responsible for: |
|---|---|
| EPA | <ul style="list-style-type: none"> • All scheduled activities • Activities and premises subject to an environment protection licence, including all licences to control water pollution from non-scheduled activities • Premises occupied by, or activities carried on by, the State or a public authority |
| Local councils | All other activities in a council area |
| Lord Howe Island Board | All other activities on Lord Howe Island |
| Western Lands Commissioner | All other activities in the Western Division of the State, except in local council areas |
| Marine authority | Noise control notices in relation to vessels in navigable waters, and premises used in conjunction with vessels that are situated adjacent to, or partly or wholly over, navigable waters |

NOTE: Where there is no other appropriate regulatory authority, the EPA is the default ARA. The authorities listed above (other than the EPA and marine authority) are the 'local authorities' referred to in the POEO Act.



Appendix 2

Other approvals that might be needed for developing or upgrading marinas

If you are proposing to start a development you should contact the relevant authorities to find out their approval requirements.

Any proposal for the development or upgrading of a marina or boat repair facility is likely to require planning and/or building approval from the local council and/or statutory authorities responsible for waterways or port areas. It is envisaged that consent authorities will refer to these guidelines when they are deciding what conditions will be attached to planning or building approvals.

Other relevant legislation/approvals from key authorities might include:

| Council | Development approvals |
|---|---|
| Department of Urban Affairs and Planning | <i>Environmental Planning and Assessment Act 1979</i> |
| NSW Fisheries | <i>Fisheries Management Act 1994</i> |
| Department of Land and Water Conservation | <i>Crown Lands Act 1989</i> |
| Department of Land and Water Conservation | <i>Rivers and Foreshores Improvement Act 1948</i> |
| National Parks and Wildlife Service | <i>National Parks and Wildlife Act 1974</i> |
| Waterways Authority | <i>Environmental Planning and Assessment Act 1979</i> |

The EIS Guideline from the Department of Urban Affairs and Planning is probably the best source of information on other approvals.



Appendix 3

Restrictions on the use of tributyltin antifouling paints

The following restrictions on the use of paints containing organotin compounds were introduced in 1989; they are provided here to remind readers that these restrictions still apply.

WHY THE RESTRICTIONS?

Paint containing tributyltin (TBT) is very effective in preventing the growth of barnacles, algae and various other fouling organisms on boat hulls. The paint, however, also releases small amounts of TBT into waterways—usually estuaries—where it affects other marine organisms such as fish, bivalves (mussels and oysters), gastropods (periwinkles) and crustaceans (crabs and lobsters). Very low levels of TBT in the water column have been known to cause harmful effects such as loss of mobility, shell deformations and restricted growth and reproduction—including the failure of newly laid eggs to develop. Estuaries are important breeding grounds for fish, and at least two-thirds of the commercial fish harvest in NSW depends on them. To protect the State's important oyster industry, as well as our valuable estuarine environments, restrictions on the use of TBT were introduced.

NSW does not currently allow the use of TBT antifouling paints on vessels under 25 metres long.

USING TBT

Only boat repair facilities and other premises that have the capacity to treat vessels over 25 metres are legally entitled to be in possession of TBT paints. Such premises must have a National Registration Authority (NRA) permit (PER 1606 or any permit that supersedes it) and hold an Environment Protection Authority (EPA) licence.

To obtain permission to use TBT paints on vessels over 25 metres, **contact the NRA to seek approval** for inclusion under NRA permit PER 1606 (or any permit which supersedes it) to use TBT paint and **obtain the appropriate EPA licence(s)**. Your premises might need to be inspected to ensure that you have adequate safeguards to contain the TBT, and that you can provide for responsible disposal of the wastes collected.

Boat repair facilities and other premises that have been approved in writing by the NRA to operate under permit PER 1606 (or any permit that supersedes it) and hold the appropriate EPA licence(s) can obtain TBT antifouling paints directly from paint suppliers, but only for use on vessels over 25 metres. It is an offence under the *Agricultural and Veterinary Chemicals Code Act 1994* (Agvet Code) for retailers to sell TBT paints unless they have been included under schedule 1 of the NRA permit PER 1606 (or any permit that supersedes it).

TBT paints are recognised as pesticides under the *Pesticides Act 1978*, but are not currently registered in NSW by the NRA.

All waste materials from antifouling paints containing TBT or other organotin compounds have been declared chemical wastes under Section 10 of the *Environmentally Hazardous Chemicals Act 1985* (EHC Act). The Organotin Wastes Chemical Control Order 1989 (Organotin Wastes CCO) regulates the handling and disposal of these paint wastes. The controls specified in the Organotin Wastes CCO ensure that wastes generated during the application or removal of organotin antifouling paint—including scrapings, overspray, equipment and used containers—are prevented from entering the marine environment. The EPA is currently reviewing the Organotin Wastes CCO.

The *Protection of the Environment Operations Act 1997* (POEO Act) requires the licensing of transporters of hazardous waste (including TBT and other organotin wastes) in quantities greater than or equal to 200 kg or 205 L per load. Non-licensed transporters must observe requirements relating to non-licensed waste transporting under the POEO Act. The POEO Act and the EHC Act require the disposal of these wastes according to the Organotin Wastes CCO.

For further information (including the outcome of the review of the Organotin Wastes CCO), contact the Environment Protection Authority.

| Activity | Requirement | From | Legislation |
|--|---|----------------------------------|---|
| Possession/sale/use of TBT antifouling paint | Permit | National Registration Authority | <i>Agricultural and Veterinary Chemicals Code Act 1994</i> (Agvet Code) |
| Discharge of aqueous organotin wastes (including TBT wastes) to waters | Licence | Environment Protection Authority | <i>Protection of the Environment Operations Act 1997</i> |
| Generation/storage of organotin wastes (including TBT wastes) | Licence | Environment Protection Authority | <i>Environmentally Hazardous Chemicals Act 1985</i> |
| Disposal of organotin wastes (including TBT wastes) | In accordance with the Organotin Wastes Chemical Control Order 1989 | Environment Protection Authority | <i>Environmentally Hazardous Chemicals Act 1985</i> <i>Protection of the Environment Operations Act 1997</i> |
| Transportation of organotin wastes (including TBT waste) in quantities \geq 200 kg or 205 L per load | Licence | Environment Protection Authority | <i>Protection of the Environment Operations Act 1997</i> |