

Fremantle Ports Outer Harbour Project

Fremantle Ports/Department for Planning and Infrastructure

Advice to the Minister for the Environment from the Environmental Protection Authority (EPA) under Section 16(e) of the *Environmental Protection Act 1986*

(This is not an assessment of the Environmental Protection Authority under Part IV of the Environmental Protection Act 1986)

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1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice to the Minister for the Environment under section 16(e) of the *Environmental Protection Act 1986* and the Western Australian Planning Commission (WAPC) on the proposal by Fremantle Ports and the Department for Planning and Infrastructure (FP/DPI) to develop a new port facility and related transport infrastructure for container trade and general cargo in Cockburn Sound.

The project is intended to provide a substantial container and general cargo port facility which would accommodate growth of shipping trade beyond 2017, when the existing Inner Harbour facilities are predicted to reach capacity. The preferred site is located at Naval Base/Kwinana, north of James Point. Four development concepts have been considered by the proponents. Three options are for an offshore facility while the fourth is a combined land backed and offshore design. The offshore designs would be approximately 2.6 km long and 0.7 km wide, and linked to new rail and road infrastructure by a bridge. Following consideration of these alternative concepts, a preferred development option has been recommended by the proponents.

Fremantle Ports and the Department for Planning and Infrastructure, as joint proponents, have commenced a process to obtain environmental, planning and other approvals for a future port facility in Cockburn Sound and associated road/rail links. In view of the scale and complexity of the proposal and issues arising from the options, FP/DPI are proceeding through a two-stage strategic assessment and statutory approval process.

The first stage strategic assessment involves the EPA providing section 16e advice to the Minister for the Environment and the WAPC providing integrated strategic advice to the Minister for Planning and Infrastructure, following consideration of significant environmental, social and economic issues related to the four concepts and a preferred development proposal.

Once the integrated strategic advice is received from the WAPC, the Western Australian Government would then make a decision on proceeding to the next stage of obtaining statutory environmental and planning approvals on a specific proposal. This second stage environmental assessment is expected to be undertaken under section 38 of the *Environmental Protection Act 1986* rather than section 48A, even though an amendment to the Metropolitan Region Scheme (MRS) will be required. There are likely to be limitations in the ability of the MRS, as a planning instrument, to impose detailed environmental conditions on aspects of the project, such as dredging, which would occur beyond the amendment area.

2. The proposal

The Strategic Assessment Report (FP/DPI 2006a) provides the following description of the details of the proposal requirements and port development options.

The proposed port facility is intended to provide a world-class container and general cargo port facility capable of accommodating future generations of container ships to service the growing trade needs of Perth and wider Western Australia.

The proponents state (FP/DPI 2006a, p3) that it is therefore necessary to have a port facility with sufficient land for the handling and storage of cargo; ship berthing facilities with adequate shelter from waves and swell; shipping channels and harbour basins with adequate width and depth to handle future generations of ships; efficient cargo handling facilities to enable the efficient movement of cargo from ship to shore and to road and rail transport links and vice versa and efficient road and rail linkages to enable the efficient transport of freight between the port and importers and exporters.

Four project options for a port facility at the Naval Base/Kwinana location have been evaluated, together with associated road and rail links. The main components of the overall project are:

- three two-berth container terminals;
- one two-berth general cargo terminal;
- bridge to shore (Option 1, 2 and 3) or bridge to land backed facility (Option 4);
- road and rail access across the bridge;
- upgrade of existing shipping channels or/and new shipping channel;
- ship berthing and turning areas;
- land reclamation;
- primary road access (west of Kwinana Freeway to the port); and
- freight rail access (west of the Kwinana-Kewdale Freight Line).

Secondary components could include improved road access within the Kwinana Industrial Area and facilities to replace the recreational boat ramp at Sutton Road, in the event it is impacted by the port.

The four port facility options are shown in Figure 1. Each of the options, when fully developed, would have the same port capacity. They would each provide three two-berth container terminals and one two-berth general cargo terminal. Each of the options would be able to be developed in stages to progressively meet growing trade needs.

In each of the four options, the need for continued shipping access to Alcoa and the Australian Marine Complex (AMC) has been taken into account.

