Albany Iron Ore Project
Albany Port Expansion Proposal
PUBLIC ENVIRONMENTAL REVIEW

RESPONSE TO
PUBLIC SUBMISSIONS

Albany Port Authority

Albany Port Expansion Proposal

EPA Assessment No. 1594

August 2008

ecologia
ENVIRONMENT

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1.0 Responses to submissions

A total of 19 submissions were received in response to the Albany Port Authority Port Expansion Proposal (EPA Assessment No. 1594) Public Environmental Review. From these submissions individual comments and questions were identified. Albany Port Authority (APA) has collated the responses received and responded to the submissions in this document. As many of the answers are of a similar nature, questions/statements that have a similar answer have been grouped together. These have then been categorised into chapters (based on the issue).

Questions have been coded according to submission number (see table below) and the number of the question within the submission. For example, the second question in the Department of Health Submission is coded as 9.2.

A copy of all submissions has been included on the data CD attached to this document.

1	Richard Keeler
2	Downtime Shells
3	Conservation Council of WA
4	Western Australian Fishing Industry Council
5	South Coast Purse Seine Association
6	Smithson Planning
7	Fish Processing Factory -Garry Bevan
8	Tony Harrison
9	Department of Health (DoH)
10	Department of Planning and Infrastructure (DPI)
11	Department of Water (DoW)
12	Department of Environment and Conservation (DEC) Noise Branch
13	Western Australian Museum
14	Department of Indigenous Affairs (DIA)
15	Heritage Council of Western Australia
16	Department of Environment and Conservation (DEC)
17	Environmental Protection Authority Service Unit (EPASU)
18	Department of Fisheries (DoF)
19	Department of Environment Water Heritage and the Arts (DEWHA)

Through the responses in this document APA aims to provide submitters with the most accurate information that is available at this stage of development and design of the Albany Port Expansion Proposal.

APA would like to extend their appreciation to all parties that chose to forward a submission to the Western Australian Government as part of this environmental approvals process.

Through the consultation processes, APA has amended the dredge and land reclamation program to balance environmental outcomes. Details of this can be found in Section 9.0

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2.0 Stakeholder Engagement

2.6 **At a meeting held between commercial stakeholders and proponents of the project, total dismissal of the effect of the Leeuwin Current on the proposed dump site. The concerns expressed by stakeholders were based on observations made on a daily basis by people whose occupation requires it. Graham Hebert made the reply to these comments of ".... the Leeuwin Current has no effect here". I feel this shows arrogance to the stakeholders who would dare ask questions in a meeting designed for forum and displays a blatant disregard for the public consultation process. We have observed strong currents in areas around the proposed dump site whenever we have dived there, and while we offer no speculation or inference as to the origin of these currents, to be told they don't exist is further illustration of the attitude towards stakeholder involvement.**

The existence of strong bottom currents at the external dump site option is discussed in the technical report (GEMS, 2007 – p.67) and was further discussed at the public meeting in Albany by technical expert Dr Hubbert. Analysis of the data from the current meter deployed at the external disposal site option showed a high correlation between the current speed variations and the wind speed variations (GEMS, 2007 - p 69). This observation lead to the conclusion that the strong bottom currents are due to shelf waves driven by strong westerly winds – not the Leeuwin Current which is usually much slower, except on associated eddies.

Even if the strong currents were due to the Leeuwin Current this current also follows the shelf edge and does not propagate towards the shoreline and so the conclusions concerning impacts inside King George Sound would be the same.

4.7 Given there has been limited opportunity provided to date to consider the views raised by industry and the potential for the industry to be significantly impacted by the proposal we believe it would be worthwhile for a meeting to be held between the proponents and industry.

7.4 We ask that we be able (along with the Fishermen) to have some discussions as to how the industry can be helped during the dredging time and then look again when King George Sound has settled and the shipping begins.

The APA has continually engaged with stakeholders and the Albany community since the commencement of the feasibility studies.

A public meeting was held in Albany on 21st March 2005 to present Project information to the community and to give the public an opportunity to raise queries or concerns. A project brochure was mail dropped to 10,000 residences in Albany outlining the project and providing a reply paid comment sheet prior to the public meeting.

The APA had an information stall, manned by key project staff, at the Albany Agriculture Show in November 2006 where information and leaflets on the port expansion were provided, the fair was attended by approximately 20,500 people and feedback was overwhelmingly supportive.

A second public briefing session similar to the Albany public meeting was held in Perth on the 28th June 2005 with representatives from government agencies, the Wildflower Society of WA, Aquaculture Council of WA, the Marine Conservation Network and the Greens.

A marine stakeholder group was formed in 2005 and convened in November 2005 with groups and individuals who have a commercial and non-commercial interest in the scope of the marine works. The group included representatives from marine-related tourism operators, Great Southern Aquaculture Association, South Coast Professional Fisherman's Association, Local regulatory groups, Local Recreational Fishing Advisory Committee, local SCUBA diving businesses and interested individuals of the community. A series of meetings were held to inform the group on the scope of the works and results of environmental investigations. Presentations were made by the proponents and Project consultants regarding the Project and investigations being undertaken, followed by a question time.

The Great Southern Development Commission (GSDC) facilitates a monthly project working group meeting. Members of the group include Albany representatives of DEC, Western Power, Main

Roads, Water Corporation, DPI, DoIR, City of Albany, Albany Port Authority and Grange Resources. This meeting has been used as a forum to discuss Project requirements, progress against Project phases, and to help resolve local issues that arise.

A public consultation meeting for the Grange Southdown project was advertised in local press and held in Albany on 2/11/07 and attended by local stakeholders. Here the APA, scientists and consultants presented findings of investigations and outlined potential impacts of the Project along with an unconstrained discussion period.

In November 2007 *ecologia* Environment provided an unscheduled briefing for the secretary of the WAFIC and one member who had been unable to attend the public consultation workshop. A presentation was given at this briefing detailing the project overview, modelling and predicted turbidity impacts. An open discussion followed where WAFIC was given the opportunity to raise any concerns.

Throughout the project conceptual development the APA has been and continues to be open in meeting with individual stakeholders to discuss potential impacts throughout the project, including through planning, construction and during project operation to ensure that any issues that arise are managed appropriately. APA and Grange Resources are further developing their combined community engagement strategies and are seeking their individual Board approvals to implement the planned activities. Although, these are yet to be officially endorsed, three activities that are well developed include participation in a local careers exhibition for High School students (August 2008), a manned information stand at an upcoming port open day (September 2008) and a re-run of the information stand at the Albany Agricultural Show (November 2008).

2.1 Compensation

4.1 WAFIC is of the view that this proposal has the potential to cause both short and long term economic loss to the fisheries operating within King George Sound. However, as a result of the negotiations between the fishing industry and the Clough Resources' Shark Bay Salt Joint Venture in 1996 WAFIC understands that the EPA's position is that compensation to affected industries cannot be dealt with by the EPA. In this particular case, the EPA imposed a condition that the proponent would need to compensate for loss of income resulting from the project. In response to the proponents appealing the decision to the supreme Court an appeals committee was established which found that the issue of compensation is inconsistent with the Environmental Protection Act (1986) and should be dealt with through the provisions of State Agreement Acts and the Fisheries Adjustment Scheme. Furthermore, that these considerations should form the basis of consultation between the Department of Fisheries, the fishing industry and the Department of Resources Development. WAFIC seeks clarification from the EPA if this position still applies.

APA is unable to provide comment on the EPA's position on compensation. However, APA supports the findings of the Supreme Court Appeals Committee quoted within the submission.

5.3 In the report it states that if there is any loss of income to the stakeholders in KGS that they should get adequate compensation. When the question was asked at the stakeholders meeting held at the port authority (Brad Williamson, port authority CEO) washed their hands of it. Who will pay? If there is compensation to be payed who determines who pays and how much is payed. The critical issue is that stake holders will not be able to wait for years for these sorts of determinations. We are small operators with limited financial capacities; we are not multinational companies that can offset these sorts of issues.

