

## Report on the implementation of the Environmental Management Plan for the Management of Contaminated Sediment – September 2009

### Background

#### Office of the Environmental Monitor

The Office of the Environmental Monitor's (the Office) terms of reference outlines the arrangements to report on the implementation of the Channel Deepening Project (CDP).

They include the following tasks:

- Review the management reports of the Environmental Management Plan (EMP) prepared by the Port of Melbourne Corporation (PoMC) and examine any other reports related to the EMP that may be requested by Victorian Ministers;
- Monitor and evaluate the environmental performance of the project, including matters raised by stakeholders and the community to 31 December 2011; and
- Advise PoMC and relevant Ministers, or their delegate, on the above matters, and any other matters referred to the Environmental Monitor by a relevant Minister, as appropriate.

All matters are to be examined against the EMP's requirements.

The terms of reference set out reporting arrangements that include:

- The Environmental Monitor will provide regular reports to the Minister for Environment and Climate Change, or delegate, on all matters monitored against the EMP. Reports will be provided quarterly as a minimum, but more regularly by request of the Minister and/or if the Environmental Monitor considers it necessary.

#### Office work program – Management of Contaminated Sediment

The Office established a program of work activities for the management of contaminated sediment that includes assessing:

- The bund and stub wall;
- Methods to remove and place contaminated sediment; and
- Sand capping.

#### Contaminated sediment

Most metals such as arsenic and nickel occur naturally in the rocks and soil found in Port Phillip Bay's (the Bay) 9,790 square kilometre catchment. In an ongoing process, sediment from this catchment is carried into the rivers and settles in the lower reaches of the Yarra and Maribyrnong Rivers. Every storm and flood carries sediments into the rivers and the Bay each year, resulting in metals being naturally present.

Human activities within the catchment such as agriculture, urban development and industry can lead to higher levels of these metals ending up in the rivers and can also result in introduction of other metals and organic compounds that are not naturally present in the catchment.

Sediments are considered to be polluted with contaminants when the concentrations of compounds reach levels that may pose risks to the environment or public health.

As part of regular maintenance of the Port of Melbourne shipping channels, dredging of contaminated sediment has occurred for more than one hundred years. The last major dredging program in the Yarra River and Hobsons Bay was in the early 1980s, with minor dredging occurring more recently. The contaminated sediments that have accumulated in the lower reaches of the Yarra River, Williamstown and Port Melbourne Channels and berth pockets since then are being dredged during the project.

As part of the Supplementary Environment Effects Assessment, PoMC was required to examine sediments from the Yarra River for metals and organic compounds and to consider any effects to human health and the Bay's ecosystem. In total 441 samples were collected and up to 49 tests completed on each sample.

Where present, the contaminants are, in the main, tightly bound to the sediment. This limits the extent to which they can dissolve in the water and enter the marine aquatic ecosystem. However, small amounts of contaminants may be taken up by fish and other marine organisms, either directly through the ingestion of contaminated sediments or consumption of other organisms that have accumulated contaminants either directly or indirectly. The assessment identified no likely health risk concerns for Bay users as a result of dredging contaminated sediment (see the Minister for Planning's Environmental Effects Assessment of the CDP at [www.dpced.vic.gov.au](http://www.dpced.vic.gov.au)).

The contaminated sediments largely occur as a layer of unconsolidated sediment that has settled in the Yarra River on top of the riverbed's packed clay. This clay is more than one million years old. Some contaminated sediment also occurs in the Williamstown and Port Melbourne shipping channels and berth pockets, and may consist of unconsolidated contaminated sediment or contaminated clay. No contaminated sediments occur in the shipping channels dredged in the south of the Bay or at the Entrance.

## **Channel Deepening Project (CDP)**

As part of the CDP, dredging to increase the navigable depth of the Yarra River, Williamstown and Port Melbourne Channels occurred in 2008 and 2009.

The EMP includes controls for the dredging, or removal, and transportation of contaminated sediment from the Yarra River, Williamstown and Port Melbourne Channels, swing basins and berth pockets. These controls were developed to minimise the amount of contaminated sediment suspended in the water column and thereby limit the potential for environmental impacts or risks to human health.

The EMP also includes requirements and controls for the construction of a bund surrounding the area to contain the contaminated sediment, the placement of the contaminated sediment into this area and subsequent capping of the area. This area is located within the Port of Melbourne Dredge Material Ground and is referred to as "DMG" in the remainder of this document.

## **Environmental Management Plan (EMP)**

It was envisaged that the EMP may require amendment from time to time. The process for considering such amendments is set out in the EMP (Section 1.7).