Following consideration of all of the port and transport infrastructure options, the proponents have selected a refined Option 1 as their preferred outer harbour development (FP/DPI 2006b). Some modifications to the proposal illustrated in Figure 1 have been made. These include:

- Raising of the road and railway to reduce the depth and width of the transport corridor cutting and removing the need for reclamation for the rail spur and Sutton Road realignment.
- Shifting the corridor southwards to reduce clearing of native vegetation north of the corridor by 9.4 Ha and providing better delineation between the industrial zoned land and Beeliar Regional Park.
- Retention of the high, wide load access along Cockburn Road and access to Sutton Road, Challenger Beach, Naval Base Holiday Park and Beeliar Regional Park (FP/DPI 2006b, p31).

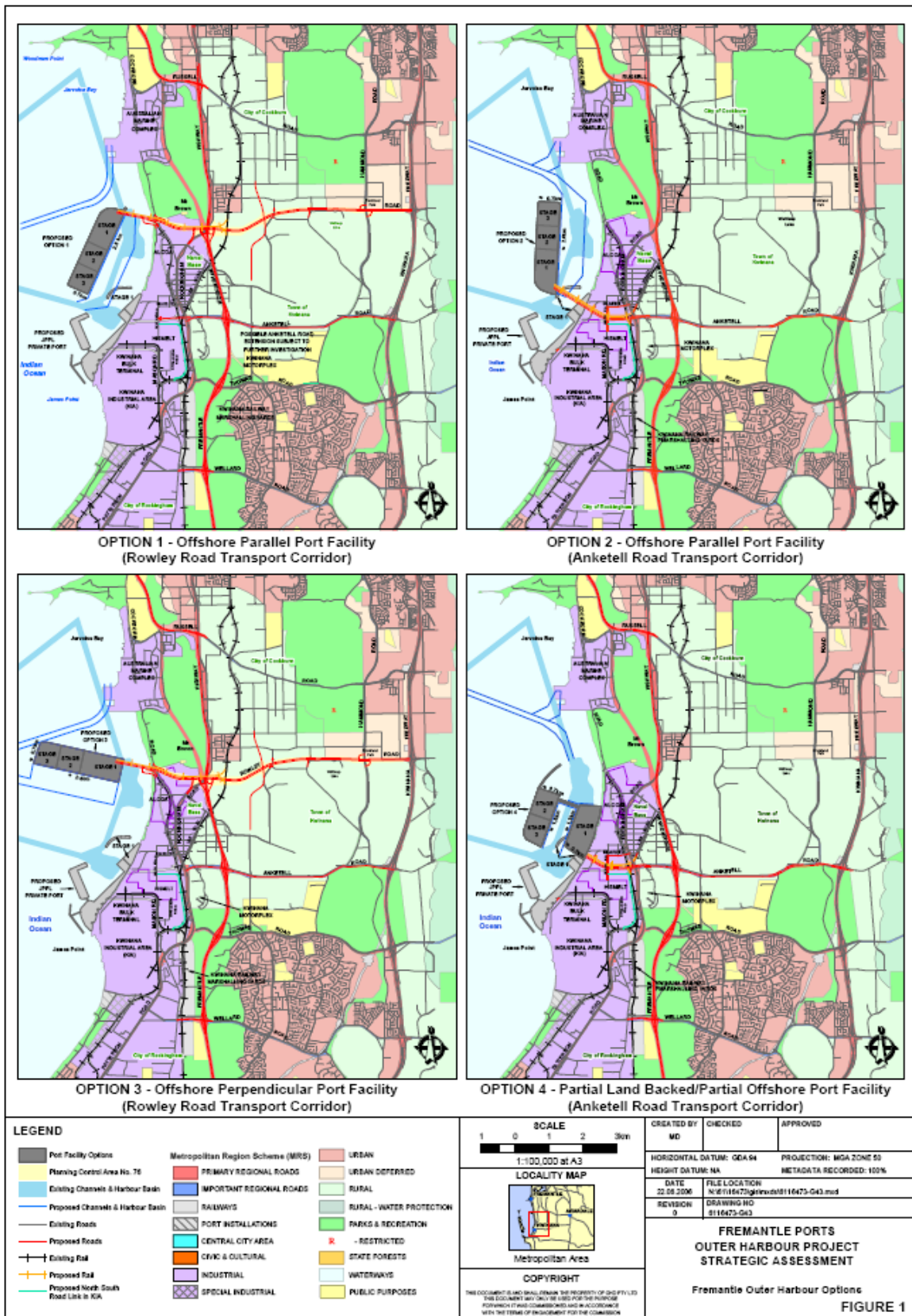


Figure 1: Port Development and Infrastructure Options (from FP/DPI 2006a)

3. Consultation

There has been extensive stakeholder consultation by Fremantle Ports and Department for Planning and Infrastructure over the whole of this strategic assessment phase.

The Draft Recommendation Report on Preferred Option (FP/DPI 2006b) and the key documents supporting the strategic assessment process were released for a 4 week public comment period from 26 July until 23 August 2006. A total of 36 submissions were received from individuals, community organisations, Government Departments and local businesses. The EPA has been provided with a copy of the proponents' summary, analysis and response to all submissions.

Key views on environmental issues expressed in submissions on the preferred option report included:

Marine environment

- The majority of comments received by the proponents on the Strategic Assessment Report and Report on the Preferred Option were in relation to concerns over the choice of site location within Cockburn Sound rather than the preferred option itself. Some submitters also expressed concerns that the preferred option would negatively impact on the marine environment of Cockburn Sound.
- Several submitters indicated that Cockburn Sound was overburdened with industry, nutrient loading and contaminants and that an alternative site should be considered.
- Concerns over the cumulative impacts of development in Cockburn Sound were also raised. The necessity of a public and private port (James Point Private Port) in the same vicinity and concerns in relation to the combined impacts of the desalination plant, New Gen power plant and other discharges were raised in the context of cumulative impacts.
- The potential for the construction and operation of the port to impact on local industry such as the Water Corporation desalination plant, BP refinery and also on local professional fisherman was also raised.
