

Office of the Environmental Monitor



Work Program

Version 3 – April 2008 to December 2011

The Entrance

Management of contaminated sediments

Dredging plume management in the south of the bay

Contents

1. Introduction.....	1
2. Work Program.....	2
2.1 Critical elements of the project - management of rock removal at the Entrance.....	4
2.2 Scheduled activities - management of rock removal at the Entrance.....	6
2.3 Critical elements of the project - management of contaminated sediments.....	8
2.4 Schedule activities - management of contaminated sediments.....	11
2.5 Critical elements of the project - dredging plume management in the south of the bay....	16
2.6 Schedule activities of the project - dredging plume management in the south of the bay.	19
3. Compliance with Environmental Management Plan.....	21
3.1 Construction Management.....	21
3.2 Marine-based works (all areas).....	24
3.3 Land-based works.....	27
3.4 Dredging and plume.....	28
3.5 Dredging schedule.....	33
3.6 Dredge material management.....	35
3.7 Entrance Dredging.....	40
3.8 Hydrohammer use and marine-based pile driving.....	45
4. Monitoring of data collected across Port Phillip Bay.....	48
4.1 Environmental Management Plan Baywide programs.....	48
4.2 Existing Programs of Port Phillip Bay.....	51
5. Appendices.....	53
5.1 Appendix 1 – Environmental Limits.....	53
5.2 Appendix 2 – PoMC Notification Requirements.....	55

This Work Program is a living document that will be routinely updated during the Channel Deepening Project and for two years after its completion.

1. Introduction

The Office of the Environmental Monitor (the Office) provides an around-the-clock independent and transparent view on the environmental performance of the Channel Deepening Project (the project).

The role, objectives, functions, outputs and stakeholders of the Office are outlined in the Work Plan 2008-2012. The Work Plan outlines the responsibilities of the project proponent - the Port of Melbourne Corporation (PoMC) and the Victorian project regulator - the Secretary of the Department of Sustainability and Environment. The Work Plan can be found at <http://www.oem.vic.gov.au/WorkPlan200812WorkProgram>.

This document is the Work Program. It details the activities the Office will undertake to judge the environmental performance of the project. It is a living document and will be routinely updated during the project and for two years after its completion. Updates may reflect issues raised by stakeholders and the community, requests for advice from regulators and Ministers and changes to the dredging schedule by PoMC.

In fulfilling its role as the independent and transparent monitor of the project, the Office will consult widely with stakeholders to remain informed on aspects of the project that could affect its environmental performance. The Office will also seek to keep stakeholders and the community informed through regular updates to its website www.oem.vic.gov.au.

About this April 2008 to December 2011 version of the Work Program

This version includes details of the Office's activities from April 2008 to December 2011 relating to the operational phase involving deepening the Entrance, dredging and management of contaminated sediments and the management of dredging plume in the south of the bay.

2. Work Program

The Office will implement its Work Program by monitoring and assessing the environmental performance of the project against the Environmental Management Plan (EMP) or rule book. Where necessary, the Office will engage technical specialists or auditors to help deliver tasks set out in the Work Program.

In addition to monitoring and assessing the environmental performance of the project's implementation, the Office will quarterly and annually prepare and release reviews on its findings. These reviews will be timed to follow PoMC's obligation to report quarterly and annually.

The Office has divided its Work Program into three areas of activity; critical elements of the project; compliance with the EMP; and monitoring of data collected across Port Phillip Bay.

1. Critical elements of the project

As PoMC implements the operational phase of the project in 2008/09, the type of dredging activity, the controls specified in the EMP, and the resulting changes and range of effects on the bay will vary with each different dredging location.

The Office will monitor and assess:

- The management of rock removal in the Entrance (the Great Ship Channel). Details of Office activities are provided in this version of the Work Program.
- The dredging and management of contaminated sediments in the north of the bay (Port Melbourne, Williamstown and Yarra Channels). Details of Office activities are provided in this version of the Work Program.
- The management of the plume to meet the light requirements of seagrass in the south of the bay (South Channel). Details of Office activities are provided in this version of the Work Program.

The timing of this work, and associated reports and advice, will be based on PoMC's dredging schedule.

2. Compliance with the Environmental Management Plan

The EMP specifies measures including environmental controls, environmental limits and procedures that have been designed to mitigate the environmental effects to Port Phillip Bay from dredging.

The Office will monitor and assess the above measures and all dredging activities across the bay in order to judge the project's compliance with the EMP and its environmental performance.

The timing of this work and associated reports and advice, will be based on PoMC's obligation to provide quarterly reports.

3. Monitoring of data collected across Port Phillip Bay

The EMP specifies various monitoring programs that cover environmental monitoring, process monitoring, inspections and surveys, management performance monitoring and baywide monitoring.

The Office will continually assess all data from the wide range of monitoring programs as it becomes available.

The timing of this work, and associated reports and advice, will be determined by the frequency with which the observations are made, and the number of observations that are required to allow meaningful comment.

Therefore, the timing of reports will vary from weekly for example, PoMC's continuous observations of bay turbidity levels, to yearly, when observing the reproductive cycle of certain fish species.

The Office will also consider a wide range of data from other monitoring programs in the bay, including beach water monitoring programs run by Environment Protection Authority (EPA) Victoria and the Victorian Shellfish Quality Assurance Program, run by the Department of Primary Industries.

2.1 Critical elements of the project

Management of rock removal in the Entrance

April 2008 to November 2008

The Entrance

The Entrance is where the waters of Port Phillip Bay and Bass Strait meet. It is approximately 3.2 kilometres wide between Point Nepean and Point Lonsdale, which extend underwater as rocky banks. Nepean Bank and Rip Bank are approximately 15 metres deep. These banks are separated by the canyon, which is part of the old Yarra River bed system that winds through the Entrance. The canyon is several hundred metres wide and 100 metres deep at its deepest point.

The Entrance is relatively narrow compared to the bay and water movements through this area are driven by the differences in water level between Bass Strait and the bay. This creates strong currents that control the volume of water entering the bay.

The distribution of plants and animals at the Entrance depends on the amount of light available for plants to photosynthesise. Sunlight readily penetrates to approximately 20 metre depths and the shallower banks are abundant with marine plants such as kelp. Below 20 metres, there is limited light and fewer plants are found. These deeper areas such as on the canyon walls and the canyon floor are abundant with marine animals such as sponges and seasquirts.

Dredging at the Entrance

Dredging in the Great Ship Channel that crosses the Entrance started on 5 April 2008 and is scheduled to end by 2 October 2008.

The EMP includes controls to keep changes to channel width and depth to a minimum. These controls were developed to limit the effects on flushing of water through the Entrance and subsequent changes to bay tidal levels.

The EMP also includes controls to minimise the amount of loose rock left with each pass of the dredge draghead. Minimising loose rock reduces the potential for rock to be swept by currents into the Entrance canyon, including into the Port Phillip Heads Marine National Park. It also reduces the potential for erosion of the rocky banks through a rock-scouring process after dredging is complete.

The rock removed from the channel will be placed at the South East Dredge Material Ground and buried with clean sand dredged from the South Channel.

Work Program

From April to November 2008 the Office will monitor and assess dredging activities in the Entrance and the expected minor tidal range effects.

Following completion of dredging in the Entrance, the Work Program will be updated to include the Office's activities in assessing PoMC's compliance with EMP requirements for continued bathymetric and other surveys related to Entrance dredging.

The April to November Work Program will monitor and assess three issues including, width and depth of dredging; work methods to reduce rock spill and changes in tidal heights. A detailed schedule of tasks is listed in section 3.1. Depending on the results of the assessments during dredging, the Office may adjust its Work Program to include additional activities.

1. Width and depth of the dredging

Relevant EMP specifications are contained in Project Delivery Standards (Dredging and Plume). In summary, they include the final channel width being no greater than 15 metres of the Entrance design toe line. In relation to depth, the specifications require a minimum of 50 percent of the dredged area to be no deeper than 1.3 metres, and for a minimum of 90 percent to be no deeper than 1.8 metres of the 17.3 metres design depth.

The Office will examine information on the draghead tracks, bathymetric surveys and video monitoring to judge the project's compliance with the EMP.

2. Work methods to reduce rock spill

Relevant EMP specifications are contained in Project Delivery Standards (Entrance Dredging). In summary, they include measures for cleaning up loose rock until the rate of rock collection drops below 540 cubic metres within a 10-hour interval. Measures to minimise rockfall include leaving a 5 metre lip on the canyon edge until after clean up operations and for dredging of the canyon edge to only occur in a direction from the canyon edge to the bank.

The Office will examine information on the draghead tracks, rates of rock clean up and bathymetric surveys to judge the project's compliance with the EMP.

3. Changes in tidal heights

Changes to tidal height as a result of deepening the Entrance were predicted in the Supplementary Environment Effects Statement. The relevant EMP specifications for assessing these changes are contained in Project Delivery Standards (Entrance Dredging). They include a requirement for PoMC to identify changes to tidal conditions within the bay.

The Office will examine tidal height measurements from tide gauges in the bay to judge whether or not the environmental performance of the project is as predicted.

2.2 Scheduled activities

Management of rock removal in the Entrance

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
Width and depth of dredging	<p>Compliance with width requirements</p> <ul style="list-style-type: none"> Final channel width is no greater than 15 metres of the Entrance design toe line, with 50 per cent of delivered toe line within 9 metres of the Entrance design toe line. (North west side of Nepean Bank excepted) 	<ul style="list-style-type: none"> Draghead tracks Bathymetric surveys Calculated widths 	<p><u>During construction</u></p> <ul style="list-style-type: none"> 4-6 weeks after dredging starts <p><u>Post construction</u></p> <ul style="list-style-type: none"> On completion of dredging 	Assess dredge tracks locations
	<p>Compliance with depth requirements</p> <ul style="list-style-type: none"> A minimum of 50 percent of area to be dredged and within toe lines is to be within 1.3 metres of design depth (17.3 metres). A minimum of 90 per cent of area to be dredge and within toe lines is to be within 1.8 metres of design depth (17.3 metres). 	<ul style="list-style-type: none"> Surveys <ul style="list-style-type: none"> Bathymetric Calculated percentages 	<p><u>Pre-construction</u></p> <ul style="list-style-type: none"> Bathymetric survey and visual monitoring of scour holes at three-monthly intervals in the trial dredge area and immediately adjacent areas of the Great Ship Channel until the start of dredging. <p><u>During and Post construction</u></p> <ul style="list-style-type: none"> Bathymetric surveys of dredged areas and towed video of dredged and adjacent areas: <ul style="list-style-type: none"> 4-6 weeks after dredging start On completion of dredging 	Assess bathymetric survey results
Work methods to reduce rock spill	<p>Compliance with reducing the amount of loose rock on the banks</p> <ul style="list-style-type: none"> Final clean up achieves rate of rock removal below 540 cubic metres within a 10 hourly interval. 	<ul style="list-style-type: none"> Draghead tracks Clean up rates Surveys <ul style="list-style-type: none"> Bathymetric Video 	<p><u>During construction</u></p> <ul style="list-style-type: none"> Draghead tracks <ul style="list-style-type: none"> 4-6 weeks after start of dredging On completion of dredging Bathymetric surveys and clean-up rates 	Assess the effectiveness of clean-up operations