During 2008 and 2009 there was regulatory approval for amendments to the EMP. None were specific to controlling the management of contaminated sediment.

Table 16 of the EMP sets out requirements for the removal and placement of contaminated sediment by the dredge vessels, Trailing Suction Hopper Dredger (TSHD), or backhoe and grab dredges.

Contaminated sediment dredged during the CDP consisted of two types:

1. Unconsolidated contaminated sediment (these are soft silts).
2. Contaminated clay (these are consolidated sediments).

The EMP includes rules for the removal, management and placement of these contaminated sediments. All contaminated sediment must be placed at the PoM DMG, or extension to it, located in the north of the Bay.

### **EMP rules for construction of the bund for the containment of unconsolidated contaminated sediment and contaminated clay**

The EMP specifies that the bund can be constructed from several materials:

- Consolidated sediments (clays) dredged from Port Melbourne Channel,
- Uncontaminated clays dredged from Yarra River and Williamstown Channel,
- Sand from South Channel used for cleaning the TSHD hopper, and
- Contaminated clay from Appleton Dock, near Webb Dock and batter walls.

It also provides specifications for the bund including; location in the PoM DMG, minimum width of the crest of the bund (not less than 40m), maximum crest elevation of the main bund and/or stub wall of -14.0m Chart Datum (the mean lower low water mark in the Bay) and the option to create a 'stub wall' on top of the main bund wall with a crest height not greater than 1.0m above the main bund crest and crest width not less than 5.0m.

Once the main bund has been constructed, the EMP allows the remainder of the consolidated sediments (clays) to be used to construct an extension to the main bund, which surrounds an area to contain contaminated sediment from future maintenance dredging programs.

### **EMP rules for removal and placement of unconsolidated contaminated sediment**

As set out in the EMP, the unconsolidated contaminated sediment could be removed by either of two methods:

1. By TSHD (e.g. the CoZa) operating in non-overflow mode with a silt draghead.
2. By backhoe or grab dredge (e.g. the *Storken* or *Goomai*).

#### *EMP rules for the removal and placement of unconsolidated contaminated sediment by TSHD*

When removing the sediment, the dredger must operate in its non-overflow mode and the sediment must subsequently be placed within the DMG using a diffuser. The unconsolidated contaminated sediment placed by the diffuser must then settle for around 140 days before capping.

#### *EMP rules for the removal and placement of unconsolidated contaminated sediment by backhoe or grab dredge*

When removing the sediment, the backhoe or grab dredge the sediment must be placed in a barge, then transported to the DMG, and then placed into the DMG through the hopper bottom doors. A diffuser is not required. As set out in the EMP, if the sediment is removed by backhoe or grab dredge then the 140 days settling time does not apply. This is because there is less water taken up with the sediment when removed by a backhoe or grab dredge, compared to the TSHD.

## EMP rules for removal and placement of contaminated clay

As set out in the EMP, the contaminated clay could be removed by either of two methods:

1. By TSHD (e.g. the CoZa) operating in non-overflow mode with a clay draghead.
2. By backhoe or grab dredge (e.g. the *Storken* or *Goomai*).

The EMP allows the contaminated clay to be used to build the bund. Where this occurs, the EMP requires that it be placed:

- Within 20m of the bund centreline on the non-capped side of the bund only.
- To a height not exceeding RL -17m.
- Covered with uncontaminated clay or by capping.

Alternatively it can be placed on the inward side of the bund and covered by the sand capping. As required by the EMP, where this material is removed by the TSHD, it is to be placed by opening the dredger's hopper doors, thereby releasing the clays. The EMP requires that, if consolidated clay is removed by a backhoe or grab dredge, the clay must be transported and placed by a barge using the same method as for placement of unconsolidated contaminated sediment.

## EMP rules for capping of unconsolidated contaminated sediment and contaminated clay

Unconsolidated contaminated sediment placed in the DMG by the diffuser must settle for around 140 days before capping can commence. Unconsolidated contaminated sediment placed in the bund by barge does not require the 140 days settling period. Contaminated clay placed by the TSHD or barge also does not require the 140 days settling period.

The capping layer must be of clean sand from South Channel and must be a minimum of 0.5 m in thickness.