- The Cockburn Sound Management Council (CSMC), in its submission to Fremantle Ports, highlighted the concern that the nature and scale of the development pose a potential for significant and possibly irreversible effects impacts upon the marine environment of Cockburn Sound.

Terrestrial environment

- In terms of potential impacts on the terrestrial environment associated with the northern access (Rowley Road) of the preferred option, submitters raised concerns in relation to impacts on Lake Wattleup, wetlands and flora and fauna in Beeliar Regional Park and Mt Brown. Risks from spillages, increased traffic and visual amenity were also raised in this context.
- Other issues raised in the submissions include impacts on land use, impacts on industry and local business, community values and access to Cockburn Sound and traffic and emergency access.

4. Strategic Advice on Outer Harbour Project

4.1 Site Selection

This strategic assessment follows from investigations finalised in the 1990's that identified a preferred port site in the Kwinana/Naval Base area. This strategic assessment only examines port and transport corridor options related to a facility in Cockburn Sound in the Kwinana/Naval Base area.

The EPA notes that the majority of comments received by the proponents on the Strategic Assessment Report on the Preferred Option were in relation to concerns over the choice of site location within Cockburn Sound rather than the preferred option itself.

One issue of concern to the EPA is that the James Point proposal as an alternative facility has not been addressed, except in terms of its physical compatibility with the port and infrastructure options. James Point Stage 1 has received environmental approval subject to conditions and James Point has now referred its Stage 2 proposal, which will be formally assessed by the EPA at the level of Environmental Review and Management Programme (ERMP). In making this comment, the EPA is not advocating for one or other proponent or proposal, but is concerned about increasing complexity and how cumulative environmental impacts as well as social and economic matters can be adequately evaluated and addressed.

4.2 Current Condition of Cockburn Sound

The ecological condition of Cockburn Sound was at its lowest in the 1970s, with poor water quality, high chlorophyll-a levels and the loss of extensive areas of meadow forming seagrass from the eastern margin of Cockburn Sound. A substantial amount of time and resources has been invested by the Government, industry and the community to improve the environmental quality in Cockburn Sound since the late 1970's. During the mid to late 1980s and early 1990s chlorophyll-a concentrations and water clarity improved, and have generally stabilised since then.