The Public Environmental Review does not include any detail on compensation. There is no undertaking in the PER to provide compensation to affected stakeholders. There are no precedents for compensation where dredging has occurred in Western Australia and financial / economic considerations are outside the scope of the PER and the *Environmental Protection Act, 1986*. If approved, the proposed development will be carried out entirely within APA's appropriately designated jurisdiction for port activities and implementation will be appropriately managed.

8.5 Section 5.3.1 (pg. 43) Given that the Albany Port expansion and dredging activities occur wholly within APA land and waters, and that the APA has exclusive control of the Albany Port, will the APA accept responsibility for the shallowing of the southern side of Princess Royal Harbour (as a result of the dumping of dredging material close to shore at Middleton Beach in 1985?) should this proposal be approved?

The disposal of dredge material will be in King George Sound and modelling has been undertaken for each of the different dredge scenarios showing sedimentation at the completion of the dredging and 12 months after. The results show a degree of smoothing out of the offshore disposal site but indicate that the sediments placed at this site will be largely non-dispersive and will not re-enter KGS or Princess Royal Harbour. Modelling does not indicate that dredging and disposal will result in the southern side of PRH becoming shallower.

3.0 Project Justification

1.3 Financial consideration is excluded from the process but should be considered to give an adequately holistic approach to the assessment. There appears to be a high element of financial risk combined with a high environmental risk. Much downside and little upside, when considered from an overall perspective.

The financial viability will be determined from the rigorous feasibility study and if the risk is too great on a commercial basis then the project will not proceed as investors will not be attracted to an unviable project. Further, financial considerations do not form part of the EPA's assessment of the project. There is a potential for environmental risk and hence the rigorous level of assessment (PER) set by the EPA for both related proposals.

6.1 As the mining and export operations are inextricably linked, the submitter believes it is pertinent I believe that the proponents are made aware that other factors may influence the long-term viability of their preferred sea port location, and the route of the proposed slurry pipeline to that port handling facility.

This comment and associated papers have been reviewed and are acknowledged.

19.2 APA need to provide details on other factors / activities in the area of the expansion project that may impact on their proposal including the long term viability of the preferred sea port location, and the route of the proposed slurry pipeline to that port handling facility.

The slurry pipeline does not form part of EPA Assessment No. 1594 however; APA will resolve any potential conflicts and facilitate an appropriate route for the slurry pipeline through its jurisdiction. The Port of Albany has a very long tradition being the first on-going European settlement in Western Australia, not surprisingly; this was mainly due to the existence and accessibility of the natural deepwater port. The Port of Albany has underpinned the diverse socio-economic development and sustainability of the region since 1826 and the implementation of this project will further enhance the important role within region's rich socio-economic fabric. Notwithstanding these aspects the Western Australian Government via the Albany Port Authority has signed binding long-term lease agreements with regionally and nationally significant trades (e.g. the recent CBH 50 year lease agreement). In terms of environmental and economic efficiency and prudent management of public investment it is entirely logical to maximise the capacity of existing port infrastructure rather than replicate multiple, unnecessary, ports along the coast.

13.1 The Western Australian Museum has a general concern that this proposal is unacceptable on both environmental and general amenity grounds. More detailed points are documented below.

King George Sound (KGS) is unique along the southern coast of WA in terms of depth and water circulation and other physical factors and has the most westerly (and sometimes only) records in WA for many species of important soft-substrate benthos, such as the large clavagellid bivalve *Kendrickiana veltchi,* and many more species than those few groups and species listed. Apart from their intrinsic value, many soft substrate species in both deep and shallow water are important food items for many birds, fish, & other molluscs.

From the literature available the distribution and numbers of *Kendrickiana veltchii* in the King George Sound area is not clear as is the ecological importance of this species. *Kendrickiana veltchii* apparently live exclusively in subtidal seagrass beds and the proposed dredging and disposal program is not expected to significantly reduce the seagrass meadows of KGS. As such it is unlikely that there will be adverse affects to the mollusc *Kendrickiana veltchi.*

It is doubtful that a species which is so few in number in KGS could form a significant component of the food supply for birds, fish and other molluscs. Equally, more numerous other species found in the KGS will not be adversely affected as they will be able to recolonise those areas affected during dredging and disposal.

Given that no benthic species are rare or endangered and any effects on benthic faunal ecology will be short-term and reversible, there does not appear to be grounds for concern about the acceptability of the proposal.

4.0 Project Description

4.1 Project Timing

7.2 Could you please advise an estimated time of the beginning of the project and how long it is expected to take?

The dredging program has been split into two distinct phases, dredging of the initial berth pocket and dredging of the channel (Section 9.0). These programs could occur independently of each other depending on the availability of the different types of dredges required.

Dredging of the initial berth pocket and construction of the seawall and land reclamation area is expected to take three months and will require a Cutter Suction Dredge. Dredging of the channel will take between 4.5 – 7 months and will require a Trailer Hopper Suction Dredge. Both dredging campaigns will commence on availability of a dredge contractor, the timing of which is currently unknown. However, a targeted start date is 2009 subject to all regulatory approvals and financial close.

4.9 Ensuring no dredging occurs during the purse seine fishery's peak season (March - April). We also note that dredge monitoring indicated that plumes would potentially be more extensive during this period due to the south-west prevailing winds.

Dredging, land reclamation and offshore disposal of excess material are normal activities in all ports from time to time and Albany Port Authority has a designated jurisdiction to carry out these business activities, with due regard to all other regulatory requirements, under the auspice of the *Port Authorities Act, 1999*. The timing for the berth pocket dredging is dependent on securing a dredging contractor at a time that matches the commencement of the Project start-up targeted to commence during 2009. Impacts have been modelled to understand the environmental risks across the 3 dominant meteorological periods across a full 12 month period.

9.7 The proposed dredging timetable of August 2008 to March 2009 is primary over the summer period. Dredging during the summer months may increase inorganic materials and may adversely impact mussel/oyster yields and recreational activities. Winter is the preferred dredging period for the aquaculture industry, however it is understood that there are other environmental impacts requiring consideration i.e. the migration of whales during winter.

16.14 There is not enough information provided in the section on the dredging schedule (page 38) to allow for analysis of whether dredging will coincide with periods of whale migration, seagrass recruitment/growth and coral spawning.

A dredge schedule, including dredge locations and timing, should be provided in conjunction with an analysis of critical ecological windows for BPPH and marine fauna.

19.3 APA should provide their dredging timeframe to stakeholders, and an analysis of critical time windows including fishing seasons and the presence of cetaceans. I understand that the APA has confirmed with your (EPASU) Officers that the dredging will take place in winter and due to the availability of dredge vessels, the dredging may take seven months to complete rather than four or five as stated in the referral. APA will need to confirm if the dredging will be continuous for the full seven months. I also note that APA will provide revised modelling on the impacts of the dredging for the revised period of time. I look forward to the revised modelling data.

A specific dredging timetable is currently unavailable and APA is unable to lock in a specific timetable at this time as dredge equipment availability is difficult to predict. Dredging in all seasons have been assessed and shown to be impacting at levels below, or very near, the relevant Benthic Primary Producer Habitat guidance. A targeted commencement date is proposed for 2009 subject to all regulatory approvals and financial close.

Dredging of the initial berth pocket and channel may occur independently of each other depending on the availability of the dredges required. The turbidity and environmental impacts of the revised dredge program are described and provided in Section 9.0.