## Sequence of major activities in the management of contaminated sediment

### Major dredging activities

1 March 2008	Construction of main bund commenced, initially with clay removed from the Port Melbourne Channel. The bund is then built in series of 'lifts' and stages.
29 May 2008	Diffuser placement of unconsolidated contaminated sediment, removed by TSHD, into the DMG commenced.
24 April 2008	Barge placement into the DMG of unconsolidated contaminated sediment removed by backhoe or grab dredge commenced.
5 October 2008	Diffuser placement of unconsolidated contaminated sediment, removed by TSHD, into DMG completed.
1 May 2009	Barge placement into the DMG of unconsolidated contaminated sediment removed by backhoe or grab dredge completed.
17 May 2009 <sup>1</sup>	Barge placement into the DMG extension of unconsolidated contaminated sediment removed by backhoe or grab dredge commenced.
02 May 2009	Capping of the DMG commenced and was completed on 09 June 2009

6 June 2009	Dredging of all unconsolidated contaminated sediment (silt) completed. Barge placement into the DMG extension of unconsolidated contaminated sediment removed by backhoe or grab dredge completed.
06 June 2009	Capping of contaminated sediment into the DMG extension commenced and was completed on 08 June 2009
08 August 2009	Dredging of all contaminated clay and placement within the bund has been completed.

Note

- 1 Following regulatory approval in April 2009, 13,000 m<sup>3</sup> of unconsolidated contaminated sediment was placed within the bunded extension at the PoM DMG.

### Major monitoring activities

Under requirements set by the EMP three suites of monitoring data were available to the Office during the dredging, transport and placement of contaminated sediment. These were:

Process monitoring, inspections and surveys

- Tracking of equipment, including TSHD dredgers.
- Dredging schedule of TSHD dredgers.
- Internal PoMC audits of dredging activity.
- Notifications of the transition from dredging contaminated to uncontaminated sediment.
- Notification of the placement of contaminated sediment in the bund. This included hydrographic surveys to confirm bund capacity.

Environmental Monitoring

- Turbidity monitoring at 20 locations across the Bay including in the Yarra River, Hobsons Bay and just south of the PoM DMG.

Baywide monitoring

- Monthly water quality monitoring, including trace metals, at 11 locations including Yarra River (near the Newport Power Station intake), Hobsons Bay and at the PoM DMG, to detect changes in water quality outside expected variability.
- Contaminants in fish monitoring in January/February 2009 to determine if the existing health advisory requires review.
- Plume intensity and extent monitoring to detect changes in the intensity and/or extent of the plume outside expectations.

In addition the Office considered the results of EPA Victoria's weekly beach monitoring that included trace metals and organics at 36 beaches around the Bay.

## Office findings on the implementation of the EMP

### Findings

The Office's findings are based on:

- Scrutiny of information generated by monitoring of dredging activities and reporting requirements set out in the EMP;
- Assessment of environmental incidents;
- Expert advice from the Independent Expert Group;
- Independent audits of works and baywide monitoring programs; and
- Reports and issues raised by the community.

#### **1. The bund and stub wall**

Dredged material placement for the construction of the bund, including if constructed a stub wall, is set out in PDS 34, 35 and 36, Table 16 'Dredging Summary' and associated design specification in Drawings C001, C002 and C003 in Annexure 7 'Drawings' of the EMP.

The Office examined notifications provided by PoMC that included hydrographic surveys and tables detailing the bund and stub walls during construction of the bund. The Office examined height and width requirements for the bund and stub walls to determine that design specifications were complied with.

An independent audit commissioned by the Office found full compliance with the bund wall specifications for the PoM DMG.

#### **Finding**

The Office is satisfied that the standards set for construction of the bund in the PoM DMG have been met.

The requirements for the construction of the bund for the PoM DMG extension will be examined by an independent audit of EMP Project Delivery Standards conducted in late 2009.

#### **2. Methods to remove and place contaminated sediment**

Controls on the removal and placement of contaminated sediment were set to reduce the suspension of contaminated sediments in the water column, identify the limits for the areas being dredged, consideration of environmental and seasonal sensitivities, and monitor the transition from dredging contaminated to uncontaminated sediment.

#### **Removal of contaminated sediment**

PDS 24, 27, 28, 29 and 30 collectively set out controls to limit the area dredged where contaminated sediment is located, the type of equipment to be used and detail the process to be followed to determine the transition from dredging contaminated to uncontaminated sediment within the Yarra River and Williamstown Channels.

PDS 26 and Annexure 6 'Response processes' provides a response procedure for the operation of a TSHD in the vicinity of the Newport Power Station cooling water intake with respect to level of turbidity and certain contaminants.

PDS 31, 32 and 33 provide controls on the scheduling of dredging activities and consideration of environmental and seasonal sensitivities.