The *State Environmental (Cockburn Sound) Policy 2005* (Cockburn Sound SEP) provides for an environmental quality monitoring program to be implemented in Cockburn Sound to determine if the established Environmental Quality Objectives¹ set for the Sound are being achieved, and therefore whether the Environmental Values² are being protected. Under the Cockburn Sound SEP, the Cockburn Sound Management Council (CSMC) has responsibility to oversee the environmental quality monitoring program and publicly reports the findings each year. In 2005, the council prepared a *State of Cockburn Sound Report 2005* (in addition to the public reporting program), which was tabled in Parliament (Cockburn Sound Management Council, 2005).

¹ Environmental Quality Objectives (EQOs) have been established by the Cockburn Sound SEP for each Environmental Value. EQOs are specific management goals for a part of the environment and are either ecologically based by describing the desired level of health of the ecosystem or socially based by describing the environmental quality required to maintain specific human uses.

² Under the Cockburn Sound SEP, Environmental Value means a particular value or use of the marine environment that is important for a healthy ecosystem or for public benefit, welfare, safety or health and which requires protection from the effects of pollution, environmental harm, waste discharges and deposits. The Environmental Values that apply to the Cockburn Sound policy area are listed in Clause 6 of the Cockburn Sound SEP.

Overall (based on the best available information and expert advice) there appears to have been no significant change in the overall health of Cockburn Sound since monitoring programs began in 2000. Data collected under the monitoring program was assessed against the Environmental Quality Criteria for Cockburn Sound and a series of Report Cards were developed to inform stakeholders and the community on the health of the Cockburn Sound marine environment.

The Cockburn Sound Report Cards for 2005, produced from data collected during 2004-2005, indicate that investigation and/or action is required in relation to a number of parameters monitored for ecosystem health (seagrass shoot density in Mangles Bay; chlorophyll-a, light attenuation and tributyltin in Jervis Bay).

The 2005 Report Cards highlighted that in the area of *High Ecological Protection*³:

- chlorophyll-a concentrations met the relevant guidelines, but were elevated in Jervis and Mangles Bays;
- water clarity met the guideline, but was poorest in northern sites and Jervis Bay; and
- seagrass health met the standard in all sites except Mangles Bay. Overall there has been no significant region-wide change in the status of seagrass meadows at sites surveyed between 1998 and 2005.

In the areas of *Moderate Ecological Protection*⁴, environmental quality met the guidelines except in the Jervis Bay Harbours where:

- the guidelines for chlorophyll-a and light attenuation, in addition to the guideline and standard for phytoplankton biomass, were not met at any of the sites in Northern Harbour, and
- the guideline for tributyltin was not met at any of the sites within Jervis Bay Harbours (Northern and Southern harbours).

More recent monitoring for 2005-06 together with the 2006 Report Cards highlighted that some of the environmental quality indicators monitored in Cockburn Sound were at levels that required action to be taken. These indicators include bacteria levels at the Rockingham foreshore waters, chlorophyll-a at Jervis Bay Northern Harbour and tributyltin at James Point, Careening Bay, Woodman Point and both harbours in Jervis Bay.

In summary, water quality improvement in Cockburn Sound seems to have reached a plateau which is significantly better than several decades ago but where improvement is getting more difficult to achieve.

³ For the EQO-‘Maintenance of Ecosystem Integrity’, there are 3 levels of ecological protection that apply. A High level of ecological protection allows for small changes in the quality of water, sediments and biota. The extent and boundary of the High Ecological Protection area within the policy area is shown in Schedule 2 of the Cockburn Sound SEP.

⁴ Moderate level of ecological protection allows for moderate changes in the quality of water, sediments and biota. The extent and boundary of the Moderate Ecological Protection area is shown in Schedule 2 of the Cockburn Sound SEP.

4.3 Pressures on Cockburn Sound

As indicated above, while nutrient related water quality parameters improved during the mid to late 1980s and early 1990s, and have generally stabilised since then, overall, Cockburn Sound remains under significant pressure from existing activities. Further pressures are likely from approved projects which are yet to operate.