Management strategies are in place and will be further developed to avoid and mitigate against impacts to whales, seagrass and coral. Management strategies to avoid impacts to whales are included in the PER in Section 9.3.5, are detailed in the Dredge and Land Reclamation Management Plan attached as Appendix 16.17 to the PER. TA16.2 Sampling and Analysis Plan and Benthic Primary Producer Report also provides details on impacts to whales and coral. The management approach is applied in line with the precautionary principle and is compliant with the Australian Guidelines for Whale and Dolphin Watching. Water monitoring will occur at recreation sites such a Middleton Beach to ensure recreational water quality is not affected. The details of this monitoring programme can also be found in the Dredge and Land Reclamation Management Plan TA 16.7. A seagrass rehabilitation management plan is being prepared to ensure net seagrass loss does not exceed set levels.

13.12 It is suggested that the best time to dredge is in winter, but what happens to the dredging plume if it coincides with winter storms?

Monitoring of water quality and impacts to BPPH will be on-going and in line with the Dredge and Land Reclamation Management Plan. This will include monitoring during storm events that coincide with the monitoring periods. APA will consult with the DEC and DoW if water quality at nominated reference sites become affected by storm event turbidity. Management of the dredging and land reclamation works will monitor (actual and projected) levels of BPPH loss, which will take into account background turbidity levels.

Monitoring of sediment and water quality will be undertaken as part of the port expansion. Multiple monitoring sites will be established at each within both zones of impact and the area of influence of the identified impact zones and reference monitoring sites will be established outside the impact area. Sampling parameters will include:

- pH, salinity and temperature;
- bioavailable nutrient load;
- total nitrogen, nitrate/nitrite and ammonium;
- total phosphorus and orthophosphate;
- chlorophyll *a* concentration;
- an extension of the existing WASQAP;
- mercury and Silver;
- turbidity (TSS and secchi); and
- Incident light loggers

In accordance with the ANZECC Guidelines for Fresh and Marine Water Quality (2000) trigger values are established based on the 80th, 95th and 99th percentile of data gained from baseline monitoring. Management responses are triggered by a monitored variable exceeding the threshold value. As directed and discussed with EPASU on 19/6/08 the rolling average of the 80th percentile of the median from a reference site will be used as an appropriate stage 1 trigger. This response involves a tiered management approach where specific management actions are put into place. Triggers will take into account any impacts from winter storms such as turbidity. The detailed water quality monitoring programme can be found in the Dredge and Land Reclamation Management Plan included in the PER as Technical Appendix 16.17.

17.1 The PER currently refers to a range of dredging scenarios based on different options for dredge volumes, channel options, duration and time of year. For example, the PER states that somewhere between 7.85 and 13.54 million cubic metres of material will be dredged depending on the outcome of the proponent's cost-benefit analysis. It is also stated that dredging duration is anticipated to take between four and seven months (depending on final channel depth and location of disposal site).

At this advanced stage of the assessment process, the proposal will need to be described in further detail prior to the EPA finalising its assessment and making recommendations to the Minister for the Environment on a well-defined proposal. Accordingly, the EPA Service Unit requires the proponent to provide a clear and final description of the key characteristics of the proposal in relation to the:

1. **Final volume of material to dredged and disposed offshore (accompanied by information on the implications on the shipping channel dimensions);**
2. **Duration of the dredging campaign; and**
3. **Timing and scheduling of the campaign.**

It is expected that the final proposal described in relation to items 1, 2 and 3 above will be justified by the proponent on environmental grounds and be informed by the results of the proponent's investigations/modelling undertaken to date.

Some of the major environmental grounds that have been used to minimise the overall impacts of the proposal are: the utilisation and extension of the existing channel that do not require any rock blasting prior to dredging; the A-Class Reserve interactions have been avoided and designed out; the channel has been optimised to reduce dredging volumes through the proposed use of an under keel clearance system.

1. The scope of the project that approval is being sought for is defined in Section 9.0. This includes 300,000 cum to be dredged for the initial berth pocket, some of this material (nominally up to 87 000 cubic metres) may not be geotechnically suitable for use in land reclamation and will require disposal offshore. The balance of the dredging will generate 11.7 Mm^3, thus in total up to 12 Mm^3 volume of material will be dredged.

   This amount of dredging will enable access by 16 m draft cape size vessels and includes 300 mm of over dredge. The berth and channel footprint will have a footprint of 247.7 ha on completion of which 47.3 hectares is already comprised of existing port infrastructure (Figure 9.1 in this RPS).

2. Dredging of the initial berth pocket and construction of the seawall and land reclamation area is expected to take three months and will require a Cutter Suction Dredge. Dredging of the remainder of the berth pocket and channel will take approximately 4.5 - 7 months and will require a Trailer Hopper Suction Dredge.

3. Both dredging campaigns will commence on availability of a dredge contractor, the timing of which is currently unknown. However, subject to all regulatory approvals, financial close and availability of equipment contractors a commencement date of 2009 has been targeted.

17.5 Table S1 of the PER currently states that the preferred timing for dredging is between August 2008 and March 2009. However, it appears that the proponent's preferred timing coincides with the modelled November-February dredging scenario where the greatest losses to seagrass communities are predicted. As mentioned above, the EPA Service Unit considers that the proponent should commit to a timeframe/timing for dredging and justify it in the context of the environmental constraints identified during the environmental investigations.

APA cannot commit to a dredging timetable at this stage due to a lack of certainty over environmental approval timing, limitations on dredge equipment availability and financial close. However, all three modelled scenarios indicate a close alignment with the intent of Guidance Statement 29.

5.0 Environmental Offsets

11.9 The PER outlines an offset policy for seagrass lost in Princess Royal Harbour, and this policy is supported. The PER states the maximum amount of area possible will be replanted using material from the area affected in the harbour. The methods and areas will be detailed in a Seagrass Rehabilitation Plan. This should be prepared in consultation with the Department of Water, and could form part of the more detailed Dredge Management Plan.

There is little information on the seagrass monitoring program. This needs detailing and the area of *Posidonia* within the entrance of Princess Royal Harbour needs particular attention given its close proximity to the dredging operation.

The Seagrass Rehabilitation Management Plan will be prepared in consultation of the Department of Water and the Department of Environment and Conservation. Information on the seagrass monitoring programme and location of seagrass species will be detailed in this plan.

16.36 The proponent should demonstrate the effectiveness of seagrass rehabilitation as an offset to ensure that no net loss of seagrass within Management Unit 1, no more than five per cent loss of seagrass in Management Unit 2 and no net loss of seagrass in Management Unit 3 can be achieved.

The offset package outlined in the PER in Section 9.2.6 will be further developed in consultation with the DEC, DoW, Oceanica Marine consultants and a local seagrass expert. Seagrass has previously been transplanted successfully in Western Australia in Cockburn Sound (Cockburn Cement Ltd, Murdoch Universities Marine and Freshwater Research Laboratory) and in close proximity to Princess Royal Harbour and Oyster Harbour. Previous seagrass rehabilitation has yielded like for like growth, based on shoot density and cover after four or five years and a similar result is also expected in Management Unit 1 in PRH.

16.55 The proponent should develop an offset strategy in consultation with DEC consistent with EPA Position Statement No. 9 and the Draft EPA Guidance on Environmental Offsets

(Guidance Statement No. 19).

16.56 If this proposal gains Ministerial approval, the development and implementation of an offset strategy with specified seagrass rehabilitation completion criteria, should be required by a Ministerial Condition. This offset strategy and associated completion criteria should be developed to the satisfaction of the Minister for the Environment on the advice of DEC.

These comments are acknowledged and APA is agreeable to a Ministerial Condition for the seagrass offset strategy in PRH. This strategy will be prepared in consultation with the DEC, DoW and a local seagrass expert following the relevant guidance statements.

6.0 The Project Environment and Potential Environmental Impacts and Management

6.1 The Project Environment

1.4 Albany has some of the most magnificent and accessible scenery in Western Australia. This is evident from a multitude of private and government surveys. This natural beauty is irreplaceable and risking it requires extremely careful and broad consideration.

APA agrees with these comments. The EPA's level of assessment and the large breadth and bodies of work being carried out to mitigate, minimise and manage such impacts and APA's insistence on the highest quality project team reflect this.