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
		<ul style="list-style-type: none"> • Advice from PoMC on the effectiveness of clean up operation and the environmental risks posed by the remaining loose rock material for ongoing rock scour, rock fall and safety, and the project implications for continuing clean up works. 	<ul style="list-style-type: none"> ○ 4-6 weeks after start of dredging ○ Last clean up cycle <ul style="list-style-type: none"> • Advice from PoMC on clean up effectiveness and assessment of risk <p><u>Post construction</u></p> <ul style="list-style-type: none"> • Bathymetric survey and towed video survey ○ Within 3 months following completion of dredging to assess the existence of loose rock over the entire area of Rip Bank and Nepean Bank. 	
	<p>Compliance with procedures to reduce rock fall into canyon</p> <ul style="list-style-type: none"> • Dredging of the canyon edge to occur in a direction from the canyon edge to the bank. • When dredging toward canyon, draghead is lifted to ensure no rock is removed within 5 metres of the canyon edge (defined as first high point inside the 19.1 metres depth contour). • North-west edge of Nepean Bank to be dredged last in the dredging schedule for Nepean Bank. 	<ul style="list-style-type: none"> • Draghead tracks • Surveys <ul style="list-style-type: none"> - Bathymetric - Video 	<p><u>During construction</u></p> <ul style="list-style-type: none"> • Draghead tracks ○ 4-6 weeks after start of dredging ○ During dredging ○ On completion of dredging <p><u>Post construction</u></p> <ul style="list-style-type: none"> • Bathymetric survey and towed video survey ○ Within 3 months following completion of dredging to assess the existence of loose rock over the entire area of Rip Bank and Nepean Bank. 	<p>Assess dredge tracks locations</p>
Changes in tidal height	<p>Assess changes to tidal heights</p> <ul style="list-style-type: none"> • Tidal changes consistent with SEES predictions. 	Tidal gauge data	<p><u>Post construction</u></p> <ul style="list-style-type: none"> • Tidal gauge data 	<p>Assess resulting tidal heights</p>

2.3 Critical elements of the project

Management of contaminated sediments

May 2008 to March 2009

Contaminated Sediments

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 metals ending up in the rivers and can also result in other metals and organic compounds to be recorded.

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 material 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. The contaminated sediments that have accumulated since then will be dredged during the project.

The contaminated sediment identified in these shipping channels largely occurs as a layer of silt that has settled on top of the riverbed's packed clay. This clay is more than one million years old. These silts will be dredged as part of the project.

Where present, the contaminants are in the main, 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.

A 2007 study by EPA Victoria of fish in the lower Yarra and Maribyrnong Rivers found that where contaminants were present in fish, none were above the relevant standards, including the Australian and New Zealand Food Standard maximum residual levels.

In response to this study, Victoria's Chief Health Officer said fish was part of a balanced diet; however urban waterways could become contaminated with industrial residues, which in turn could build up in fish and eels.

He further said; "While it is safe to eat fish caught from these rivers [Yarra and Maribyrnong Rivers] it is recommended people limit themselves to one serve a week. I reiterate my advice following the initial pilot study of 2005 to limit serves of eel to one a month."

He further advised that it was not uncommon for a more conservative approach to be recommended for women of child-bearing age and children and advised they should limit fish consumption to one serve a month and they should not eat eels caught in these rivers.

A health advisory is in place and this can be found at http://www.health.vic.gov.au/environment/downloads/eat_fish.pdf.

During the assessment phase of the project, PoMC was required to examine sediments from the Yarra River for metals and organic compounds and consider any affects to human health and the bay's ecosystem.

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 Channel Deepening Project at www.dpcd.vic.gov.au)

Removal and containment of contaminated sediment

Dredging of contaminated sediment in the Yarra River and north of the bay, and placement of this sediment at the Port of Melbourne Dredged Material Ground started on 24 April 2008 and is scheduled to end by late September 2008¹.

The EMP includes controls on all equipment used in the removal and containment of contaminated sediment, including the trailing suction hopper dredges (TSHD) such as the Cornelius Zanen, the grab dredge, the Goomai, and the backhoe dredge, the Storcken, as well as a number of barges.

Controls to limit the dispersal of sediments into the bay include: building a bund wall to stop the sediment from spreading across the sea floor, using a non-overflow mode when dredging contaminated silts with the trailing suction hopper dredge, using a diffuser to place the silt into the bund, and limiting the height of the bund wall above the seafloor so that the contaminated silt is not disturbed by storm waves. Controls are in place to ensure that the process for changing work methods between dredging contaminated and non-contaminated material is properly managed.

A layer, at least 0.5 metres thick of clean sands dredged from the South Channel will cap the contaminated silt to prevent marine animals from burrowing into it. This sand layer must also be at a water depth where it will not be affected by storm waves.

Work Program

From May 2008 to March 2009, the Office will monitor and assess dredging activities that remove, place and contain the contaminated sediment.

Once the removal and placement of the contaminated silt in the Port of Melbourne Dredge Material Ground is completed (September 2008), the Work Program will be updated to include the Office's activities in assessing PoMC's compliance with EMP requirements for continued bathymetric and other surveys of the bund. The Work Program will also be revised, as required, once the results of the placement of the sand capping and the Contaminants in Fish Baywide Monitoring Program are known.

The Work Program will monitor and assess three issues including: the construction of the bund, work methods used to remove and place the contaminated material and the placement of sand capping. Particular attention will be given to assessing water quality data that is available from monitoring programs that test physical, chemical and biological indicators of water quality. A detailed schedule of tasks is listed in section 2.4. Depending on the results of the assessments during dredging, the Office may adjust its Work Program to include additional activities.

¹ Schedule issues by PoMC 6 May 2008 (Schedule FINALRev1Upd2)

1. The bund and stub wall

Relevant EMP specifications are contained in Project Delivery Standards (Dredge Material Management) and method statement for the Port of Melbourne Dredge Material Ground.

In summary, they include the location of the bund, the bund crest to be no less than 40 metres wide, and that if it is required, the stub wall crest to be no less than five metres wide and no more than one metre higher than the bund crest, and that the height of stub wall crest must not exceed 14.7 metres. They also include specifications on the way in which the bund and the stub wall are to be constructed.

The Office will examine information on the implementation of dredging and placement plans, vessel and vessel tracking records and hydrographic surveys, and post construction inspection records to judge the project's compliance with the EMP.

2. Methods to remove and place contaminated sediment

Relevant EMP specifications are contained in Project Delivery Standards (Dredging and Plume, and Dredge Material Management) and method statement for Dredging Works North - Contaminated.

In summary, they include that the trailer suction hopper dredge must operate in non-overflow mode when dredging contaminated silts and that these silts must be placed by a diffuser immediately above the seafloor within the bund. They also include specifications for managing the transition of the dredging process between contaminated and non-contaminated sediment.

The Office will examine information on dredging and placement plans, vessel and vessel tracking records, hydrographic surveys and transition notification details to judge the project's compliance with the EMP.

3. Sand capping

Relevant EMP specifications are contained in Project Delivery Standards (Dredge Material Management).

In summary, they include that the capping layer is placed over the contaminated silt no less than 140 days after the last of the contaminated silt, which was removed by the trailing suction hopper dredge, has been placed into the bund. They also include the requirements that the capping layer will be made from clean sand dredged from South Channel and that the layer is at least 0.5 meters thick.

The Office will examine the project schedule, dredging and placement plans, hydrographic surveys, and post construction inspection reports to judge the project's compliance with the EMP.

2.4 Scheduled activities

Management of contaminated sediments

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
The bund and stub wall	<p>Compliance with design specifications of bund walls</p> <ul style="list-style-type: none"> • The bund crest shall be no less than 40 metres wide. • The stub wall crest shall be no less than 5 metres wide. • The stub wall crest height shall be no greater than 1 metre higher than the bund crest. • The stub wall crest height shall be no greater than RL -14.7 metres. • If required, contaminated clay may be placed within a cross sectional area bounded by limits of: <ul style="list-style-type: none"> ○ Within 20 metres of the bund centreline on the uncapped side of the bund ○ To a height not exceeding RL -17 metres. 	<ul style="list-style-type: none"> • Placement plans • Vessel tracking records • Vessel records <ul style="list-style-type: none"> ○ Dredged location ○ Disposal location ○ Material type • Hydrographic surveys • Post construction inspection records 	<p><u>During bund construction</u></p> <ul style="list-style-type: none"> • Placement Plans, vessel tracking records, hydrographic surveys outputs <ul style="list-style-type: none"> ○ At partial completion of bund ○ On completion of stage 1 (main bund) ○ On completion of stage 3 (extension) <p><u>Post bund construction</u></p> <ul style="list-style-type: none"> • Post construction inspection records of bund after completion <ul style="list-style-type: none"> ○ Two weeks ○ One month ○ Two months 	<p>Assess construction</p>

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
<p>Methods to remove and place contaminated sediment</p>	<p>Compliance with equipment and methods for dredging and placement of contaminated material</p> <p><u>Dredging</u></p> <p><i>Contaminated clays</i> in locations within Appleton Dock and near Webb Dock and batter walls</p> <ul style="list-style-type: none"> • Dredged with: <ul style="list-style-type: none"> ○ TSHD in non-overflow with clay draghead ○ Grab dredge & Backhoe dredge <p><i>Contaminated silts</i> in Yarra River, Williamstown Channels and southern section of Port Melbourne Channel</p> <ul style="list-style-type: none"> • Dredged with: <ul style="list-style-type: none"> ○ TSHD in non-overflow with silt draghead ○ Grab dredge & Backhoe dredge <p><u>Placement</u></p> <ul style="list-style-type: none"> • Contaminated silts dredged with TSHD placed by diffuser • Contaminated silts and clays dredged with Grab dredge and Backhoe dredge and contaminated clays dredged with TSHD placed by opening the hopper doors of barges 	<ul style="list-style-type: none"> • Dredging and placement plans • Vessel tracking records • Vessel records <ul style="list-style-type: none"> ○ Dredged location ○ Disposal location ○ Material type 	<p><u>During Dredging</u></p> <ul style="list-style-type: none"> • Dredging and placement plans, vessel tracking records 	<p>Assess dredging and placement procedures</p>

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
	<p>Compliance with transition arrangements from dredging contaminated to uncontaminated material</p> <ul style="list-style-type: none"> • Dredging of contaminated material in a management unit has been completed when no fewer than the nominated number of dredging passes has been recorded in each grid cell. • Dredging of contaminated material has been completed when removal of contaminated sediment to the full thickness has been recorded in each grid cell within an area. 	<ul style="list-style-type: none"> • Hydrographic surveys • Dredging and placement plans • Transition notifications including <ul style="list-style-type: none"> ○ Drawings showing contaminated/ uncontaminated boundary ○ Nominated number of passes required per cell grid (TSHD only) ○ Areas where number of passes have been achieved ○ Depth of resultant dredge surface 	<p><u>During-dredging</u></p> <ul style="list-style-type: none"> • Hydrographic surveys, dredging and placement plans, transition notifications <ul style="list-style-type: none"> ○ On completion of transitions 	<p>Assess equipment tracking data.</p>