In 1998, the EPA provided Strategic Environmental Advice on the Marine Environment of Cockburn Sound in Bulletin 907 (EPA 1998a). This advice was prepared as part of the environmental assessment of the proposed Industrial Infrastructure and Harbour Development in Jervoise Bay.

In Bulletin 907, the EPA attempted to deal with some of the future developments that were likely to arise in Cockburn Sound, and address environmental implications that could result from these proposals.

Forecast developments identified in Bulletin 907 included the following:

- proposed Industrial Infrastructure and Harbour Development in Jervoise Bay (received environmental approval in 1998 (Ministerial Statement 490), now constructed as the Marine Support Facility);
- a Fremantle Port Authority harbour at Naval Base (now called the Fremantle Ports Outer Harbour Project);
- a residential marina in Mangles Bay (currently the subject of section 16 advice by the EPA);
- expressions of interest to construct and manage a private port in Cockburn Sound (now called James Point Port); and
- proposed additional berth at the FPA bulk cargo jetty (not yet constructed).

Since Bulletin 907 was published, the James Point Port Stage 1 proposal has received environmental approval subject to conditions (Ministerial Statement No. 669), while the larger James Point Stage 2 has commenced its environmental assessment at the level of Environmental Review and Management Programme. The EPA is also assessing a proposal by Fremantle Ports to significantly upgrade the capacity of the Kwinana Bulk Terminal Berth No. 1 (at Public Environmental Review level of assessment). Recent industrial developments along the Cockburn Sound foreshore, using Cockburn Sound for water supply and water discharge, include the Perth Seawater Desalination Plant, Verve Energy's Cockburn 1 and 2 gas turbine power stations and NewGen Power's Kwinana Gas-Fired Power Station. Some of these projects are in operation or under construction, and all have environmental approval.

Apart from the Marine Support Facility (MSF), the proposed Mangles Bay residential marina and the proposed bulk cargo jetty expansion, all of these proposals and projects are located between James Point and Challenger Beach. There are already marine activities associated with Alcoa's Kwinana Refinery and Verve Energy's Kwinana Power Station in this section of Cockburn Sound.

Bulletin 907 included a Statement of Advice entitled: An Appraisal of Potential Environmental Consequences for Cockburn Sound of Future Harbour Developments. This Statement of Advice was prepared for the EPA through a series of technical workshops comprising a group of experienced marine scientists. The Statement pointed out that

environmental changes resulting from potential harbour developments need to be considered at three spatial scales:

- within harbours;
- between harbours (along the eastern margin of Cockburn Sound); and
- broader Cockburn Sound.

The EPA considers that the Statement of Advice remains relevant to consideration of cumulative environmental impacts arising from existing and proposed marine-related developments for Cockburn Sound, including the Outer Harbour Project. Matters raised as potential implications from harbours include effects on ecological processes, loss or alteration of habitat, changes to nutrient cycling and increased biota stimulation, disturbance of sediments and contaminants, reduction in light, introduction of pest species, and changed water circulation.

The executive summary of the Statement of Advice is provided in Appendix 2 of this report.

4.4 Environmental Issues Related to Port Options and Transport Infrastructure

While some of the terrestrial impacts arising from the preferred option may be reduced through actions such as those mentioned above (in Section 2), there are few opportunities to reduce marine impacts arising from the port options, including Option 1.

Each port option would lead to significant adverse environmental change in Cockburn Sound through a combination of marine habitat loss (seabed and water) arising from dredging and reclamation and potential environmental quality impacts arising from changed water flow patterns (hydrodynamics) and contaminants.

In large part because of the scale of the dredging and reclamation requirements of any of the options, the Outer Harbour Project has the potential to adversely affect a substantial portion of the eastern-shelf of Cockburn Sound. Based on current information, it is not yet possible to form the view that construction and operational impacts for any of the options within Cockburn Sound are likely to be acceptable.

Terrestrial

Two main infrastructure access corridors were considered for the port options, a realigned and extended Rowley Road and an extended Anketell Road. The recommended preferred route from the Kwinana Freeway to port Option 1 is Rowley Road.