The Office used a suite of information to monitor conformance with these controls including; review of dredging schedules, CDP weekly updates, internal PoMC audits of dredging activity and relevant Notifications from PoMC that are required by the EMP.

The Office also monitored and followed up on any relevant media reports or community concerns relating to dredging of contaminated sediments.

An independent audit commissioned by the Office found full compliance with the removal of contaminated sediment for the period to 16 October 2008. This period included all dredging of unconsolidated contaminated silts by TSHD. This period also included a significant component of dredging by backhoe and grab dredges.

## **Finding**

The Office is satisfied that the standards set for removal of unconsolidated contaminated sediment by TSHD have been met.

The requirements for the removal of contaminated clay and unconsolidated contaminated sediment by backhoe and grab dredge after 16 October 2008 will be examined by independent audits of EMP Project Delivery Standards conducted in 2009.

## **Placement of contaminated sediment**

Management of the placement of contaminated sediment, whether it was unconsolidated contaminated sediment or contaminated clay, is set out in PDS 34. All dredged material to be placed in accordance with Table 16 'Dredging Summary' of the EMP and disposal (or placement) locations to be recorded as set out in PDS 24. An EMP Method Statement for material placement in the PoM DMG sets out measures for the placement of all contaminated sediments.

Management controls to place unconsolidated contaminated sediment dredged by TSHD through a pipeline and diffuser are provided in PDS No. 25, with specific requirements provided in Drawing C002 of the EMP and described in the EMP Method Statement mentioned above.

PDS 36 requires that prior to any placement of unconsolidated contaminated sediment within the DMG, confirmation is required that the partially constructed bund has been constructed in accordance with design specifications and that the DMG has the volume capacity for the sediment to be placed within it.

Also, PDS 36 requires regular hydrographic surveys be conducted to monitor depth contours and confirm DMG capacity and freeboard of the bund.

The Office monitored conformance with these controls through several mechanisms including review of internal PoMC audits of dredging activity and relevant Notifications from PoMC that are required by the EMP. The Office also monitored and followed up on any relevant media reports or community concerns relating to dredging of contaminated sediments.

An independent audit commissioned by the Office found full compliance with the placement of contaminated sediment in the DMG to 16 October 2008.

## **Finding**

The Office is satisfied that the standards set for placement of unconsolidated contaminated sediment by TSHD have been met.

The requirements for the placement of contaminated clay and unconsolidated contaminated sediment dredged by backhoe and grab dredge after 16 October 2008 will be examined by independent audits of EMP Project Delivery Standards conducted in late 2009.

### **3. Sand capping**

Controls for the placement of sand capping over the contaminated sediment placed into the DMG are detailed via PDS Nos. 31, 34 and 37. The capping layer must consist of sand dredged from the South Channel and be placed around 140 days after the completion of the hydraulic placement of contaminated sediment (that is placement through a diffuser from a TSHD). The sand capping must have a minimum thickness of 0.5m and be placed in at least 2 layers. PDS No. 37 also requires that the thickness of the sand cap be confirmed by survey and/or physical testing prior to the transfer of the DMG to PoMC.

Hydraulic placement of contaminated sediment from a TSHD was completed in early October 2008. Sand capping of the DMG commenced on 2 May 2009, 211 days after the completion of hydraulic placement. The Office observed the piston core sampling conducted by PoMC to confirm that a distinct transition between the underlying contaminated sediment and the sand capping was present.

An independent audit found full compliance with the placement of sand capping covering the DMG in the PoM DMG.

## **Finding**

The Office is satisfied that the standards set for sand capping have been met for the PoM DMG, in particular that the minimum thickness of capping is 0.5 m.

The requirements for the placement of sand capping for the contaminated sediment placed in the PoM DMG extension will be examined by an independent audit of EMP Project Delivery Standards conducted in late 2009.

### **4. Monitoring**

Monitoring programs required by the EMP and other Bay programs provide information relevant to dredging of contaminated sediments.

Turbidity monitoring in the north of the Bay commenced on 01 February 2008 at nine locations; four along the Yarra River, two in Hobsons Bay, and three in the north of the Bay (one being south of the PoM DMG). Details of this program are set out in the PoMC Turbidity – Detailed Design (CDP\_ENV\_MD\_024 Rev 3).

Weekly turbidity reports were reviewed by the Office to determine that turbidity levels stayed within environmental limits and that appropriate action was taken by PoMC if response or environmental limits were exceeded. Very minor losses of turbidity data were reported on a few occasions but these were considered to pose no risk to the ability of the monitoring program to be delivered effectively.