16.1 Significant conservation values in the waters of King George Sound and Princess Royal Harbour that will potentially be significantly impacted by the proposal and must be considered during the assessment process include:

- **two candidate areas for possible future marine reservation as outlined in A Representative Marine Reserve System for Western Australia (Wilson *et al*, 1994);**
- **regionally significant seagrass beds;**
- **potentially endemic coral species and communities; and**
- **conservation significant cetaceans, pinnipeds and avifauna.**

The activities associated with this proposal that have the potential to significantly impact on these conservation values are:

- **dredging;**
- **spoil disposal; and**
- **land reclamation works within Princess Royal Harbour and King George Sound**

16.21 There are a number of sensitive marine habitats that occur either within the area of influence of the dredge, reclamation and spoil disposal activities, or within close proximity to these activities. These values include, but are not limited to:

1. **The intertidal sand flat community supporting diverse communities of burrowing invertebrates of Royal Princess Harbour and Oyster Harbour.**
2. **Gio Batta Patch, Michaelmas Reef and fringing reefs adjacent to Michaelmas and Breaksea Island Nature Reserves (supporting coral (potentially endemic species) and rocky reef communities).**
3. **The endemic gastropod (Diastoma melanoides) the sole extant survivor of the family Diastomatidae which lives in the seagrass beds east of Albany.**
4. **Significant seagrass communities supporting rich and diverse flora and fauna.**

These comments are acknowledged and agreed hence the high level of modelling, environmental management and work being undertaken to ensure environmental impacts to the marine environment are minimised in the Albany waterways. The level of assessment set by the EPA is also a reflection of this.

The habitat of Michaelmas Reef and Gio Batta Patch will not adversely be affected by the dredging and disposal activities associated with this project (Section 9.0). The modelled zones overlayed on the habitat map clearly show that the zones that would lead to loss of Benthic Primary Producer Habitat do not include these reefs. The zone of influence is not a measure of impact but rather it indicates where elevated turbidity will occur at some time during the dredging program. This elevated turbidity will not adversely impact on flora or fauna during the program.

Diastoma melanoides is a gastropod found in South Australia and along the south coast of WA as far west as Albany. It lives in the sand among seagrass meadows in shallow water. This species is not at risk from the proposed dredging but it is acknowledged that any fauna present in the footprint of the dredging will be lost. However, the minimal loss of seagrass from this project in shallow water is a good indicator that minimal impact will result on fauna associated with seagrass meadows.

The proposed dredging and disposal program is not predicted to significantly reduce the seagrass meadows of King George Sound and as such is unlikely to adversely affect species found within this habitat.

2.5 The report pays little attention to two major unseasonal storm events which have occurred in April of 2006 and 2007.

The Swan wave model was used to predict hourly wave heights during the dredging scenarios. These scenarios covered the full 12 months and therefore included storm events. However they are most unlikely to have included extreme events as one in 50 or one in 100 ARI events.

There may be unseasonal storm events during the actual dredging program (this cannot be predicted) however the study has shown that even very large storm events do not generate sufficient wave action in King George Sound to significantly disturb sediments at the preferred spoil ground location (GEMS, 2007 – pp. 49-50). Further, dredging cannot be undertaken in extreme sea–state / weather conditions.

8.7 Section 6.2 (pg. 50) The along-shore dynamics in King George Sound have changed since 1985 when maintenance dredging material was dumped off Middleton Beach, preventing the water from moving along the shore in the way it used to. Water now carries sediment and seaweed along the shoreline to Ellen Cove which has gradually become shallower and seaweed now collects in the Cove.

These comments are acknowledged and the proponent agrees that there have been some changes following the massive storm events of August 1984 that entirely eroded the primary dunes of Middleton Beach and subsided several residences at Emu Point into the sea. Subsequently there have been a number of engineering attempts made to stabilise the area in and around Emu Point that may have influenced the shore dynamics stated by the submitter.

8.10 Section 6.3.2 (pg. 56) Princess Royal Harbour- The disturbance of sediment due to dredging and ship movement through the channel will redistribute sand into Princess Royal Harbour and into the new marina especially during the summer with the south-easterly winds. Sediment will also redistribute around the Yacht Club - affecting the ability of deep keeled yachts to moor (this has already started happening, and will only be exacerbated by the movement of more sand into the Harbour from the proposed dredging) and CAPE ships leaving the harbour.

At 35 m deep once complete the disposal site is considered stable. Modelling has indicated that sediment will not redistribute as at this depth dredge material is too deep to be significantly resuspended by wave action (PER Section 10.3). At this depth ships propellers or any other suspension mechanism will not have an affect. Sediment accumulation and movement is detailed in Technical Appendix 16.1 the Port Development Oceanographic Studies and Dredging Program Simulation Studies.

8.2 Section 5.1.3 (pg. 36) The document states "There is no swell at the berths (APA, 2003)" This statement is incorrect. Large waves generated by south-easterly winds and large swell have caused damage to boats moored on the town jetty. This has happened on several occasions, in 1984, 1988-9, 1995, 2004, 2005, and most recently in January 2007.

8.9 Section 6.3.3 (pg. 57) This section states that "the south-easterly to easterly aspect of King George Sound provides a significant level of protection to these waves". It fails to state that there is no protection during south-easterly swells. The statement that "these (sustained easterly) winds are generally not spatially extensive so that the resulting waves are less energetic, and at higher frequency" is incorrect. King George Sound is exposed to four months of strong east to south-easterly winds, with currents moving around Bald Head in a swirling motion and circulate within King George Sound in an anti-clockwise direction. This

frequently results in high energy south-east waves (standing waves through the passage). On several occasions in the past these conditions have damaged boats moored on the Town jetty (already discussed above). These waves move straight over the proposed preferred sediment dumping site, which increases the likelihood of turbidity and re-circulating sediments within King George Sound.

Waves entering King George Sound will bounce off the new berth and affect Ship stability. The waves bouncing off the berth will push the ship away from the berth and break the mooring line, stranding the ship. This has happened in Geraldton due to bouncing waves.

Waves in the open ocean are indeed large at times. The study has shown that open ocean waves are reduced significantly before reaching Princess Royal Harbour (GEMS, 2007 – pp. 49-50). Wave heights are reduced as they enter King George Sound and reach the inner spoil ground. During storm events there may be rough conditions at the berths, as there can be at present, due to wind-driven currents and locally generated wind waves.

There were no actual wave measurements at this site but the wave model which was used to study waves in KGS verified well against the wave data (GEMS, 2007 – p. 51) collected near Gio Batta Reef (which showed a very large reduction in wave heights from waves along the open coast).

It is agreed that during south-easterly wind events the currents in KGS will rotate anticlockwise at the surface as discussed in the report (GEMS - 2007 p. 33). South easterly wind events can be strong but are more intermittent and shorter lived than westerly winds in winter due to the variation in wind directions created by the passage of high pressure systems across the bite in summer. As a result of these mechanisms waves generated by south-easterly winds do not have the same fetch as waves generated by westerly winds. As discussed previously the proposed dumping site is far too deep to experience significant re-suspension velocities from these waves.

8.20 Section 9.1.6.3 (pg. 168) King Point Ocean Outfall will have contributed to contaminating the soil in this area. This will redistribute into water if moved.

There are no plans to interfere with the redundant King Point Ocean Outfall. Dredging will not occur in the locality of these contaminants. Any potential impacts to water quality will be minimised through adaptive management of the dredge operations in accordance with the monitoring set out in the relevant management plans.

8.27 Section 11 (pgs. 223-232) The potential impacts following dredging and reclamation can be learned by the Port's history. The along-shore currents have changed due to the dumping of dredge material at Middleton Beach, and the construction of the Woodchip Berth, resulting in The Harbour becoming shallower. Even though the volume and speed of water flushing between Princess Royal Harbour and King George Sound hasn't been adversely affected, the direction of the flushing has changed due to the Woodchip Berth and dumping at Middleton Beach. Sediment has now built up in Ellen Cove and King Point. Ecological integrity cannot be maintained once the sediment has been disposed of at the preferred disposal site and been re-mobilised by oceanic and shipping processes.