Although the Rowley Road and Anketell Road corridors would be close to Wattleup Lake and The Spectacles respectively, detailed design would be required to ensure that the wetlands can be avoided and adequate buffers maintained. Likewise, the Threatened Ecological Community located within the Anketell Road corridor should be avoidable and could be protected through detailed design.

Impacts on fauna will result from clearing for each of the transport corridors, with loss of habitat. The corridors will also lead to larger breaks in planned linkages between protected areas and the roads will act as a barrier which would be likely to increase the loss of fauna. In this regard, the Hope Valley-Wattleup redevelopment could be expected to have a greater

effect than the other options. The Mt Brown regional open space area is outside of the redevelopment area.

There are four Bush Forever sites that would be affected by the Rowley Road and Anketell Road corridor options:

- Bush Forever Site 346 (Brownman Swamp, Mt Brown Lake and Adjacent Bushland). Most of Bush Forever Site 346 is reserved as part of the Beeliar Regional Park, with the southern portion (Part B of Site 346) listed in the Bush Forever Site Implementation Recommendations as 'Proposed Parks and Recreation'. The western part of the Rowley Road transport corridor for port Options 1 and 3 affects the southern portion of Bush Forever Site 346. The initial proposed concept for a road and rail reserve would result in the clearing of 28 ha of vegetation within Bush Forever Site 346 and an additional 16.5 ha of Site 346 would be separated to the south of the road and rail reserve, leading to a total of 44.5 ha (or 7.5% of Bush Forever Site 346) being affected by the Rowley Road corridor. The revised alignment reduces clearing by 9.4 ha and also reduces the size of the separated land to the south of the corridor.
- Bush Forever Site 393 (Wattleup Lake and Adjacent Bushland). The Rowley Road transport corridor for port options 1 and 3 affects this site. The corridor passes through a narrow linking corridor between Wattleup Lake and the Harry Waring Marsupial Reserve.
- Bush Forever Sites 268 (Mandogalup Road Bushland) and 269 (The Spectacles). The Anketell Road transport corridor for port options 2 and 4 would affect both these sites. Anketell Road would remain largely within its existing reserve, with only a small loss from these sites.

While the refinement of the corridor has reduced the physical impact on Bush Forever Site 346 associated with Mt Brown, the impacts on the area are still considered to be significant. Construction of the road/rail corridor and associated link roads between Rockingham Road and Cockburn Sound would clearly have substantial effects, through the loss or dislocation of vegetation and habitat values, as well as by creating a visible scar on a prominent landscape feature.

Although the proponents have modified the alignment in the vicinity of Mt Brown to reduce ecological impacts, the EPA would prefer transport corridors that avoid the Mt Brown area. The EPA has previously highlighted the importance of Bush Forever Site 346 through its System 6 review report into conservation reserves on the Swan Coastal plain (DCE, 1983) and also in Bulletin 908, related to the assessment of the proposed Industrial Infrastructure and Harbour Development, where loss of reserved land was part of the proposal (EPA 1998).

The EPA notes that some modifications to the alignment affecting Mt Brown have been indicated in the Draft Recommendation Report on Preferred Option (FP/DPI 2006b, p 31). While the modifications to the Rowley Road road/rail alignment may reduce the impacts associated with this access infrastructure, this will need to be demonstrated in the statutory assessment phase along with the provision of detailed information on the proponent's further mitigation of impacts on the Bush Forever site.

Marine

Each of the port options would have impacts on benthic habitat and environmental quality during the construction and operations phases. The extent of loss and degradation of marine habitat and biodiversity through dredging and reclamation, water quality impacts from reduced flushing times and changed circulation patterns, and potential cumulative effects from existing and approved infrastructure and discharges on the eastern shore of Cockburn Sound, remain significant issues needing to be addressed.