The Plume Intensity and Extent Monitoring Program collected field and satellite data for core dredging events to compare the plume intensity and extent during dredging against plume model outputs used in the Supplementary Environment Effects Statement (SEES) impact assessment.

Monitoring of a core event for dredging of contaminated sediments occurred in June, July and August 2008. The Office reviewed the report on this core event released in November 2008 (Plume Intensity and Extent - Core Event No.2 Contaminated material dredging 12 Sept 2008) which indicated that no significant deviation from plume modelling occurred.

Monthly water quality monitoring of a range of trace metals, nutrients and organics occurred since November 2007 at 11 locations round the bay. Several locations are of particular significance to dredging of contaminated sediments including; Yarra River near Newport, Hobsons Bay, PoM DMG and Central Bay. However all locations were monitored for the full list of parameters.

The Office has reviewed all reports for the Water Quality Monitoring Program during the period that dredging of contaminated sediment occurred to confirm that they were conducted as required and see if there was any changes to any parameter outside of expected variability. The majority of parameters remained below trigger values, but for those locations particularly relevant to contaminated dredging, a few parameters including chromium, copper and zinc were occasionally elevated at Yarra River sites. Consistent with the water quality decision framework for management, an assessment of these results outside expected variability was undertaken. The assessment determined that the results were not of significance to the Bays ecosystem and that no further investigation or review was required.

A Lower Yarra River contaminants in fish study was conducted in January/February 2009 (EPA Victoria, 2009). A wide range of organic contaminants and heavy metals were analysed and the results compared with the analysis of bream sampled from the same area in April/May 2006. The study concluded that contaminant levels were essentially unchanged compared to the earlier study. An independent Expert Panel (Expert Panel, 2009) reviewed the study and noted that the conclusions drawn in the report were scientifically valid and reasonable.

An independent audit commissioned by the Office found full compliance with the turbidity, water quality and plume intensity & extent monitoring programs relevant to contaminated sediments and the north of the Bay to 16 November 2008.

The weekly Beach Monitoring Program run by EPA Victoria provides the community with the most up-to-date information about water quality at 36 beaches around Port Phillip Bay. During the CDP, it ran all year round and was expanded to include a range of metals, common organic chemical and algae, in addition to existing bacterial contamination monitoring. Results for northern Bay beaches were within expected variability, elevated levels were only seen for bacteria and were due to localised phenomena rather than the CDP.

## **Finding**

The Office is satisfied with the conduct, results and conclusions for these monitoring programs.

The requirements for these monitoring programs, as well as the contaminants in fish monitoring program, will be further examined by an independent audit of mechanisms used to monitor environmental performance conducted later in 2009.

## **5. Future activities required by the EMP**

Controls set by the EMP continue to be active for dredging in the north of the Bay and contaminated sediments. These are set by PDS Nos. 24, 32, 33, 34 and 38.

PDS 24, 32, 33 and 34 control all continuing dredging activity in the north of the Bay, though all dredging of contaminated sediments is now complete.

PDS 38 (PoM DMG – maintenance and inspection) requires ongoing inspections of the bund and sand capping on a regular, but decreasing basis until after 12 months, annual inspections are required and, after five years, inspections are required every two years thereafter.

In addition a marine pest survey of the PoM DMG is required within three years of completion of the project.

### **Action by the Office**

The Office will continue to scrutinise the implementation of the PDS that continues to apply to contaminated sediments, maintenance and inspection of the bund and sand capping post construction through to December 2011 and will publicly report its findings. It has also commissioned several audits to examine requirements of the EMP through to the end of construction activities of the CDP including:

- Second audit of the mechanisms used to monitor environmental performance; and
- Two audits of the Channel Deepening Project EMP Project Delivery Standards.

### **Source documents**

Expert Panel, 2009. Report from an Expert Panel: Lower Yarra Fish Study. Prepared for the Office of the Environmental Monitor.

EPA Victoria, 2009. Lower Yarra Fish Study: Investigation of Contaminants in Fish. Publication 1283.

GHD, March 2009. Targeted audit of EMP requirements for Management of Contaminated Sediments. Independent Audit for the Office of the Environmental Monitor.

GHD, August 2009a. Targeted audit of EMP requirements for construction of the bund. Independent Audit for the Office of the Environmental Monitor.

GHD, August 2009b. Targeted audit of EMP requirements for sand capping. Independent Audit for the Office of the Environmental Monitor.

PoMC, November 2008. Plume Intensity and Extent - Core Event No.2 Contaminated material dredging 12 Sept 2008.