Office task	Objective and EMP specification (summary only)	Information	Timing	Office activity
	<p>Compliance with requirement for placement of contaminated silts within bund</p> <ul style="list-style-type: none"> • Contaminated silts dredged by TSHD shall be placed by a diffuser at a water depth of at least one metre below the bund crest level. • Intermediate placement level of silt shall be no higher than 0.5 metres below lowest level of bund crest or stub wall. • Final placement level of silt shall be no higher than 1.25 metres below lowest level of bund crest or stub wall. 	<ul style="list-style-type: none"> • Dredging and Placement plans, • Vessel tracking records • Vessel records <ul style="list-style-type: none"> ○ Dredged location ○ Disposal location ○ Material type • Hydrographic surveys 	<p><u>During Dredging</u></p> <ul style="list-style-type: none"> • Dredging and placement plans, Vessel tracking records, vessel records and hydrographic surveys <ul style="list-style-type: none"> ○ Intermediate placement of placement of contaminated material ○ Final placement of placement of contaminated material 	
Sand capping	<p>Compliance with specifications of the capping layer</p> <ul style="list-style-type: none"> • Capping layer placed no less than 140 days after completion of the placement of contaminated materials. • Capping layer thickness to be a minimum of 0.5 metres • Capping Layer to be placed in a minimum of 2 layers. 	<ul style="list-style-type: none"> • Project schedule showing actual activities • Dredging and placement plans • Hydrographic surveys • Post construction Inspection reports (including cone penetration tests) 	<p><u>Pre-capping</u></p> <ul style="list-style-type: none"> • Project schedule, dredging and placement plans <p><u>During capping</u></p> <ul style="list-style-type: none"> • Dredging and placement plans, hydrographic surveys, inspection reports <p><u>Post-capping</u></p> <ul style="list-style-type: none"> • Post construction inspection of capping layer after completion starting at one month following capping 	<p>Assess capping procedures</p>

2.5 Critical elements of the project

Dredging plume management in the south of the bay

September 2008 to December 2011

Southern Port Phillip Bay

The southern part of Port Phillip Bay is dominated by a broad shallow delta composed of medium to fine sand known as the Great Sands. The area contains important marine assets including seagrass meadows, Ramsar-listed wetlands and marine parks. Seagrass meadows in this part of the Bay, comprised mainly of *Zostera* and *Heterozostera* species (eelgrass), provide habitat for fish, including some recreationally and commercially important species such as King George whiting. The beds bind together mobile sediments and provide habitat and food sources for many plants and animals. Seagrass occurs from intertidal areas to about five metres in depth, and is patchily distributed across the area, with notable areas off Blairgowrie, Mud Islands, Swan Bay and Corio Bay. Seagrass is dependant on light for survival and growth and its depth distribution is limited in part by the amount of light that can travel through the water and reach the seabed.

Dredging of South Channel

The South Channel is an integral part of the approach channel to the Port of Melbourne. The channel is approximately 20 kilometres long, traversing the Great Sands between Hovell Pile in the east and Popes Eye in the west. Under the Channel Deepening Project (CDP) some 14.59 million cubic metres of sand will be dredged, with most dredged from the eastern end of the channel.

The Environmental Management Plan (EMP) sets controls to minimise the effects of dredging in the South Channel. These include limits on where and when dredging can take place, the maximum depth and width of the dredged area, the methods and dredging technology to be used and on where the dredged material can be placed (including the depth required to prevent resuspension from the Dredged Material Ground). These controls are codified in the Project Delivery Standards (PDS) for the Project.

To protect seagrasses, turbidity from dredging operations is monitored continuously at six locations adjacent to important seagrass beds. Trigger levels have been set for turbidity that are designed to protect seagrass. Should these trigger levels be reached, the regulator of the Project must be notified and action taken to ensure turbidity does not adversely affect seagrass. Two additional support meters are located in the south of the Bay and will also serve to inform PoMC about the behaviour of the dredge plume.

Two of the nine Baywide Monitoring Programs will inform the Office's assessment of seagrass. First, the Plume Intensity and Extent Monitoring Program is the backbone of the Baywide monitoring programs and is designed to determine whether the dredging plume remains within expected limits. Second, the Seagrass Monitoring Program will determine whether any changes to seagrass during and for two years after the dredging are within expected variability based on historical information.

Work Program

From September 2008 to December 2011, the Office will monitor and assess critical aspects of EMP monitoring programs that relate to seagrass. The Office will focus on three main areas: 1) the Baywide Monitoring Program of seagrass health; 2) turbidity limits to protect seagrass; and 3) the dredging schedule and the implications of any revisions to the schedule for seagrass.

1. Baywide seagrass monitoring

The Baywide Seagrass monitoring program is one of nine Baywide programs under the EMP, designed to provide an overall picture of Bay health. The distribution of seagrass beds at nine locations is being monitored using aerial photography and field assessment, and the health of seagrass at six of those sites will be monitored in detail by SCUBA divers. The aim of the program is to detect any changes to seagrass outside expected variability. Aerial photography to map seagrass beds will be done annually and field assessment of seagrass health is done quarterly.

Any change outside expected variability, as assessed by pre-determined criteria, triggers an assessment to determine whether the change is significant to the environment. If it is significant, PoMC is required to complete a risk assessment to determine the flow on effects on species and ecological processes, and to identify the likely causes of the observed change. Appropriate management actions will then be identified and applied. The Office will scrutinise the implementation of the Baywide Seagrass Monitoring Program against the requirements of the detailed design, and provide advice as necessary.

2. Turbidity limit to protect seagrass

Turbidity is a measure of the amount of light that is reflected by particles suspended in a column of water. Turbidity in the water affects the amount of light available for marine plants like seagrass, such that the greater the turbidity (and the deeper the water), the more light is reduced. The dredge plume and its effect on light availability is the primary mechanism by which dredging could impact on seagrass. The EMP sets environmental turbidity limits to protect seagrass.

The turbidity limits set for seagrass aim to meet the ecological objective that 15 percent of surface light is maintained at a depth of at least 3 metres. This is considered to be a conservative estimate of the amount of light required to maintain seagrass (*Zostera* and *Heterozostera*).

For the EMP, the relationship between turbidity and light reduction was defined using a model simulation, which included certain assumptions about the homogeneity of sediments within the dredging plume. The EMP detailed design specifies that light levels and turbidity levels will be monitored continuously at three locations and this data will be reviewed monthly.

Total Suspended Solids (TSS) is a measure of the amount of material suspended in the water, and is measured in units of milligrams per litre of water. While TSS may be used as a surrogate for turbidity, the exact relationship depends on the nature and size of the suspended particles. The Baywide Plume Intensity and Extent Monitoring Program requires that the observed dredging plume is assessed against the modelled plume, and that any deviation from the model be investigated. By necessity, the output of this model is in units of TSS (mg/l), which must be converted to turbidity units (NTU) for comparison with field data. Data on the exact relationship will improve the ability to determine the deviation of the measured plume from that predicted in the model, as required in the EMP. PoMC is refining this relationship (PoMC 2008. Minutes of the interim management review for Environmental Monitoring – Plume Intensity and Extent – 23 July 2008). The Office will carefully examine the work regarding light reduction, turbidity and

TSS and will examine how these results are applied in the implementation of turbidity monitoring and the Plume Intensity and Extent Monitoring Program.

3. Dredging schedule

The EMP specifies that a dredging schedule must be prepared and that revisions to the schedule must be assessed to confirm the ability to comply with turbidity limits (PDS 32).

In its first Quarterly Review, the Office highlighted an opportunity for the timing of Baywide programs to be reviewed when adjusting the dredging schedule, to ensure the most timely conclusions could be drawn from this monitoring. PoMC has committed to do this.

Both of these considerations will be important during dredging in the south of the Bay, in relation to both the Seagrass Monitoring Program and the Plume Intensity and Extent Monitoring Program. For both programs, any results outside expected variability will require timely follow-up in order to mitigate any impacts that may arise.

The Office will continue to carefully examine any changes to the dredging schedule for the south of the Bay and provide advice on any implications for turbidity plume and the timely delivery of monitoring results.

2.6 Scheduled Activities

Dredging plume management in the south of the bay

Office task	Objective and EMP reference	Information	Timing	Office activity
Baywide Monitoring seagrass health.	<ul style="list-style-type: none"> ○ Compliance of seagrass monitoring activities with the design of the program, and implementation of subsequent decision processes (e.g. risk reviews, changes to the program). 	<ul style="list-style-type: none"> ● Scheduled reporting of the Baywide Seagrass Monitoring Program ● Interim management reviews of the program ● Audit of the program 	<u>From now until the end of 2011</u>	Assess implementation of Baywide program, Management Reviews and audits of the program
Turbidity limits to protect seagrass.	<ul style="list-style-type: none"> ○ Assess whether EMP tasks to confirm that environmental (turbidity) limits to protect seagrasses meet ecological objectives are completed, ○ New data to inform the relationship between light attenuation NTU and TSS is available, and ○ Confirm that the assessment of these relationships is considered in the Turbidity and Plume Intensity and Extent monitoring program. 	<ul style="list-style-type: none"> ● Data collected during the Turbidity Monitoring Program. ● PoMC Reports ● Management review workshop 	<u>By end of January 2009</u>	Assess work on light, turbidity & TSS and its application to monitoring programs

Office task	Objective and EMP reference	Information	Timing	Office activity
<p>Implications of changes to the dredging schedule.</p>	<ul style="list-style-type: none"> ○ Ensure that effects on turbidity are considered by the dredging schedule. ○ Ensure that the timing of monitoring programs are, where relevant, aligned to the dredging schedule so that timely information is provided to inform management. 	<ul style="list-style-type: none"> • Notifications of updated schedule from PoMC • Expert advice as required 	<ul style="list-style-type: none"> ○ <u>September 2008 until completion of dredging in the south of the Bay</u> 	<p>Review notifications provided by PoMC of changes to schedule and provide advice as necessary</p>

3. Compliance with Environmental Management Plan

3.1 Construction Management

Construction management (all activities)		Project phase	Compliance
Objective	To appropriately plan and implement construction aspects of CDP activities. To ensure noise levels comply with SEPP N-1 requirements. To ensure that materials are appropriately stored, handled and disposed of.		
Target	Conformance with all environmental limits and controls specified in this PDS.		
Application	The duration of the CDP during all project activities and areas.		
Environmental controls			
1. Hours of operation <ul style="list-style-type: none"> ▪ All activities may be conducted on a 24 hour, 7 days a week basis, except where explicitly restricted within a PDS, or relevant legislation. 		All phases	
2. Airborne noise <ul style="list-style-type: none"> ▪ All activities must be conducted within SEPP N-1 limits. ▪ Noise assessment (desktop) of dredging vessels and major equipment (that are new to the CDP and not included in the existing modelling) to be conducted before acceptance and mobilisation onto project. Where the assessment indicates that the vessel or equipment may not conform to the SEES risk assessment outputs, appropriate action is to be taken as described in Airborne Noise Contingency Plan. 		All phases	
3. Airborne Noise Monitoring <ul style="list-style-type: none"> ▪ Noise monitoring to be undertaken as described in the Airborne Noise Monitoring Program (Annexure 5): <ul style="list-style-type: none"> - An initial daytime compliance noise check of CDP activities in the Yarra River and Hobsons Bay will be undertaken at the monitoring location(s) nearest to the work activity over the first 3 days of construction activities. - An evening and/or night-time noise check will be undertaken when equipment identified with the potential to exceed SEPP N-1 limits is to be used in the evening or night. ▪ Where monitoring indicates an exceedence, or potential exceedence, of SEPP N-1 limits, appropriate action is to be taken as described in Airborne Noise Contingency Plan. 		Construction	