Circulation and flushing issues

Each of the port options will affect water circulation patterns at a range of scales, from the harbour-scale to Cockburn Sound-scale. While water circulation within the harbour (or at the local-scale) is likely to be improved to some extent with the removal of the access spur on Challenger Beach compared with a situation where an access spur is present, it will still be affected by the overall size, shape and angle of the port configuration. This would also be the case at a Cockburn Sound-scale. The modelling of water circulation based on conceptual layouts of the reclamation, channel and basin configurations (which includes the spur but does not include James Point Stage 1,) suggests that Option 4 is likely to have the least effect at the Cockburn Sound-scale and harbour-scale, and that Options 3 and 2 would have greater effects than Option 1 (Oceanica, 2006). For Option 1, modelling indicates that at the harbour-scale water currents are expected to be weak and variable in the deepened harbour basin with stronger currents expected through the northern causeway.

Based on the results of flushing studies presented in Oceanica (2006), the proponent predicts that longer residence times for waters within the harbour are likely for Options 1 and 2, with the latter Option increasing residence times of surface waters by between 4 and 8 fold relative to the current situation. For deeper waters, Option 2 is predicted to increase residence times by up to 6 days. The report states, “the flushing characteristics of (Option 2) are poor” (GHD 2006, p131).

For Option 1 it is predicted that the local water residence times are expected to be up to 24 hours longer than the existing situation. Modelling the effects of Option 1 on adjacent waters also indicates that water residence times near the MSF in the Jervoise Bay region, and between Option 1 and the MSF, are predicted to increase.

Water residency time is a measure of the time it takes for a body of water to flush from an area of the ocean. The environmental consequences of longer water residency times in Cockburn Sound are discussed in greater detail in EPA Bulletin 907 but include potential for greater biomass of phytoplankton and changes in the cycling of nutrients in Cockburn Sound’s waters and marine sediments.

The potential impacts of the Outer Harbour options on industrial discharges may have environmental and policy implications. From results of flushing studies, the proponent predicts that Options 1, 2 and 4 are likely to lead to changes in the flushing times of waters between Alcoa’s Kwinana Refinery and James Point, where there are a range of existing and proposed outfalls and other industrial facilities. However, the effect of these options on discharge plume behaviour from these sites has not been examined in detail. Development of Options 1, 2 or 4 is likely to adversely impact intake water quality for the Perth Desalination Plant and possibly other seawater intakes in the area (Industrial water supply is an Environmental Value in the Cockburn Sound SEP), while the predicted longer water residence

time caused by the port structure and harbour deepening may lead to some changes in the behaviour (and possibly reduced performance) of the existing and approved industrial outfalls.

From a policy perspective, the effect of the Outer Harbour Project options on existing and approved Low Ecological Protection Areas, as shown in Schedule 3 of the Cockburn Sound SEP, will require detailed investigations.

The results of modelling undertaken to date are best considered as indicative only. Of concern is the fact that the flushing studies did not include consideration of James Point Stage 1, which has been granted environmental approval subject to conditions. The hydrodynamic implications of all existing and approved developments, including the James Point Stage 1 Port, on the Fremantle Ports proposal need to be examined and considered in more detail.

Based on the hydrodynamic modelling information in the Strategic Assessment Report, it is not possible, with any degree of certainty, to make a judgement on implications of the port options on water circulation patterns and flushing times. For example, while the document provides basic information on circulation pattern changes for one season (summer), this is too limited to properly address the potential consequences of any option on the different seasonal water movement patterns which occur in Cockburn Sound. This is acknowledged in the Strategic Assessment Report (FP/DPI 2006a).

Furthermore, hydrodynamic information alone will not answer questions about the effect of an Outer Harbour on the overall 'Ecosystem Health' of the Sound. Ecosystem Health is a fundamental ecological value identified in the Cockburn Sound SEP, and a significant further effort would be necessary to predict impacts of the presence of an outer harbour on overall Ecosystem Health, including water and sediment quality, and seagrass health. Such predictions would need to be presented in the context of the Cockburn Sound SEP, as the EPA will use the SEP as the basis on which to assess environmental quality implications of a proposal should Government decide to progress an environmental impact assessment of a preferred option.