There is no scientific or any other form of evidence to support the suggestion that Princess Royal Harbour is becoming shallower. The DPI bathymetry investigations that are carried out every two to three years would be the first to show signs of shallowing. The latest bathymetry set from 2005 indicated no such occurrence. The project Modelling has demonstrated that sediments at the preferred disposal site will be largely non-dispersive (see GEMS – 2007 and PER Section 10.3). Shipping processes will not adversely affect or interact with marine sediments at the preferred disposal site.

10.2 The PER document is not clear in this instance whether the discharge of waste and or stormwater associated with the proposal will occur in a manner that will not degrade the coastal environment, including the adjoining coastal foreshore reserve(s), coastal waters and marine ecosystems.

10.3 Drainage is not a primary function of coastal localities, and water quality is significantly important as utilisation of the foreshore and marine environment in Albany increases. Waste and or stormwater drainage associated with the proposal and its management are primary elements that the PER document should address, in accordance with Section 5.1 (xii) and (xiv) of State Planning Policy 2.6 'State Coastal Planning Policy'. It is recommended that prior to any development taking place, the proponent be required to prepare drainage and stormwater management plans for the reclamation area demonstrating that water quality will not be adversely affected by stormwater runoff from the proposed port expansion. This may be able to be incorporated into the 'Dredge and Land Reclamation Management Plan' proposed by the proponent.

Section 5.1.5 of the PER outlines the construction method that will be put in place to ensure that storm water is ameliorated until the construction of an adequate storm water system is implemented. This section was included in the PER to address concerns from the local DoW who have jurisdictional responsibility of the waterway. The land reclamation area will be graded back toward the centre of the reclaim to allow for temporary in-situ infiltration until such time that Grange Resources implement and build approved stormwater management infrastructure.

No impacts to surface water in the vicinity of the Port are anticipated as stormwater from the Contained Area Drainage System will be diverted through a gross pollutant trap or silt trap and then stored in a storage tank where water will be harvested and returned to the Southdown mine site for reuse. This is part of the Grange Southdown Magnetite Project which is subject to a separate formal impact assessment process.

Once the infrastructure is constructed there will be no reticulated discharge of waste to the receiving environments and therefore no threat of degradation to these environments in this regard.

As an aside, Section G (c) of the State Coastal Planning Policy states that ports are included as exemptions from the policy, 'Industrial and commercial development that is demonstrably dependent on a foreshore location. Such development may include, for example, marinas, cage based aquaculture operations, port facilities and associated infrastructure'.

13.3 There are many statements about the aim to 'maintain diversity', but according to the results of the survey diversity is low. These results may not be a true reflection of the diversity in the area, for instance see the comment above on KGS.

The PER states that the Princess Royal Harbour supports a diverse community of burrowing invertebrates and attracts a summer population of several thousand migratory waders. It is detailed that the WA Museum has identified 203 species of fish in PRH, Oyster Harbour and King George Sound. The PER also identifies the species of pinnipeds and cetaceans that can be found in the harbour.

The results that found diversity to be low occurred at the inner disposal site. Here the survey found that diversity of epifauna was low and sparsely distributed. None of the epifauna found are rare and all are widely distributed in the region.

8.6 Section 5.3.1 (pg. 43) At the end of the Dredge Channel section it states that "The proposed channel alignment will not impact upon these potential areas of interest" with regard to the marine habitat areas under consideration for a marine reserve by DEC. However no mention is made in this section that the turbidity resulting from sediment plumes while the dredging takes place will definitely impact upon these sites.

The impact regions for turbidity and sedimentation were calculated by analysing the hourly output files from the dredge modelling against the impact criteria provided by SKM (see Section 9.0). The resultant zones of influence shown therefore represent the totality of the region which may experience some form of interaction but this does not necessarily translate to an impact or effect. For example, and area that may experience a dredge related elevation of 1mg/l TSS for 1 day would not have an adverse impact on marine habitat.

16.28 There are four coral species endemic to the southern coast of Australia. According to the Report of the Marine Parks and Reserves Working Group (Wilson *et al*, 1994) there are a number of species endemic to the south coast, some of which are found in King George Sound and in the vicinity of Albany. These include the endemic gastropod (Diastoma melanoides) identified earlier in this submission. Associated with seagrass, there is a rich and diverse fauna which has not been described in the PER. Also, in King George Sound and Princess Royal Harbour seagrass communities have been described in detail (Wilson *et al*, 1994) in papers including Kirkman et al (1991); Walker *et al* (1991) Hutchings *et al* (1991) Wells *et al* (1991), and in reports associated with Albany Harbour Study 1990 (EPA, 1990). These have not been referenced in this assessment and may not have been used in preparing the PER.

The word endemic has not been used correctly here or elsewhere in the submission. Endemic means "A native species confined to a given region." The coral species referred to are not endemic to the south coast or to King George Sound. In addition to the *Turbinaria* spp (see discussion of four species of Turbinaria in comment 13.5) *Coscinaraea marshae* is distributed between the Recherche Archipelago and the Houtman Abrolhos Island and *Plesiastrea versipora* is found throughout Australian waters. The later two species are endemic to Australia but are neither rare nor endangered. None of the species are at risk from this proposal as has already been stated.

Diastoma melanoides is a gastropod found in South Australia and along the south coast of WA as far west as Albany. It lives in the sand among seagrass meadows in shallow water. This species is not at risk from the proposed dredging but it is acknowledged that any fauna present in the footprint of the dredging will be lost. However, the minimal loss of seagrass from this project in shallow water is a good indicator that minimal impact will result on fauna associated with seagrass meadows.

Checking the list of Threatened Fauna compiled by the Department of the Environment, Water, Heritage and the Arts is a recognised method of ensuring no Critically Endangered, Endangered, Vulnerable or Conservation Dependent fauna exist in the region. This process was undertaken and no marine benthic faunal species were found to be present in the region.

16.45 The proponent has not acknowledged the value of areas within Princess Royal Harbour and King George Sound for marine conservation reserve purposes. The Report of the Marine Parks and Reserves Selection Working Group (Wilson *et al*, 1994) states "The Working Group recognised that King George Sound, Princess Royal Harbour and Oyster Harbour are extensively used for port and recreational purposes and that the two inlets show evidence of environmental degradation. Nevertheless these areas are of such biological importance that reservation of some parts of them for conservation purposes should be considered'. The Working Group report recommended candidate areas for marine reservation that could potentially be affected by this proposal (refer to Figure 5.2 of the PER).

In addition, it should be noted that the legend in Figure 5.2 is incorrect indicating that the diagonal hatching is representative of "Marine Park as supplied by *DEC".* The legend in

Figure 5.2 should be revised to state "Candidate Marine Reservation Areas as recommended in A Representative Marine Reserve System for Western Australia, CALM 1994".

The proponent should provide a discussion on the potential impacts on values within the candidate marine reservation areas and outline how the potential impacts on these values will be avoided, mitigated, managed or offset.

Every effort is being made to minimise the impact on the entire marine environment in the Albany waterways. Modelling has shown that the offshore Island and reefs will be outside of the impact zones. The area on either side of Vancouver Peninsula and Frenchman Bay are also outside of the impact zones but given their proximity to the dredging monitoring sites will be established there in consultation with the DEC. Management and mitigation will be via the procedures defined in the Management Plan.

The legend in Figure 5.2 of the PER has been amended to state "Candidate Marine Reservation Areas as recommended in A Representative Marine Reserve System for Western Australia, CALM 1994". The amended plan is included as Figure 8.2 of this document.