Construction management (all activities)		
<p>4. Waste management</p> <ul style="list-style-type: none"> ▪ All marine vessels to have sewage containment or treatment facilities. Sewage treatment will comply with Section 23G of the <i>Pollution of Waters by Noxious Substances Act 1986</i> (Vic). ▪ No disposal of untreated sewage or other wastes to the bay. ▪ Contractor waste management arrangements to include waste minimisation, containment, segregation and appropriate reuse, recycling, treatment and disposal. ▪ The handling and disposal of unexpected materials identified during dredging (e.g. inert debris such as metallic wastes and timber) to be included in waste management arrangements. ▪ All waste to be managed in accordance with: <ul style="list-style-type: none"> - <i>Environment Protection Act 1970</i> (Vic) - <i>Quarantine Act 1908</i> (Cwlth) (applicable vessels) - <i>Pollution of Waters by Oil and Noxious Substances Act 1986</i> (Vic) 	Construction	
<p>5. Energy and greenhouse gases</p> <ul style="list-style-type: none"> ▪ The project will identify, calculate and report on energy consumption and greenhouse emissions on major plant and equipment consistent with the provisions of the Greenhouse Challenge Plus Program. 	Construction	
<p>6. Equipment maintenance</p> <ul style="list-style-type: none"> ▪ Maintenance programs will be implemented for all plant and equipment as defined in the <i>Occupational Health and Safety Regulations 2007</i> (Vic). 	Construction	
<p>7. Fuels, oils, chemicals and hazardous goods</p> <ul style="list-style-type: none"> ▪ Storage and handling of chemicals in accordance with: <ul style="list-style-type: none"> - <i>Dangerous Goods Act 1985</i> (Vic) - <i>International Ship Management (ISM) Code</i> (applicable vessels) - <i>Pollution of Waters by Oil and Noxious Substances Act 1986</i> (Vic) ▪ Asbestos to be managed in accordance with the <i>Occupational Health and Safety Regulations 2007</i> (Vic). 	Construction	

Construction management (all activities)		
8. Emergency response preparedness <ul style="list-style-type: none"> ▪ Development and testing of emergency response procedures, integrated with Melbourne Port Emergency Management Plan, including provision for fuel, oil and chemical spills. ▪ All dredge vessels to have oil spill response kits on board. Relevant personnel to be trained in its use. 	Construction	
Environmental limit	Environmental monitoring program	
Airborne noise	Airborne noise	
Contingencies	Airborne Noise Contingency Plan Emergency response managed via Emergency Response Procedures	

3.2 Marine-based works (all areas)

Marine-based works (all areas)		
Objective	<p>To appropriately manage marine-based works.</p> <p>To minimise disturbance to and appropriately manage non-Aboriginal heritage.</p> <p>To minimise impacts on cetaceans due to vessel manoeuvring.</p>	
Target	Conformance with all environmental controls specified in this PDS.	
Application	All marine-based construction activities.	
Environmental controls	Project phase	Compliance
9. Safety <ul style="list-style-type: none"> ▪ A safety zone of 600 m radius to be established around major dredging equipment during operations. 	Construction	
10. Marine pests <ul style="list-style-type: none"> ▪ Marine pest inspection and certification of monitoring and support vessels, dredgers and pontoons is required before mobilisation onto project, where these are sourced from outside Port Phillip Bay. Certification must be received from the final port of call, before entry to Port Phillip Bay. ▪ All vessels to comply with “Protocol for Environmental Management – Domestic Ballast Water Management in Victorian State Waters”, EPA Publication 949.1 (June 2006) ▪ All vessels to comply with “Australian Ballast Water Management Requirements”, AQIS (1 June 2007) 	Pre-mobilisation Construction	
11. Vessel anchoring <ul style="list-style-type: none"> ▪ Vessels to anchor in accordance with the Port Waters of Melbourne Operations Handbook, 2006. This does not include the anchoring of pontoons at DMGs. 	Construction	
12. Vessel bunkering <ul style="list-style-type: none"> ▪ All bunkering to take place in accordance with PoMC Bunkering Guidelines and vessel bunkering procedures. 	All phases	
13. Cetaceans – vessel manoeuvring <ul style="list-style-type: none"> ▪ If within 300 m of a dolphin or whale the vessel must not: <ul style="list-style-type: none"> - approach a whale or dolphin head on - be in the path of a whale or dolphin - separate any whale or dolphin from a group - come between a mother and a calf - drop or lower an anchor overboard from the vessel. 	All phases	

Marine-based works (all areas)		
<ul style="list-style-type: none"> ▪ Within 300 m of a whale or dolphin, the vessel must: <ul style="list-style-type: none"> - maintain a constant speed that does not exceed 5 knots - avoid sudden changes in direction - manoeuvre the vessel to a distance of at least 200 m from the whale or dolphin if it shows any signs of disturbance (where safe to do so). 		
14. Cetacean sightings and log <ul style="list-style-type: none"> ▪ Personnel on board vessels are to report all sightings of cetaceans. ▪ A log of cetacean sightings and action taken to be kept for all work areas. 	Construction	
15. Services protection and removal <ul style="list-style-type: none"> ▪ Management measures including positional controls and mechanical devices or annexures to dredging equipment to minimise the risk of damage to services. 	Construction	
16. Marine-based berthworks and river protection works <ul style="list-style-type: none"> ▪ Management measures to minimise quantity of debris entering the river during demolition and construction works. 	Construction	
17. Heritage (marine-based) – identification of potential relics <ul style="list-style-type: none"> ▪ If potential relics are identified during construction activities, the process described in Annexure 6 will be followed. 	Construction	
18. Maritime heritage – berthworks and river protection <ul style="list-style-type: none"> ▪ Recording and removal of Stony Creek Ballast Wharf Yarra River (H7822-0423) site in Newport Park, and the Lower South Wharf (H7822-0598) site associated with the expansion of the Swanson Dock swing basin as follows: <ul style="list-style-type: none"> - Recording of above-water and below-water remains of the structure and any visible artefacts associated with the structure. - Monitoring of the riverbank modification works leading to the destruction of the site by an appropriately qualified archaeologist. If significant items are uncovered, the works will be suspended and the archaeologist given an opportunity to record the finds. - In the event that the riverbed is to be disturbed, to be preceded by test excavations to determine the nature of the archaeological deposit on the riverbed and to recover a sample of significant artefacts. 	Construction	

Marine-based works (all areas)			
19. Maritime heritage – dredging <ul style="list-style-type: none"> ▪ Multibeam survey to be conducted on the bed of South Channel, SE DMG and the PoM DMG extension within 2 months before the start of dredging. Results to be reviewed by an archaeologist. Where any potential additional heritage sites are identified, these shall be investigated and appropriate management action taken, as advised by the archaeologist. Where an additional heritage site is identified, a report of the findings is to be made available to Heritage Victoria. ▪ Conduct survey, excavation and removal of the Unidentified Dromana site (S894) (former Hovell pile light), South Channel. Report to be provided to Heritage Victoria. ▪ Before the start of dredging, the following items will be recorded and removed: <ul style="list-style-type: none"> - Dumped rock and artefacts, Port Melbourne Channel. - Wheels and axle, located at Hovell Pile, South Channel. ▪ Conduct site inspection in vicinity of the <i>HMAS Goorangai</i> (S294) before the start of dredging in that area. ▪ Conduct two inspections of the Edward (S209) before the start of dredging in the Entrance. ▪ Inspection and site works described above to be carried out under the supervision of an archaeologist. 		Pre-construction	
<ul style="list-style-type: none"> ▪ The following management measures shall be implemented for the wreck of the <i>HMAS Goorangai</i> (S294): <ul style="list-style-type: none"> - Use of the sweep bar in conjunction with the TSHD in the vicinity of the <i>HMAS Goorangai</i> to minimise overdredge. - Draghead tracking to confirm that all dredging has taken place within the construction zone. ▪ Survey to be carried out under the supervision of an archaeologist and report to be provided to Heritage Victoria. 		Construction	
<ul style="list-style-type: none"> ▪ Multibeam survey to be conducted on the bed of Williamstown Channel, Port Melbourne Channel and South Channel within 12 months of completing dredging, to identify whether any more heritage sites have become exposed by batter adjustment. Results to be reviewed by an archaeologist. Where any potential additional heritage sites are identified, these shall be investigated and appropriate management action taken, as advised by or agreed with the archaeologist. ▪ Conduct site inspection within 2 months of completion of dredging in the vicinity of <i>HMAS Goorangai</i> (S294). ▪ South Channel Pile Light (H1519 and H7821-0006) – four inspections of site, scheduled one per season within the first year after completion of dredging, with the aim of recording and recovering artefacts that have become exposed. ▪ Unidentified – Port Melbourne n.2 (787) – eight inspections of the site, scheduled one per season for 2 years following completion of dredging, with the aim of recording erosion processes affecting the site. ▪ Inspections to be carried out under the supervision of an archaeologist and reports to be provided to Heritage Victoria. 		Post- construction	
Environmental limit		Environmental monitoring program	
Not applicable to this PDS		Not applicable to this PDS	
Contingencies	Not applicable to this PDS		

3.3 Land-based works

Land-based Works		
Objective	To appropriately manage land-based works. To minimise disturbance to, and appropriately manage, Aboriginal heritage sites.	
Target	Conformance with all environmental controls specified in this PDS.	
Application	North of the Bay land-based works: Swanson Swing Basin, Holden Dock, Newport Park, Swanson Dock, Appleton Dock and Gellibrand Pier South of the bay land-based works (navigation aid): Queenscliff	
Environmental controls	Project phase	Compliance
20. Stormwater and groundwater management <ul style="list-style-type: none"> Develop, implement and maintain stormwater and groundwater management plan to appropriately contain and manage discharges in accordance with <i>Environmental Guidelines for Major Construction Sites</i>, <i>EPA Publication 480</i>, <i>SEPP (Groundwaters of Victoria)</i>, and <i>SEPP (Waters of Victoria)</i>. 	Construction	
21. Contaminated material <ul style="list-style-type: none"> Manage and dispose of any land-based contaminated material in accordance with the <i>Environment Protection Act 1970</i>, subordinate legislation and associated guidance and technical notes. This includes <i>Industrial Waste Management Policy (Waste Acid Sulfate Soils)</i>, and <i>SEPP (Prevention and Management of Contaminated Land)</i> 	Construction	
22. Aboriginal heritage <ul style="list-style-type: none"> If a potential heritage or Aboriginal site is identified during construction activities, the process described in Annexure 6 of the EMP will be followed. Monitoring by relevant Aboriginal representatives during construction at the Rocky Point and Narrows PEL Beacon sites in accordance with the Cultural Heritage Management Plan. As far as practicable, and in accordance with the Cultural Heritage Management Plan, avoid excavation on the access track to the Narrows PEL Beacon site at Queenscliff. This will minimise the risk of causing impacts on any undiscovered Aboriginal archaeological sites. 	Construction	
Environmental limit	Monitoring program	
Not applicable to this PDS	Not applicable to this PDS	
Contingencies	Not applicable to this PDS	