Dredging and reclamation

Construction of any one option would involve significant reclamation and dredging in Cockburn Sound to develop new or deeper shipping channels and a harbour basin. Protection of the biota and their supporting systems is a primary goal of the EPA for Cockburn Sound. Benthic and other flora and fauna in Cockburn Sound could be significantly affected during and following construction of any of the port options. Construction would cause direct permanent loss of benthic habitat through excavation and overtopping, and also has potential to indirectly impact benthic habitats and environmental quality through the liberation of fine sediments to the water column during dredging and reclamation.

The extent of loss of shallow habitat along the eastern margin of Cockburn Sound from dredging and reclamation is determined by the design capacity of the port. The scale of the direct impacts varies between the port options, but is substantial in all cases. For example, the combination of dredging and reclamation will lead to the permanent loss of between 338 ha (Option 1) and 398 ha (ha) of benthic primary producer habitat found in waters less than 10 m depth. These losses include areas of extant seagrass but are predominantly unconsolidated marine sediment, where seagrass once grew.

Impacts on benthic primary producer habitats

Cumulative permanent losses of benthic primary producer habitats (BPPH) are considered by the EPA in the context of Guidance Statement No.29 Benthic Primary Producer Habitat Protection (EPA, 2004). The EPA defines BPPH as both the benthic primary producer communities as well as the substrata that can or do support these communities (EPA, 2004). In the Cockburn Sound context, the key benthic primary producer habitats are areas of extant seagrass and unconsolidated sediments where seagrass once grew and could recolonise if ambient environmental conditions were suitable. The EPA will expect that the proponent addresses the cumulative loss of each different BPPH in the context of Guidance Statement No. 29, if a preferred Option is presented to the EPA for formal environmental impact assessment.

Concern about seagrass loss in Cockburn Sound is not new. Approximately 80% of the seagrass present in Cockburn Sound prior to development commencing in the area has been lost since the 1950's. The EPA has a stated objective to protect the remaining seagrass meadows in Cockburn Sound (EPA, 1998). The EPA is concerned about the incremental loss of further *Posidonia* seagrass in Cockburn Sound. In previous assessments of proposals in Cockburn Sound where loss has been a predicted outcome, the EPA expressed significant concern about the loss of any further seagrass in Cockburn Sound in the context of historical losses (eg. Jervoise Bay Southern Harbour and Mangles Bay Marina). The EPA remains of the view that the remaining seagrass in Cockburn Sound should be protected and that activities and developments should be planned and implemented with an environmental objective for *Posidonia* seagrass of no net loss and preferably a net environmental gain.

Further loss of BPPH that is potentially suitable for seagrass recolonisation (i.e. unconsolidated sediment generally in less than 10 m water depth where seagrass once grew) is also of significant concern. The importance of protecting sandy banks and margins where seagrass meadows once grew in the Sound has been highlighted by the EPA (1998) and this issue is also reflected in the Cockburn Sound Management Plan (CSMC, 2005), which includes a recommendation related to the promotion of the recolonisation and re-establishment of seagrass in areas of Cockburn Sound where it once occurred (recommendation 1.3-16). Excluding the areas of reef habitat shown in Table 5 of the Strategic Assessment Report (FP/DPI, 2006a), the sum of the areas of other benthic primary producer habitat directly disturbed by each Option provides an indication of the potential total direct loss of "seagrass" habitat for those Options. For example, Option 4 would cause greatest loss (378 ha) while Option 1 the least (326 ha), followed by Option 2 (376 ha). The potential losses of each BPPH associated with any port option would need to be considered in the context of all other historical and approved losses.

From the available information, each of the port options will cause the cumulative loss thresholds set out in the EPA's in Guidance Statement No. 29 to be exceeded for both seagrass and sandy habitat that once supported seagrass. Considering historical and approved losses, the proponents have predicted that this project, if approved, could see the cumulative loss since European habitation of sandy habitat that once supported seagrass reach 17%. This figure is well above the 10% cumulative loss threshold in the EPA Guidance Statement for Category E: Development Areas. There needs to be further discussion of the predicted cumulative loss from this project against the EPA cumulative loss threshold.

In relation to implications for each of the different marine BPPHs, Table 1 below shows the calculated areas of direct loss of each type of BPPH for each (Oceanica 2006, p 27).