6.2 Modelling

2.4 Section 5.1.4 states that Albany is affected by an easterly wind pattern during autumn, a westerly wind pattern through the winter months and a "mixed easterly and westerly regime during spring and summer. However, in Section 6.3.1 (p55) the report states that "during summer, a ridge of high pressure directs easterly winds over the south-west corner of the continent". This draws to my attention that either the report is poorly constructed or it is based on scant information and is incorrect.

A very detailed analysis of the meteorology over KGS was undertaken using seven years of atmospheric model data from the Bureau of Meteorology (GEMS, 2007 – pp.24-31). These data verified very well with the data collected by the Met Buoy over a 10 month period (GEMS, 2007 – pp. 25-29).

The reason for the existence of easterlies in the Albany region in summer and autumn is due to the Southward movement of the high pressure ridges relative to winter (GEMS, 2007 – p.13). This does not mean of course that the winds are easterly all the time; they will vary as the high pressure systems move from west to east.

2.3 Significant portions of the Report are based on a modelling system which we believe to be unsound for the following reasons.

1. The data on which this modelling was obtained from surveys conducted sporadically over a twelve month period, no data set based on a whole year of seasonal variations and can make no extrapolation to the variation between years.

Detailed wind roses (GEMS, 2007 – p.29 and p.31) were provided in the report for the four months of the first dredging scenario (March – June). This period was selected as it represented the model verification period. Wind roses for the other months can be provided if required.

The study was carried out for three different start times, 4 months apart, within a meteorological period which was analysed to be “normal”. In this manner variations throughout the year were accommodated. Variations between years, and indeed variations during the actual dredging period, can cause slightly different conditions to occur but the results are unlikely to cause significant variation to the impact zones determined for the various dredging start times within the one year.

8.1 The modelling presented in the document has been based on weather data that is inaccurate for the coastal area. The scenarios modelled for dredging, and all other predictions based on predominant winds, are therefore invalid in this document (i.e. Section 9.1.5). This is a major oversight and should be corrected. These are the dominant wind patterns in the Albany region:

November-February East to south/easterly winds

March- July North-east to North-west and West-south-westerly winds

August to October West to South-west and Southerlies

Section 5.1.4 (pg. 38) The predominant winds given in the Dredge Schedule and elsewhere in the Proposal) are incorrect for the coast. The season is dominated by north-easterly and north-westerly winds in autumn and south-westerly winds in winter. This means that the predicted outcomes for confining turbid plumes during the scheduled timing of dredging are incorrect.

Section 9.1.2 (pg. 131) Here and elsewhere in the document the wind directions for the seasons given are incorrect for the coast.

Once again, the modelling discussed in this section (9.1.6), and the conclusions drawn for time of year, are incorrect due to the wrong wind directions being used.

The modelling used a high resolution numerical weather predicting model which was validated with data collected from July 2005 to April 2006. Field work to provide observational data to the modelling was carried out during winter and spring of 2005 and in summer and autumn of 2006.

The data used for model verification purposes was collected during both winter and summer and there was a great variety of data from current meters and surface drifters at different time periods. It is therefore extremely reasonable to conclude that the ocean current model predictions are reasonably accurate over all time periods.

The currents predicted using these winds and the local tidal data verified very well against current meter data collected in King George Sound (GEMS, 2007 – pp. 36-43).

The dredging start times modelled were not specifically chosen with regard to prevailing wind patterns. The three start times were selected four months apart to simulate dredging programs that experienced the full 12 months of meteorological influences. These scenarios could be shifted by two months each to sample slightly different mixes of wind conditions but this does not seem necessary as the simulations covered a full 12 months.

3.3 It is noted that the modelling of current patterns within King George Sound relied in part on wind data from the sub-coastal Albany Station which is not considered to be representative of conditions on the coast or within the Sound. Local fishers and other marine industry players are suggesting that the modelling significantly under estimates current velocities and swell penetration particularly during the spring summer months dominated by south-easterly and southerly winds. Changes to the currents could have a significant impacts on plankton distribution and productively and therefore on the distribution, abundance and availability of pilchards to both fishers and shearwaters.

The modelling for these studies specifically did not use data from the Bureau station at Albany Airport for the reasons mentioned. The wind data was derived from the Bureau of Meteorology High Resolution Atmospheric Forecast Model which provided hourly wind fields (speed, direction and atmospheric pressure) over the entire region. As a result the meteorology used varied in space and hourly in time and verified very well with data collected by MetOcean engineers for 10 months on a channel pylon in King George Sound (GEMS, 2007 – pp. 27-28).

The PER (Section 9.1.2) detailed the results modelling using the GEMS 3-D Coastal Ocean Model with comparisons to drifting buoys which were released into King George Sound and Princess Royal Harbour and tracked using GPS. The model was run for the summer/autumn period and included south to south easterly wind regimes. A good agreement between the model predictions and the drift tracks was found.

The hydrodynamic and wave models do not indicate any significant changes to such broad scale influences as the currents found in the project area are strongly influenced by meteorology and swells and seas, which the project will not influence. The biota of concern exist in extremely dynamic systems and the higher order organisms mentioned are mobile foragers who are adapted to searching out their food sources.

8.12 Section 6.5 (pg. 79) This section states that "the hard coral colonies found at Gio Patta Patch, Michaelmas Reef and adjacent to the large offshore islands (Michaelmas Island and Breaksea Island) were not included in habitat mapping nor BPPH calculations as their density in any given location was less than 1% cover and *these reefs are not anticipated to be impacted by the dredging of the associated turbidity* (italics mine)." I strongly disagree with this. All of these areas are close enough to the dredging and or disposal sites to be affected by circulating loose virgin sediment which could smother the coral reefs - with the associated problems of less sunlight, and dying reef systems which have been experienced elsewhere.

Section 6.5.5 (pgs. 85-88) Gio Patta Patch and Michaelmas Reef are too close to the proposed dredging channel and disposal site to not be affected. This section states that the areas prone to swell, significant wave height and strong winds. All these factors will affect the proposed disposal site, shifting the relocated sediment back towards these reef ecosystems and covering them. Loss of surrounding marine habitats has been experienced in other dredge sites, such as the Dawsville Cut in Mandurah.

The exclusion of the corals from calculations of BPPH due to low percentage cover is correct; however, the risk of impact to these species was not discounted based on this.

The assessment was based on where the corals were found during the survey and their ability to cope with elevated turbidity. The corals noted in the area were found not to be at risk during the dredging and disposal program. The reason for this is that these species grow on the sides and in some cases the top of the limestone reefs in the vicinity of the area to be dredged. This position along with the prevailing currents and wave action prevents sediment from settling onto the colonies thus minimising the impact of sedimentation. The more offshore granite reefs and pavement often have coral patches associated with them but they are well outside of the zone of influence and thus not subject to elevated turbidity or sedimentation.

The turbidity levels that will be generated during the program are not sufficient to adversely affect the light climate at Gio Batta Patch, Michaelmas Reef or any other reefs where corals may be found. Direct comparison of this program with others undertaken in the state where corals were present is not valid because the sediment properties at Albany would not result in similar turbidity and the coral species are not in an area that can be impacted.

This is also true for naturally occurring turbidity generated in the area. Corals are not found around the pavement at the base of Gio Batta Patch or Michaelmas Reef simply because the action of waves and coarse sediment scours the corals and prevents settlement for colonisation.

The disposal site is in 40 m of water and once the spoil is deposited there it will remain there. The reason for this is that the site is stable and not subject to significant wind, wave or currents due to water depth and protection from the shelf waves/current. Comparison with effects at Mandurah from the creation of the Dawesville Channel is not applicable as that area is in shallow water with significant wave activity which resuspends sediment from the sea bed.

8.15 Section 9.1.4 (pg. 137-141) This section concedes that "The Albany Port Expansion Proposal could potentially impact on ecosystem health through impacts to water quality from the turbidity associated with dredging, impacts to water quality from the potential liberation of contaminants and nutrients in the sediment and impacts from spills of hydrocarbons from the dredge". These impacts are then outlined in more detail.