3.4 Dredging and plume

Dredging and plume PDS		
Objective	<p>To appropriately manage dredging activities and contaminated sediments.</p> <p>To minimise the area of seabed disturbed and appropriately manage the material removed.</p> <p>To protect assets, beneficial uses and values from long-term adverse effects due to dredging-related water quality effects.</p>	
Target	Conformance with all environmental limits and controls specified in this PDS.	
Application	<p>All dredging activities in Yarra River, Williamstown Channel, Port Melbourne Channel, South Channel and Entrance.</p> <p>The disposal of dredged material at the PoM DMG and SE DMG.</p> <p>Use of Trailing Suction Hopper Dredge (TSHD), backhoe dredge, grab dredge and associated equipment.</p>	
Environmental controls	Project phase	Compliance
<p>23. Sands and adjacent coast and beaches monitoring</p> <ul style="list-style-type: none"> ▪ Undertake a baseline bathymetric survey of the Sands flood tidal delta system, with continuous cover of the area within the Entrance from Point Lonsdale to St Leonards (including Swan Bay), across to Hovell Pile to Martha Point to Point Nepean, and including all the adjacent coast and beaches within that area, at a resolution of better than or equal to five metre horizontal spacing and vertical accuracy of better than or equal to 0.5 m. To be completed prior to commencement of dredging in the south, and two and four years after dredging commences. ▪ Multibeam surveys of the Entrance shipping channels and South Channel to be undertaken prior to commencement of dredging in respective areas in the south, and two and four years after dredging commences. ▪ Current measurements to be undertaken in South Channel and inside the Entrance after completion of dredging. Measurements to be compared against SEES predictions. ▪ Sediment size analyses to be undertaken in conjunction with refined sediment transport numerical modelling post-construction. 	Pre-construction and post-construction	

24. Dredging

- Design depths are to be achieved as a minimum in all areas. Due to dredging tolerance, actual construction depth will exceed design depths. Design depths are as follows:

	Great Ship Channel / layby	South Channel (fairway / channel / Hovell Pile)	Port Melbourne and Williamstown Channels	Yarra River Channel
Design depth (m)	17.3 / 14.3	16.8 / 15.8 / 16.3	15.8	16.1 / 15.8 / 15.2

- Dredging must remain within the maximum total insitu volume, width constraints and construction depth constraints identified below:
 - Maximum total insitu volume to be dredged is 22.92 million m³ ± 15%, and
 - Maximum insitu volume to be dredged in the Entrance is 0.55 million m³ ± 15%, and
 - Maximum insitu volume of contaminated sediments (soft silts) to be dredged is 1.72 million m³ ± 15% (dredging volume to be finalised following pre-construction bathymetry survey), and
 - A minimum of 50% of the area to be dredged and within toe lines is to be within 0.9 m of the design depth (sands and clays) and within 1.3 m of the design depth (Entrance). This does not apply to the sand waves within South Channel, and
 - A minimum of 90% of the area to be dredged and within toe lines is to be within 1.8 m of the design depth (19.1 m total depth) as determined following completion of dredging (Entrance only), and
 - For areas to be dredged, final channel width to be no greater than 25 m outside of the Williamstown Channel, Port Melbourne Channel, and South Channel design toe lines and 15 m of the Entrance design toe line. 50% of the delivered toe line is to be within 15 m of the Williamstown Channel, Port Melbourne Channel, and South Channel design toe lines and 9 m of the Entrance design toe line. This does not apply to the sand waves within South Channel.
- Construction zone – construction zones have been identified to limit the footprint of dredging activities. Construction areas are identified in drawings listed below.
- All dredging activities to take place within the construction zones. No dredging (as a subset of dredging activities) is to take place within 65 m of the outside edge of the construction zone (Port Melbourne Channel, South Channel and the Entrance only). This is to be confirmed through draghead tracking (in dredging mode only) and validated by bathymetry survey (where draghead tracking indicates that dredging in this area has potentially occurred).
- Dredging equipment and associated support vessels will be required to manoeuvre outside construction areas, including transit between construction areas.
- Toe lines and construction zones are identified on:
 - Drawing 35328 – Channel Deepening Project – Port of Melbourne – Coastal Management Consent Scope of Works
 - Drawing 35329 – Channel Deepening Project – Port of Melbourne – South – Coastal Management Consent Scope of Works

- Drawing 35330 – Channel Deepening Project – Port of Melbourne – North – Coastal Management Consent Scope of Works
- Drawing 35331 – Channel Deepening Project – Port Phillip Entrance – South Channel – Coastal Management Consent Scope of Works
- Drawing 35332 – Channel Deepening Project – Port Phillip Entrance – South Channel – Coastal Management Consent Scope of Works
- Drawing 35333 – Channel Deepening Project – South Channel – West - Coastal Management Consent Scope of Works
- Drawing 35334 – Channel Deepening Project – South Channel – East - Coastal Management Consent Scope of Works
- Drawing CDP-ENV-50254 – Construction Areas – Heritage significance

(Drawings are included in Annexure 7)

- Dredging to be undertaken in accordance with EMP Method Statement for Dredging works North – Contaminated (CDP_ALL_MS_408)
- Tracking of equipment activity as follows:

Equipment	Time	Date	Coordinates	Other
TSHD	✓	✓	Dredging – x,y,z of dragheads (northing, easting, depth to Chart Datum) Sailing and placement of dredged material – x,y (northing, easting)	Status of cycle (i.e. dredging, sailing, placement of dredged material)
Backhoe Dredge and Grab Dredge (contaminated material only)	✓	✓	x,y,z bucket (northing, easting, depth to Chart Datum)	Nil
Split hopper barges	✓	✓	x,y (northing, easting)	Nil
Spreader pontoon	✓	✓	x,y (northing, easting)	Nil
Diffuser pontoon	✓	✓	x,y,z of diffuser (northing, easting, depth to Chart Datum)	Nil

- Use of green valve at all times when using overflow.
- The overflow valve of the TSHD will be closed when sailing.

<p>25. Management of pipeline between TSHD and spreader or diffuser pontoon during transfer of sediments</p> <ul style="list-style-type: none"> ▪ Pipeline will be lit at night. ▪ Support vessels will maintain a watch for non-project vessels. ▪ Pumping will cease if an unauthorised vessel encroaches within 100 m of the pipeline, or if the integrity of the pipeline is compromised. 	Construction	
<p>26. Third party infrastructure</p> <ul style="list-style-type: none"> ▪ The process described in Annexure 6 will be followed for the management of sulfides, ammonium, TSS and turbidity in the Newport Power Station cooling water intake. 	Construction	
<p>27. Dredging of unconsolidated contaminated sediment</p> <ul style="list-style-type: none"> ▪ Contaminated sediment exists in the Yarra River and Williamstown Channels and the southern section of the Port Melbourne Channel. Dredging of contaminated sediment to be conducted with the following equipment: <ul style="list-style-type: none"> - TSHD operating in non-overflow mode with a silt draghead. - Grab dredge. - Backhoe dredge. 	Construction	
<p>28. Dredging of contaminated clays</p> <ul style="list-style-type: none"> ▪ Contaminated clays in the two locations within Appleton Dock and near Webb Dock (identified in Annexure 7, Drawing CDP-Env-50383), and batter walls will be dredged with the following equipment to design depth: <ul style="list-style-type: none"> - TSHD operating in non-overflow mode with a clay draghead. - Grab dredge. - Backhoe dredge. 	Construction	
<p>29. Monitoring removal of contaminated sediments – TSHD</p> <ul style="list-style-type: none"> ▪ The following process is to be used to determine the transition from dredging contaminated to uncontaminated material within the Yarra River and Williamstown Channels. This process applies to the TSHD. <ol style="list-style-type: none"> 1. The thickness of the contaminated sediments will be determined based on: <ol style="list-style-type: none"> a. pre-dredge hydrographic survey b. estimated top of underlying uncontaminated clay, based on the combined interpretation of boreholes and seismic investigation. 2. Nominate the number of passes of the TSHD draghead required to dredge the full depth of unconsolidated contaminated sediments. This is to be based on the excavation thickness of a single pass of the TSHD draghead. Part passes will be rounded up to the nearest whole number. 3. Identify areas of similar depth that can be practicably dredged with the same number of passes. This means localised shallower or deeper pockets of contaminated sediment that are too small to practicably be dredged separately will be incorporated into 	Construction	

<p>adjoining areas.</p> <ol style="list-style-type: none"> 4. Apply a grid over each area for comparison of nominated and completed draghead passes. The grid cell size will be determined based on draghead width and draghead position accuracy. 5. Record x,y,z coordinates of draghead tracks while dredging. 6. Calculate the number of draghead passes recorded in each grid cell within an area. 7. Dredging of underlying uncontaminated material will only commence when no fewer than the nominated number of dredging passes (minimum of 1 pass) has been recorded in each grid cell within an area. 		
<p>30. Monitoring removal of contaminated sediments – backhoe and grab dredges</p> <ul style="list-style-type: none"> ▪ The following process is to be used to determine the transition from dredging contaminated to uncontaminated material within the Yarra River and Williamstown Channels. This process applies to the backhoe/grab. <ol style="list-style-type: none"> 1. The thickness of the contaminated sediments will be determined based on: <ol style="list-style-type: none"> a. pre-dredge hydrographic survey b. estimated top of underlying uncontaminated clay, based on known maintained levels. 2. Apply a grid over the area for determination of area coverage. The grid cell size will be determined based on backhoe/grab width and position accuracy. 3. Remove full thickness of contaminated sediments to top of uncontaminated clay. 4. Record x,y,z coordinates of backhoe or grab. 5. Dredging of the underlying uncontaminated material will only commence when removal of contaminated sediment to the full thickness has been recorded in each grid cell within an area. 	Construction	
Environmental limit	Monitoring program	
Turbidity	Turbidity	
Contingencies	Turbidity Contingency Plan	

3.5 Dredging schedule

Dredging schedule		
Objective	To develop an appropriate dredging schedule, taking into account the seasonal sensitivities of Port Phillip Bay assets, beneficial uses and values.	
Target	Conformance with all environmental controls specified in this PDS.	
Application	All dredging activities in Yarra River, Williamstown Channel, Port Melbourne Channel, South Channel, Entrance.	
Environmental controls	Project phase	Compliance
31. Dredging schedule <ul style="list-style-type: none"> ▪ The initial dredging schedule to be submitted to DSE before implementation. ▪ Subsequent revisions of the dredging schedule and monthly updates will be submitted to DSE within 2 working days of approval by CDP management. 	Pre-construction	
<ul style="list-style-type: none"> ▪ Dredging to take place as summarised in 'Dredging Summary'. ▪ Dredging schedule to include: <ul style="list-style-type: none"> - dredging technology - dredging configuration (i.e. number and location of dredges, use of interval dredging) - timing, duration and sequence of dredging in Project Areas. ▪ Capping layer to be placed around 140 days after completion of the hydraulic placement of contaminated sediment to allow the sediment sufficient time to gain enough strength to support the capping layer. ▪ Capping will be completed before 31 December 2009. 	Construction	
32. Consideration of environmental limits <ul style="list-style-type: none"> ▪ Revisions to the dredging schedule will be assessed to confirm ability to comply with airborne noise and turbidity environmental limits. 	Construction	

Dredging schedule		
<p>33. Consideration of seasonal sensitivities</p> <ul style="list-style-type: none"> ▪ No dredging permitted between 18 December and 31 January in the South of bay to mitigate impacts on the recreation and tourism activities during the holiday season. ▪ Restrict dredging in Williamstown Channel (within Hobsons Bay) to less than 50% of key anchovy spawning period from 1 December to 28 February. A two weeks on/two week off sequence will be applied to this period. ▪ No dredging using the TSHD in the Yarra River or Williamstown Channels between 15 October to 30 November to protect migration of the endangered Australian grayling species (relates to EPBC Act / NES matters – refer to Annexure 8). ▪ dredging using the TSHD in Yarra River between 1 April and 30 July restricted to no more than two calendar months, or equivalent in days to protect Australian grayling larval drift. ▪ In preparing the dredging schedule, consideration will be given to seasonal sensitivities and preferred seasons identified in 'Key Seasonal Sensitivities and Preferred Seasons'. The decision process, including how seasonal sensitivities were considered, will be documented. 	Construction	
Environmental limit	Monitoring program	
Not applicable to this PDS	Not applicable to this PDS	
Contingencies	Not applicable to this PDS	

3.6. Dredge material management

Dredged material management		Project phase	Compliance
Objective	To manage and track the placement of dredged material. To dispose of and manage dredged material appropriately within the DMGs. To construct and manage the PoM DMG to the standard required for long-term containment of contaminated material.		
Target	Conformance with all environmental controls specified in this PDS.		
Application	All dredged material placement and DMG management activities in the PoM DMG and SE DMG.		
Environmental controls		Project phase	Compliance
34. Dredged material placement <ul style="list-style-type: none"> ▪ DMGs – all dredged material placement activities to take place within the specified DMGs (including associated construction areas) set out in: <ul style="list-style-type: none"> - Drawing CDP-ENV-50253 – Marine Based Construction Areas – North of bay - Drawing CDP-ENV-50254 – Marine Based Construction Areas – South of bay and Entrance. (Drawings are included in Annexure 7) ▪ Dredged material placement – All dredged material to be placed in accordance with ‘Dredging Summary’. ▪ Dredged material placement including capping – to be undertaken in accordance with EMP Method Statement for material placement in PoM DMG (CDP_ALL_MS_410). ▪ Dredging and disposal locations to be recorded as per tracking of equipment table (refer to Table 11 – Dredging and plume PDS). ▪ Volumes are to be calculated from hydrographic survey data. ▪ Dredged material placement will not commence if a whale is sighted within 300 m of the TSHD placing material into a DMG. If a whale is sighted, placement can commence if the whale has been seen to move beyond 300m, or has not been sighted within 300m for at least 15 minutes. 		Construction	

Dredged material management		
<p>35. PoM DMG – bund</p> <ul style="list-style-type: none"> ▪ Bunds to be constructed in accordance with design specifications (Drawings C001, C002 and C003). (Drawings are included in Annexure 7) ▪ Bunds to be constructed using: <ul style="list-style-type: none"> - consolidated sediments (clays) dredged from Port Melbourne Channel - uncontaminated clays dredged from Yarra River and Williamstown Channels (this is due to a deficit of clay from the Port Melbourne Channel) - sand from South Channel used for cleaning the TSHD hopper - contaminated clay from Appleton Dock, near Webb Dock and batter walls. The contaminated clays will be covered with uncontaminated clays or by capping, effectively isolating the contaminated clay from the marine environment. ▪ Once the main bund (Stage 1) is constructed, the remainder of consolidated sediments (clays) will be placed in the DMG extension (Stages 3 and 4). This clay will be used to construct bunds for future maintenance requirements in accordance with design specifications. 	<p>Construction</p>	
<p>36. PoM DMG – containment of contaminated material</p> <ul style="list-style-type: none"> ▪ Contaminated unconsolidated sediments will require dredging and disposal into the DMG prior to completing the bund. As a result, contaminated unconsolidated sediments will be placed within the partially constructed banded DMG. Therefore, before the placement of the contaminated unconsolidated sediments the following information is required: <ul style="list-style-type: none"> - Confirmation that the partially constructed bund has been constructed in accordance with design specifications. - Confirmation of bund capacity and volume of contaminated unconsolidated sediments to be dredged. ▪ Daily during TSHD disposal (weather permitting) and weekly during barge disposal, hydrographic surveys required during placement of contaminated sediments to monitor depth contours and confirm DMG capacity and bund freeboard. 	<p>Construction</p>	

Dredged material management

37. PoM DMG – capping

- Prior to the placement of cap material the following is required.
 - Confirmation by survey that bund has been constructed in accordance with design specifications.
 - All contaminated material removed for all dredging management units as per Table 11 – Dredging and plume PDS.
- Construction of cap for PoM DMG.
 - Cap material to be placed in accordance with design requirements (Refer to drawings C001, C002 and C003).
 - Cap thickness to be confirmed by survey and/or physical testing prior to transfer to PoMC.
- Bottom water velocity will be measured adjacent to the PoM DMG at -15m CD. This and other data will be used to inform the placement of the capping layer around 140 days after completion of the hydraulic placement of contaminated sediment, in accordance with EMP Method Statement for material placement in PoM DMG (CDP_ALL_MS_410).

Construction

Dredged material management

38. PoM DMG – maintenance and inspection

- Maintenance and inspection procedures to be put in place for the long-term management of the PoM DMG and incorporated into PoMC operations management system.
- Inspections and corrective measures to be in accordance with design specifications (Drawing C003).
- Post-construction inspections of the bund should be undertaken in general accordance with the following intervals after completion of the construction of the bund.
 - 2 weeks.
 - 1 month.
 - 2 months.
 - 4 months.
 - 8 months.
 - 12 months.
 - At 12-monthly intervals for the first five years after completion.
 - At 24-monthly intervals thereafter.
 - Within 2 weeks of a storm event (a 1 in a 100 year event) or seismic event (greater than 4.5ML on the Richter Scale), subject to safety considerations due to weather.
- Post construction inspections of representative areas of the capping should be undertaken in general accordance with the following intervals after completion of the capping.
 - 1 month.
 - 4 months.
 - 12 months.
 - At 12-monthly intervals for the first five years after completion.
 - At 24-monthly intervals thereafter
 - Within 2 weeks of a storm event (a 1 in a 100 year event) or seismic event (greater than 4.5ML on the Richter Scale), subject to safety considerations due to weather.
- Undertake a marine pest survey of PoM DMG within 3 years of completion of project.

Post-construction

Dredged material management		
39. SE DMG <ul style="list-style-type: none"> ▪ Minimum 0.5 m sand material to be placed over Entrance rock material. ▪ Dredged material to be placed to maximum -15 m below Chart Datum. ▪ Once the dredged materials have been placed in DMG, survey to confirm materials have been placed in accordance with requirements prior to transfer to PoMC. 	Construction	
Environmental limit	Monitoring program	
Not applicable to this PDS	Not applicable to this PDS	
Contingencies	Not applicable to this PDS	

3.7 Entrance Dredging

Entrance dredging PDS		
Objective	To appropriately manage the potential for rockfall in the canyon at Port Phillip Heads.	
Target	Conformance with all environmental controls specified in this PDS.	
Application	All dredging activities in the Entrance, including use of the following equipment: Trailing Suction Hopper Dredger. Stonefisher. Hydrohammer.	
Environmental controls	Project phase	Compliance
40. Draghead design <ul style="list-style-type: none"> ▪ The draghead will be designed to minimise rockfall in accordance with the recommendations contained within Report number Z4117, <i>Physical Model Experiments with Ripper Dragheads in Rock. Experimental research program on reduction of spill</i> WL Delft Hydraulics, October 2006. ▪ An independent peer reviewer is to verify: <ul style="list-style-type: none"> - that the draghead design is in accordance with the above mentioned report; and - that the draghead has been constructed in accordance with the design. 	Pre-construction	
41. Dredging in the Entrance <ul style="list-style-type: none"> ▪ All dredging to be conducted with the ripper draghead. ▪ When dredging towards the canyon, the draghead to be lifted so that no rock will be removed within 5 metres of the canyon edge, as defined in EMP Method Statement for Dredging works South – Entrance (CDP_ALL_MS_409). ▪ When dredging the canyon edge itself, dredging to be conducted from the canyon towards the plateau. 	Construction	

42. Clean up in the Entrance

- All clean up activities to be conducted with the clean up draghead. This may be either the ripper draghead with the teeth shielded or else a separate drag head.
- Clean-up to be undertaken in accordance with EMP Method Statement for Dredging works South – Entrance (CDP_ALL_MS_409). Weather forecasts will be obtained from a reputable service provider.
- Conduct removal of loose material in accordance with the table below. This will result in approximately twenty programmed clean up events. After clean up, dredging may recommence.

Quantity dredged (Q)	Hs predicted <3m	Hs predicted >3m
<10,000 m ³	Continue dredging	Continue dredging
10,000 m ³ – Q < 24,000 m ³	Continue dredging	Clean-up for 8-18 hours depending on quantity dredged
~24,000 m ³	Clean-up for at least 18 hours	Clean-up for at least 18 hours
Note: Q = Quantity dredged, HS = Significant wave height		

- In addition to the programmed clean-up events, conduct other clean-up events:
 - prior to removal of the ridge along the north-west side of Nepean Bank as identified in EMP Method Statement for Dredging works South – Entrance (CDP_ALL_MS_409)
 - once design profile has been achieved
 - in any areas identified at Management Review meetings (e.g. areas identified through towed video survey)
- The following process is to be used to monitor spatial extent of the clean up events. This process applies to each dredge – clean up cycle.
 1. Apply a grid over the dredging area for comparison of draghead passes (dredging) and draghead passes (clean up)
 2. The x,y,z coordinates of the draghead tracks will be recorded during dredging and clean up.

Clean up is to continue until clean up has occurred in no fewer than 90% of the grid cells which were dredged during the cycle.