Sediment from the preferred disposal site will be pushed through into Princess Royal Harbour by increased shipping and the sheer size of ships (and their propellers), resulting in a further shallowing of the Harbour, burying of substratum that contains benthic habitats and organisms (including Seagrass meadows), as well as the release of contaminants and nutrients from the dredging process itself. How can this environment be protected once the sediment has been disturbed, dredged and disposed of in an inappropriate site and all the predicted problems are happening? Flow charts and guidelines look good on paper, but cannot protect the marine environment if this proposal goes ahead.

As outlined in Section 10.3 of the PER the disposal site will be 35 m deep after completion of the programme. Modelling has shown that at this depth sediment is largely non dispersive and will not be adversely affected by ships propellers or any other re-suspension mechanism.

16.11 DEC notes that the PER states "The logged data of TSS during dredging will be used to run the *DREDGE3D* model in real time before, during an after the actual dredging campaign to monitor and measure turbidity against the predicted turbidity (page 38). It is recommended that, should this proposal be approved, the proponent be required in a Ministerial Condition to undertake this model validation process and that this model is used during the management of the dredging program.

This comment is acknowledged.

16.13 The modelling presented in the PER should be subjected to expert review.

An expert review of the modelling should be undertaken to verify the zones of impact, effect and influence. This information is critical in establishing suitable water quality and benthic community monitoring programs associated with the proposed dredging 'management program and compliance monitoring criteria.

Modelling has been developed by expert oceanographers using three sophisticated computer models. APA commissioned CSIRO and the University of Western Australia (UWA) to conduct independent peer reviews of the oceanographic modelling work. The results and outcomes of these

are documented in the Peer Review of Oceanic Studies and Dredging Program Simulation Studies document (see: Section 9.0).

Edith Cowan University Centre for Ecosystem Management was commissioned to review the Sampling and Analysis Plan and Benthic Primary Producer Report. The results of this review have been provided to the EPASU.

16.10 The proponent modelled the area of influence, area of effect and area of impact associated with dredging activities for this proposal. A number of inputs were used to predict the area of influence over the three distinct seasons of autumn (dominated by easterly winds), winter-spring (dominated by westerly winds) and spring-summer (dominated by westerly winds).

The following uncertainties surround the proponent's modelling:

1. **The proponent is basing the plume/area of influence and turbidity generation largely on wind patterns noted for the region; however the wind data necessary to demonstrate that all key wind parameters have been captured in the modelling have not been provided. It is recommended that wind roses for all months of the year be provided to support the proponent's modelling based on south-east, south-east to north-east and sustained westerly winds. For example, wind roses and additional modelling should provide justification that other wind directions not modelled (e.g. north-west winds) are not a significant issue when predicting the area of influence and associated potential impacts on BPPH for the term of the dredging program. DEC has noted that north-west winds are the predominant wind in May and June according to wind roses provided in technical report 16.1, therefore it is questioned why north-westerly winds were not used to generate the area of influence.**
2. **It is unclear whether wind velocities have been taken into account with regard to the modelling provided and it is recommended that the proponent verifies this issue as wind velocities will have a significant effect on at least surface turbidity generated throughout the dredging program. Although this information may be available in technical report 16.1, basic methods used to generate the model should be provided in the PER document.**
3. **Based on the information provided on page 128 of the PER, there are limitations in the parameters measured/collected for modelling purposes, including the deployment of one fixed point current meter in Royal Princess Harbour from July to October. This would indicate an assumption that the currents for Royal Princess Harbour are homogenous across the entire harbour and that the period of July to October is representative of the currents for the entire year. The proponent should justify the adequacy of these data in relation to predicting the extent/behaviour/movements of dredging generated turbidity for all seasons that could potentially occur during dredging. Another limitation noted is the use of 58 wireless tracked GPS for a five day period to measure surface water movements. It is questioned whether this five day period is representative of the surface water movement for the duration of the dredging program. Ideally, this form of information would be collected and used for all three key seasons modelled.**
4. **The inputs into the model for wave energy should be clarified. It is unclear whether these included worst case scenario events that may be experienced during times of storm events (e.g. ARI 1 in 50 or ARI 1 in 100) and high seas or whether wave energy inputs were based on average wave energy measures.**
5. **The PER states (page 38) that each modelling scenario was based on meteorology in 2005 and was carried out for just over four months. It should be clarified whether only four months of data were used to input into the modelling scenarios. If this is the case, it is unclear how the proponent has been able to model dredge related plumes for the three seasons that could be encountered during the dredging program.**
6. **The figure of 12Mm3 of dredge spoil for plume/area of influence simulations has been used whereas it is noted in the PER that up to 13.54 Mm3 will be dredged. It is questioned why the maximum dredge spoil has not been used in the modelling given**

the proponent claims to have based this modelling on "worst case scenarios". The proponent should also clarify whether the modelling accounts for the cumulative turbidity and sedimentation associated with natural events in conjunction with plumes generated during dredging, land reclamation and spoil disposal. The PER is unclear in this regard.

1. Detailed wind roses (GEMS, 2007 – p.29 and p.31) were provided in the report for the four months of the first dredging scenario (March – June). This period was presented as it represented the model verification period. Wind roses for the other months can be provided if required.

   At no time do north-westerly winds persist for lengthy periods of time. The modelling does not represent constant winds during each scenario but rather the predominant meteorological conditions consistent with the time of year.

2. Section 7.2 of Technical Appendix 16.1 contains an analysis of wind records. The wind analysis demonstrated the accuracy of the wind data set.
3. None of the ocean current data is included in the ocean model. The model provides an independent prediction of ocean currents driven by prevailing tidal and meteorological influences. The actual data is used to verify the model by comparing it with model predictions. In the report it was shown that this comparison resulted in a very high level of agreement with the data measured in both Summer and Winter (GEMS, 2007 – pp. 32-43).
4. The Swan wave model was used to predict hourly wave heights during the dredging scenarios. These scenarios covered the full 12 months and therefore included storm events. However they are most unlikely to have included extreme events as one in 50 or one in hundred.

5. The data used for model verification purposes was collected during both winter and summer and there was a great variety of data from current meters and surface drifters at different time periods. It is therefore extremely reasonable to conclude that the ocean current model predictions are reasonably accurate over all time periods.

6. The dredge modelling was undertaken for a defined dredging scenario which included exact volumes of material dredged (12,000,000m^3) and defined dredging depths including 300 mm over dredge Turbidity and sedimentation impact criteria were defined as over and above natural conditions.

19.4 In relation to the proponent's investigations into suitable spoil ground sites and whether the dumped dredged spoil will be mobilised at the spoil ground. How do the "very large storm events" referred to by the APA compare to ARI 1 in 50 or ARI 1 in 100 storm events? What is APAs rationale for not modelling extreme storm events? The modelled turbidity plumes are based on average total suspended solids measurements. The stakeholder comment considers that the worst case scenario TSS should be adopted. APAs response does not address this concern. If the worst case scenario is not going to be used, what is APAs rationale for doing so?

The APA's understanding of the very large storm events from 2005 were a succession of multiple 1 in 100 AR events. The orbital velocities of the waves generated even during the most extreme storm events is insufficient to provide the requisite benthic velocities to re-mobilise the spoil ground at its finished depth (i.e. the energy is dissipated through the depth of the water column). Therefore, modeling extreme weather events does not provide any meaningful further understanding and would preclude the dredge from working in the more prevalent and typical scenarios, which is counter productive when trying to understand the fate and consequence of material being influenced by the dredge program.