Construction	
--------------	--

<ul style="list-style-type: none"> If the time and/ or spatial coverage clean-up requirements described above are not achieved as a result of safety considerations due to unfavourable metocean conditions, then the following apply: <table border="1" data-bbox="107 248 983 815"> <thead> <tr> <th colspan="2"></th> <th colspan="2">Spatial extent of clean up</th> </tr> <tr> <th colspan="2"></th> <th>≥80%</th> <th><80%</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Clean up time remaining</td> <td>≤ 1 hour clean up remaining</td> <td>No further clean-up required. Dredging may recommence when metocean conditions permit</td> <td>Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.</td> </tr> <tr> <td>>1 hour clean up remaining</td> <td>Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.</td> <td>Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.</td> </tr> </tbody> </table>			Spatial extent of clean up				≥80%	<80%	Clean up time remaining	≤ 1 hour clean up remaining	No further clean-up required. Dredging may recommence when metocean conditions permit	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.	>1 hour clean up remaining	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.		
		Spatial extent of clean up															
		≥80%	<80%														
Clean up time remaining	≤ 1 hour clean up remaining	No further clean-up required. Dredging may recommence when metocean conditions permit	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.														
	>1 hour clean up remaining	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.	Clean up is to resume when metocean conditions permit until the clean up requirements described above are achieved.														
<p>43. North-west side of Nepean Bank</p> <ul style="list-style-type: none"> Along the north-west side of Nepean Bank (i.e. in the direct vicinity of the Point Lonsdale section of the Port Phillip Heads Marine National Park) a ridge at least 5 m wide along the north-west edge of the bank will be left in place until the remaining area has been dredged to the required design depth (as shown in drawing CDP-Env-50439). (Drawings are included in Annexure 7), and as identified in EMP Method Statement for Dredging works South – Entrance (CDP_ALL_MS_409) The north-west edge of Nepean Bank to be dredged last in the dredging schedule for Nepean Bank. 	Construction																
<p>44. Fish modelling</p> <ul style="list-style-type: none"> Modelling of dispersal of King George whiting larvae in the RL -22 m scenario. Report to be prepared summarising the modelling outcomes and comparison with the existing model. 	Pre-construction																
<p>45. Pre-construction plateau inspection</p> <ul style="list-style-type: none"> Conduct bathymetric survey and visual monitoring of scour holes at 3 monthly intervals in the trial dredge area and immediately adjacent areas of the Great Ship channel until the start of dredging. Following final survey, report to be prepared containing assessment of rate of scour and accretion and the mobility of material, the maximum potential depth of scour and the potential extent of lateral erosion in the scour holes. The assessment to include the consideration of hydrodynamic data records. Report to 	Pre-construction																

<p>be available during construction.</p>		
<p>46. Construction plateau inspection</p> <ul style="list-style-type: none"> ▪ 4-6 weeks following commencement of dredging, and subject to weather conditions and dredge schedule, conduct towed video survey of dredged and adjacent areas. Results to be considered at CDP Management review meeting. ▪ Commence towed video survey at Rip Bank and Nepean Bank dredge plateaus to assess existence of loose rock as soon as practicable once design profile has been achieved and final clean up has been completed. Results of video to be reviewed to determine requirement for any additional clean up. Implement management action as determined. 	<p>Construction</p>	
<p>47. Post-construction plateau inspection</p> <ul style="list-style-type: none"> ▪ Undertake towed video survey at Rip Bank and Nepean Bank dredge plateaus to assess existence of loose rock within 3 months following completion of dredging in the Entrance. 	<p>Post-construction</p>	
<p>48. Pre and post-construction bathymetric survey</p> <ul style="list-style-type: none"> ▪ Bathymetric survey of the Entrance to be undertaken to identify bathymetric changes at following intervals: <ul style="list-style-type: none"> - Prior to commencement of dredging in the Entrance - 3, 6, 9, 12 months post-dredging - 2 years post-dredging - 4 years post-dredging - 10 years post-dredging - prior to programmed major maintenance dredging campaign (towed video survey also to be conducted at this time) ▪ Report to be prepared following each survey containing assessment of accumulation and mobility of accretion due to scour, confirmation of the declared channel depth, and identifying any management responses such as no further action, further hydrodynamic modelling, further investigation or risk review (e.g. Aboriginal and non-Aboriginal heritage assessment) and/or additional clean up. 	<p>Pre-construction and Post-construction</p>	

<p>49. Post-construction deep reef habitat – impact & recovery assessment</p> <p>Due to the difficulties of using quantitative ecological methods in the Entrance environment, there is a need for flexibility in undertaking the following:</p> <ul style="list-style-type: none"> ▪ Quantitative surveys by diver-operated video and remotely operated vehicle to describe the nature and distribution of impacts on the deep reef habitats. Surveys will be along standardised isobaths ▪ Surveys will compare the coverage and distribution of physical and biological parameters, to document the status of any ongoing physical disturbance, any biological impacts and recovery. ▪ Locations will include areas at Rip Bank and Nepean Bank and within the Port Phillip Heads Marine National Park impacted by rockfall, plus control areas both within and remote from the general area of rockfall. ▪ Timing will be: <ul style="list-style-type: none"> - within 3 months following completion of dredging in the Entrance - approximately four and ten years after completion of dredging 	<p>Post–construction</p>	
<p>50. Post-construction tide monitoring report</p> <ul style="list-style-type: none"> ▪ Collect tide gauge data at Queenscliff (296000N 5761900E), Hovell Pile (316325N 5755800E), West Channel Pile (303538N 5770405E), Williamstown (Breakwater Pier) (316790N 5807170E), Fawkner Beacon (317863N 5797863E) and Point Lonsdale Jetty (291600N 5759150E) for at least one year after completion of construction activities. Prepare a report to identify any changed tide conditions at Williamstown, Queenscliff, Geelong, Point Cook, Werribee and Mordialloc subsequent to completion of the project. 	<p>Post–construction</p>	
<p>Environmental limit</p>		<p>Monitoring program</p>
<p>Not applicable to this PDS</p>		<p>Not applicable to this PDS</p>
<p>Contingencies</p>	<p>Not applicable to this PDS</p>	

3.8 Hydrohammer use and marine-based pile driving

Hydrohammer use and marine-based pile driving			
Objective	To protect assets, beneficial uses and values from long-term or irreversible change due to underwater noise from use of the hydrohammer and marine-based pile driving during the CDP.		
Target	Conformance with all environmental controls specified in this PDS.		
Application	Use of the hydrohammer in the Entrance and/or South of the bay. Marine-based pile driving in all Project Areas.		
Environmental controls	Project phase	Compliance	
51. Minimise use of hydrohammer <ul style="list-style-type: none"> ▪ Hydrohammer is only to be used following confirmation that material cannot be practically dredged by the TSHD. All available practical measures will be taken to break up hard material prior to use of the hydrohammer. 	Construction		
52. Hours of operation <ul style="list-style-type: none"> ▪ Hydrohammer and marine-based pile driving operations to take place during daylight only (daylight is defined as where there is adequate light to see a minimum distance of 600 m). ▪ Hydrohammer only to be used Monday to Friday, excluding public holidays. 	Construction		
53. Start procedure <ul style="list-style-type: none"> ▪ The start procedure for the hydrohammer and pile driving unit will comprise the use of a noise producing device that is capable of gradually increasing the level of acoustic energy for 10 minutes prior to use of this equipment. The noise producing device shall provide an initial noise level that is no greater than 140 dB (this noise level is less than that known to produce a Temporary Threshold Shift for cetaceans). This is to enable mobile fauna to move away. 	Construction		
54. Hydrohammer – noise assessment <ul style="list-style-type: none"> ▪ An initial noise check of the hydrohammer, confirming actual noise emissions against the modelling used to evaluate underwater noise impacts from the CDP will be undertaken, as follows: <ul style="list-style-type: none"> - Underwater noise monitoring of the hydrohammer by marine biology acoustic specialist. - Hydrohammer operations only to continue for as long as necessary to obtain sufficient data to confirm the source noise level and ambient underwater noise levels. - Analysis by marine biology acoustic specialist to confirm that the emission measurements conform to model used in the SEES risk assessment. Once confirmed, no further monitoring is required. - Hydrohammer operations only to resume following written confirmation by marine biology acoustic specialist that the results of the noise emission monitoring are within those modelled. 	Initial use of the equipment		

Hydrohammer use and marine-based pile driving		
<ul style="list-style-type: none"> - If the specialist confirms that the noise results significantly differ from those assessed in the noise modelling (either more or less), the contingencies identified within the Underwater Noise Contingency Plan are to be considered and appropriate action taken prior to continuing the use of the hydrohammer for the CDP. 		
<p>55. Hydrohammer – cetaceans</p> <ul style="list-style-type: none"> ▪ Hydrohammer vessel master to ensure that there are personnel available to observe a minimum of 600 m radius from the hydrohammer vessel (may be in combination with other project vessel crews or land based). ▪ A minimum of 15 minutes of active cetacean spotting required before hydrohammer operations commence. ▪ Vessel master to confirm ‘all clear’ for cetaceans within a 600 m radius of the hydrohammer before the commencement of hydrohammer operations. ▪ Hydrohammer vessel master will advise other CDP vessels in the vicinity that hydrohammer operations are scheduled. Crews of these vessels will then also keep a watch for cetaceans before and during hydrohammer operations. - If a cetacean is spotted within 600 m of the hydrohammer vessel or is assessed as likely to move within 600 m of the hydrohammer vessel, the hydrohammer to suspend operations immediately. Operations may only recommence when no cetacean has been sighted within 600 m of the hydrohammer for at least 15 minutes, or if the cetacean(s) are seen to move beyond 600 m. ▪ Any break in hydrohammer operations that results in a break in observations will require the 15 minutes pre-startup observation to be redone before hydrohammer operations can resume. 	Construction	
<p>56. Hydrohammer – no-dive zone</p> <ul style="list-style-type: none"> ▪ A 1.4 km ‘no-dive zone’ to be established around the hydrohammer operations. Beach activities (e.g. swimming, snorkelling, surfing) will be unrestricted within 500 m of shore. 	Construction	
<p>57. Marine-based pile driving – noise assessment</p> <ul style="list-style-type: none"> ▪ An initial check of marine-based pile driving equipment, confirming actual noise emissions against the modelling used to evaluate underwater noise impacts from the CDP will be undertaken as described in the Underwater Noise Monitoring Program (Annexure 5). 	Before use of the equipment	

Hydrohammer use and marine-based pile driving		
<p>58. Marine-based pile driving – cetaceans</p> <ul style="list-style-type: none"> ▪ 'All clear' for cetaceans within a 300 m radius of the pile driving unit to be confirmed before the commencement of pile driving operations. ▪ Maintain a watch for cetaceans when operating in Williamstown Channel, North of bay and South of bay and berths. ▪ If a cetacean is spotted with 300 m of equipment, the following actions shall be taken: <ul style="list-style-type: none"> - Pile driving unit to suspend operations immediately. - If cetaceans are not seen to move beyond 300 m, operations cannot restart until no cetacean has been sighted for at least 15 minutes. - If cetaceans are seen to move beyond 300 m, operations can recommence immediately. 	<p>Construction</p>	
<p>Environmental limit</p>	<p>Monitoring program</p>	
<p>Not applicable to this PDS</p>	<p>Underwater noise</p>	
<p>Contingencies</p>	<p>Underwater Noise Contingency Plan</p>	

4. Monitoring of data collected across Port Phillip Bay

4.1 Environmental Management Plan Baywide programs

Programs	Purpose	Information and frequency required by Office
1. Algal blooms	To detect changes in the occurrence of algal blooms outside expected variability	Raw data <ul style="list-style-type: none"> Abundance and species of algae across the bay - monthly Chlorophyll abundance - monthly Analysis report - Quarterly
2. Plume Intensity and extent	Detect changes in the intensity and/or extent of the plume outside expectations	Raw Data <ul style="list-style-type: none"> Satellite images of plume distribution - every image (every 7-9 days) Boat based sampling of plume distribution and intensity (turbidity) in project areas 1,2 & 3 <ul style="list-style-type: none"> weekly in each project area as available completion of each project area Analysis report - Quarterly
3. Contaminants in fish	To identify if the concentration of contaminants in fish tissue in the lower Yarra river after the dredging of contaminated sediments requires review of the current health advisory.	Raw data <ul style="list-style-type: none"> Concentrations of 8 metals and 8 classes of organic compounds in fish in the lower Yarra - 3 months after completion of dredging Yarra silts Analysis report - 6 weeks after sampling
4. Nutrient Cycling	To detect changes beyond expected variability to critical elements of bay nutrient cycling processes	Raw data <ul style="list-style-type: none"> Nitrogen cycling efficiency (8 parameters) - Quarterly at two sites and twice annually at third site Six continuous nutrient cycling related water quality parameters across the bay Every 2 months Analysis report - Quarterly

5. Little Penguins	To detect changes in Little Penguin body mass outside natural variability	Raw data <ul style="list-style-type: none"> Average daily penguin weight at Phillip Island – monthly for duration of project Analysis report - Quarterly
6. Seagrass	To detect changes in seagrass health in Port Phillip Bay outside expected variability	Raw data <ul style="list-style-type: none"> Five seagrass health indicators at six sites across the bay - Quarterly Aerial images of seagrass distribution across the bay - annually Analysis report - Quarterly
7. Water quality	To detect changes in water quality outside expected variability	Raw data <ul style="list-style-type: none"> 10 physical and chemical properties, 9 nutrients and 9 metals at 11 sites - monthly Analysis report - Quarterly
8. Ramsar wetlands	To monitor extent and health of coastal saltmarsh and intertidal mudflats to confirm Channel Deepening Project effects upon Ramsar-listed Wetlands are no greater than predicted within the Supplementary Environmental Effects Statement	Report <ul style="list-style-type: none"> Coastal saltmarsh and mudflats health and distribution in Ramsar wetlands - Annually Analysis report - Quarterly as appropriate
9. Fish Stock and recruitment	To detect changes in the distribution, abundance and types of fish in the bay, their population structures and larval distribution and abundance, outside expected variability	
- <i>Annual trawl survey</i>	To detect changes in the abundance of all common fish in Port Phillip Bay outside of expected variability	Data Report <ul style="list-style-type: none"> Length, weight and species of fish caught at 22 sites throughout Port Phillip Bay Analysis report - Quarterly as appropriate
- <i>Egg and larval survey</i>	To detect interannual changes in the abundance of snapper and anchovy eggs and larvae outside of expected variability	Data Report <ul style="list-style-type: none"> Abundance of snapper larvae, anchovy eggs and larvae at six sites in mid-north of the bay and across Port Phillip Heads Analysis report - Quarterly as appropriate

<p>- <i>Anchovy survey</i></p>	<p>Assess anchovy abundance, distribution in the bay, and population structure</p>	<p>Raw data</p> <ul style="list-style-type: none"> • Abundance, weight and length of anchovies during May-June at six sites across the bay - July <p>Analysis report - Quarterly as appropriate</p>
<p>- <i>Recreational fishing survey</i></p>	<p>To detect changes in the abundance and recruitment of key recreational fishery species outside of expected variability</p>	<p>Raw data</p> <ul style="list-style-type: none"> • Angler diary records of fish caught from Nov-Dec and March-April - May • On-site surveys of anglers (36 days from Nov-April) - May <p>Analysis report - Quarterly as appropriate</p>
<p>- <i>Fish in seagrass beds</i></p>	<p>Assess the types and abundance of fish in shallow and deeper seagrass beds</p>	<p>Data Reports</p> <ul style="list-style-type: none"> • Number of species and abundance of key species - Two sampling events per year - Autumn and late spring/early summer <p>Analysis report - Quarterly as appropriate</p>

4.2 Existing Programs of Port Phillip Bay

Programs	Purpose	Information & frequency required by the Office
Beach Monitoring Program - water quality at bay beaches	To identify and forecast daily risks to health of swimmers	Raw data <ul style="list-style-type: none"> Bacterial contamination (<i>E. coli</i>), - Weekly
Water quality in the Port Phillip and Westernport catchments	To assess compliance with SEPP requirements	Raw data <ul style="list-style-type: none"> Five physical and chemical water quality indicators, two metals, two key nutrients and bacteria (<i>E. coli</i>) - Monthly Annual report
Bacterial contamination in the Yarra River	To advise on recreational water quality in the Yarra River	Raw data <ul style="list-style-type: none"> Bacterial contamination (<i>E. coli</i>) at 12 sites, including four sites in the lower Yarra - Weekly
Occasional monitoring programs	To guide pollution prevention, trend analysis and public health information.	Raw data <ul style="list-style-type: none"> Fish bioassays for contaminants will be done in 2008/09 - As required
Biodiversity in Marine National Parks	Identify the differences in biodiversity and natural processes within and outside of Marine Protected Areas	Raw data <ul style="list-style-type: none"> Biodiversity (abundance and species of marine plants and animals) and natural processes - Annually Annual report
Juvenile snapper	To predict recruitment of snapper into the fishery 3-4 years later	Raw data <ul style="list-style-type: none"> Juvenile snapper abundance - March & April Annual report
Juvenile King George whiting	To predict recruitment of King George whiting into the fishery 3-4 years later	Raw data <ul style="list-style-type: none"> Juvenile King George whiting abundance - Monthly from August - November Annual report
Commercial catch of King George whiting	To assess fish stocks	Raw data

Programs	Purpose	Information & frequency required by the Office
and snapper		<ul style="list-style-type: none"> Size and age composition of the commercial catch - Monthly
Abalone and other reef species	To identify population trends in the fishery and community dynamics	Raw data <ul style="list-style-type: none"> Abundance and biomass of abalone and associated reef (e.g. urchins, native seastar, periwinkles)species in the northwest of the bay - Annually
Commercial catch of King George whiting and snapper	To assess fish stocks	Raw data <ul style="list-style-type: none"> Size and age composition of the commercial catch - Monthly
Victorian Shellfish Quality Assurance Program	To confirm safety for human consumption	Raw data <ul style="list-style-type: none"> Toxic and nuisance phytoplankton in aquaculture reserves toxin levels - Fortnightly Annual report

5. Appendices

5.1 Appendix 1 - Environmental Limits

Underwater Noise

Conformance location	Environmental Limit
The Hydrohammer and operation within the Entrance	Within predictions of the underwater noise model
Marine-based pile driving equipment	Within predictions of the underwater noise model

Airborne noise

Conformance location	Diameter circle (m)	Approximate (1) area zoned type (%)			Calculated SEPP N-1 noise limit dB (A)		
		1 Residential	2 Commercial or mixed	3 Industrial	Day	Evening	Night
(A) Docklands	140		100		63	57	56
	400		100				
(B) Footscray/ Yarraville	140	50	50		60	53	50
	400	50	50				
(C) Port Melbourne	140	100			53	48	40
	400	100					
(D) Williamstown North	140	100			57	52	39
	400	100					
(E) Williamstown South	140	100			50	44	40
	400	100					
(F) Queenscliff	140	100			50	44	39
	400	100					
(G) Portsea	140	100			50	44	41
	400	100					
(H) McCrae/Dromana/ Rye	140	100			52	44	39
	400	100					
(I) Point Lonsdale	140	100			50	44	45
	400	100					

Turbidity

Conformance location	Environmental Limit
----------------------	---------------------

Project area: Yarra River and Hobsons Bay	
Hobsons Bay mud	70 NTU
Mouth of Yarra River (15 Oct-30 Nov)	25 NTU above background during sprint to maximum of 45 NTU including background.
Project area: South of the bay	
Sorrento Bank	15 NTU not to be exceeded as a 2 week moving average, and 25 NTU not to be exceeded as a 6 hourly average.
Portsea Hole D	35 NTU
Swan Bay – Coles Channel	15 NTU not to be exceeded as a 2 week moving average, and 25 NTU not to be exceeded as a 6 hourly average.
Mud Islands East C	15 NTU not to be exceeded as a 2 week moving average, and 25 NTU not to be exceeded as a 6 hourly average.
Camerons Bight	15 NTU not to be exceeded as a 2 week moving average, and 25 NTU not to be exceeded as a 6 hourly average.
Rye Jetty	15 NTU not to be exceeded as a 2 week moving average, and 25 NTU not to be exceeded as a 6 hourly average.
Capel Sound	35 NTU
Lonsdale Bight	17 NTU

5.2 Appendix 2 – PoMC Notification Requirements

Subject	Timeframe for notifying Environmental Monitor
Response level reached	Notification within 1 working day (normal business hours) or verifying that a response level has been reached.
Environmental Limit exceeded	Notification within 12 hours (any time of day) of verifying that environmental limit has been exceeded. - Incident report required.
Pollution event or imminent environmental hazard	Notification within 12 hours (any time of day) of verifying imminent environmental hazard. - Incident report required.
Non-Aboriginal heritage	Notification within 7 working days of discovery of historic shipwreck. Notification prior to any additional surveys being conducted. - Report to be forwarded following heritage inspections.
Aboriginal heritage	Notification as soon as practicable and within 7 working days if potential Aboriginal site identified.
Baywide monitoring - algal blooms	Notification where chlorophyll-a concentrations are indicative of a bloom within 3 days of receipt of verified data. Notification of toxic species within 12 hours of verified data.
Underwater noise assessment of hydrohammer	Notification at least 2 working days prior to use of hydrohammer (where underwater noise monitoring confirms that noise levels are consistent with the model and existing controls are adequate). Notification to include the reason for use of the hydrohammer and extent of use proposed.
Completion of dredging of contaminated sediments within an area	Notification within 12 hours (any time of day) of determining that requirements for commencement of dredging of underlying uncontaminated material within an area have been met.
Placement of contaminated material in bund	Notification within 12 hours (any time of day) of determining that requirements for placement of contaminated material in bund have been met.
Entrance clean up	Notification within 12 hours (any time of day) of determining that final Entrance clean up is complete (once design profile is achieved). PoMC will provide advice on the environmental risks posed by the remaining loose rock material for ongoing rock scour, rock fall and safety, and the project implications for continuing cleanup works. PoMC will then seek confirmation that clean-up is to the satisfaction of the Minister for Environment and Climate Change or delegate.

Subject	Timeframe for preparing reports available to Environmental Monitor
Dredging schedule	Monthly updates and revisions of the dredging schedule forwarded within 2 working days of approval by CDP management.
Quarterly project report containing summary of: <ul style="list-style-type: none"> • Project activities, inductions, training, management review outcomes, • Audit, monitoring and inspection activities and results, including conformance with PDS, • Communication and consultation summary • Management review for environmental monitoring (6 monthly) 	Quarterly reports during construction and 2 years post-construction. Forwarded within 4 weeks after the end of the quarter. Note: Process, environmental monitoring data, baywide monitoring data and internal audit reports will be made available for inspection by relevant agencies and the independent environmental monitor at any time.
Audit of PoMC implementation of the EMP by external auditor	Audit report forwarded within 7 days of finalising the audit report. As a minimum, audits will be scheduled to coincide with the commencement of key activities and the use of key equipment, and on a 6 monthly basis whilst the activity occurs.
Annual report on performance against EPBC/NES matters referenced in Annexure 8	Annual report forwarded to DEWHA after independent audit (by auditor agreed to by DEWHA) and published within 1 month of submission.
Project close-out report	Close-out report to be forwarded within 90 days of completion of construction activities.
Deep reef, Entrance plateau and PoM DMG marine pest post-construction inspection programs, Entrance bathymetry survey, post-construction towed video survey.	Reports to be forwarded within 90 days following completion of post-construction inspection or survey.
Tide monitoring report	Report to be forwarded within 90 days following completion of post-construction monitoring
Sands and adjacent coast and beaches monitoring	Report to be forwarded within 90 days following completion of survey or monitoring.
Protected areas in Entrance	Consolidated monitoring report on protected areas. Report to be forwarded following finalisation of post-construction deep reef monitoring reports.