16.12 There are a number of limitations with regard to this mapping/modelling exercise for the zones of impact, effect and influence which should be addressed prior to a decision on this proposal:

1. **Information on the thresholds for benthic habitat health/decline and recovery are not provided to support this mapping exercise in the PER document. Therefore, it is questioned how the proponent has derived these zones when there are no clearly demonstrated linkages between predicted changes in water quality and benthic habitat responses.**

2. **It is questioned why the zones of influence and effect do not encompass the extent of the dredging generated turbidity plumes modelled in Figures 9.18, 9.19 and 9.20 which indicate that turbidity associated with dredging extends into Oyster Harbour, Frenchman Bay and at isolated locations around Breaksea and Michaelmas Islands. It is also noted that the dredge plume is predicted to abruptly discontinue at the boundary of Gio Batta Patch reef system. The maps should be revised to ensure that the potential area of influence encompasses the extent of dredge generated plume and so provide a more accurate indication of the potential areas/communities affected by the dredging program.**

3. **It is noted that the turbidity plumes associated with dredging for the three seasons modelled (Figures 9.18, 9.19 and 9.20) are based on average total suspended solids (TSS) measurements and not based on the worst case scenario TSS. These maps should be revised to indicate worst case scenario TSS to enable an assessment/indication of changes in turbidity generated by dredging in extreme circumstances.**

The limitations and discrepancies outlined above associated with the modelling of the zones of impact; effect and influence need to be addressed.

1. The linkage between water quality (light attenuation) and seagrass response (mortality) is provided in the Section 5.11.6 of the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report. The linkage is based on research into shading effects (surrogates for turbidity) at both Albany and Cockburn Sound. In conjunction with this the minimum light requirement for the seagrasses present has been derived from the literature and used as a basis for impact assessment. The linkage between TSS used in numerical modelling and light attenuation which impacts on light attenuation was derived experimentally by Optek using sediments collected from the dredge areas. This relationship is presented in Section 5.3 of the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report, and has been reassessed in Section 9.0 as part of defining impacts of the revised dredge program.

2. The impact regions for turbidity and sedimentation were calculated by analyzing the hourly output files from the dredge modelling against the impact criteria provided by SKM. The resultant zones of influence shown (9.4) therefore represent the totality of the region which is expected to have some level of influence at some time during the implementation of the proposed activities. The maps showing the overall extent of the dredge plume do not indicate the average values of turbidity in those areas rather that the area will experience some influence over the course of the entire program at some stage. The Benthic Primary Producer Habitat impact maps take into account the duration and concentration of turbidity influences.
   The third zone shows the region which may experience turbid plumes occasionally but for which there is not expected to be any impact. This region was defined in terms of turbidity entering some time during the dredging for a period greater than 6 hours at a concentration greater than 1 mg/litre. It is possible, but unlikely that plumes may be seen for short times outside of these regions as the modeling has been rigorous and validated using a variety of methods. Zone 3 represents the region where the modelling identified the potential areas of influence.
3. If dredging occurs in extreme conditions and threshold values as set in the Dredge and Land Reclamation Management Plan are exceeded, management actions will commence. If thresholds are continuously exceeded and seagrass shoot density decreases by 50%

ultimately dredging will cease or relocate, APA will consult with the DEC and the Dredge Management Group will be convened to discuss options.

17.6 Alteration to flushing of Princess Royal Harbour (PRH)

The PER statement that '*Modelling of wave current directions before and after the construction of the land reclamation area and deepening of the channel indicates only minor variations in current directions' (PER page 225)* has incorrectly interpreted the GEMS report. However if this statement is modified to refer to currents generated by tides and winds (but not waves) then it is supported by the model results presented in the GEMS report, Section 11.

This comment is acknowledged and agreed. The statement should refer to currents generated by tides and winds rather than waves.

18.1 The Public Environmental Review document prepared for the Albany Port Authority, and released for public comment, covers the relevant environmental issues and importantly includes discussion and modelling of expected dredge turbidly. However a more detailed explanation of the turbidity modelling would be of assistance in understanding the impact of turbidity on aquaculture and on the pilchard fishery. Average values are provided but the frequency and duration of turbidity events that are above water quality standards is required to fully appreciate the potential impact.

Further information on turbidity modelling is available in Technical Appendix 16.1 Port Development and Oceanographic Studies and Dredge Program Simulation Studies. Water quality management is detailed in the Dredge and Land Reclamation Management Plan, Technical Appendix 16.7. A tiered management approach has been developed based on threshold values to ensure water quality standards are not breached. The impact to aquaculture and the pilchard fishery is not anticipated to be significant. APA will liaise with the Department of Fisheries and industry to monitor and discuss the existing fish monitoring programmes and stock assessments. APA will work in collaboration with the industry and supplement the current WASQAP monitoring programs.

6.3 Environmental Impacts

16.3 The PER (page 20) indicates that not all possible sites for a deep water port option were feasible, however, specific information to justify why alternatives were not feasible has not been provided. The site selection and feasibility criteria that has determined that the expansion of the existing facilities will "result in the smallest possible impact to the environment' has not been substantiated with comparisons of the environmental footprints and risks of other options. This information needs to be provided to demonstrate the adequacy of the proponent's assessment of alternatives and help justify that the Albany Port Expansion proposal (as proposed in the PER) is the option that will result in the "smallest possible impact to the environment'.

Apart from the demonstrated analysis outlined in the PER APA does not feel that a new deep water port is sound in terms of overall environmental footprint, when new approaches, channels, turning basins and landside road and rail infrastructure would be required in these sites. Much of the required infrastructure would be duplicated in, on or through many sensitive (including National Parks) and relatively undisturbed areas / habitats. The Western Australian government is also committed to maximising the efficiency and utilisation of existing facilities as opposed to the premature construction of additional coastal infrastructure.

16.2 In summary, the Public Environmental Review (PER) does not provide adequate information to undertake an informed assessment on the actual and potential impacts and risks relating to this proposal. Given there is a high level of uncertainty in relation to the impacts of dredging, spoil disposal and the ecological responses/effects on marine ecosystems, it is difficult to provide informed advice on the environmental acceptability of this project. There are significant information deficiencies and discrepancies that must be addressed prior to the EPA finalising the assessment of this proposal. These uncertainties and information gaps are discussed in detail in the advice below.

16.57 There is considerable uncertainty with regard to the environmental impacts and associated impact manageability of this project. This is largely attributed to the absence of critical information required to undertake an analysis of the adequacy of the modelling, the potential impacts on significant benthic communities and in determining whether all suitable avoidance and management measures have been exhausted. Without addressing the key information gaps highlighted throughout this advice, this proposal presents risks to significance conservation values in Princess Harbour, King George Sound and Oyster Harbour.

Modelling has been undertaken for three scenarios selected to reflect the distinctive meteorology of Albany. This modelling has been peer reviewed by both, the University of Western Australia and the CSIRO and the results of these reviews and the responses to queries have been completed and forwarded to the EPASU. Modelling has demonstrated that sediment at the disposal site will not disperse and there is a high level of certainty in this regard. Details of the modelling showing sediment accumulation are detailed in the PER in Section 9.1.2 and in Technical Appendix 16.1 the Port Development Oceanographic Studies and Dredging Program Simulation Studies.

The effects on marine ecosystems, potential impacts to benthic communities are detailed in the PER for the range of dredge scenarios and in Technical Appendix 16.2 the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report. Management strategies have been outlined throughout the PER and in the numerous technical appendices, including Technical Appendix 16.1.

The technical appendices provide in detail the critical information referred to by the submitter. Any risks to conservation values in the Albany waterways will be minimised and managed as provided for in the technical appendices.

18.3 The APA should also address whether maintenance dredging will be required at a future date and include how the potential environmental impacts for an ongoing dredging program will be addressed.

The sediments within the bounds of the Albany Port Authority are predominantly deep siliceous sands that are extremely stable with low turbidity generating tendencies. Subsequently, Albany Port has very low requirement for historic maintenance programmes with the last being a small programme in 1985. It is not anticipated that the new channel will require regular maintenance dredging. It is noted that the future is difficult to forecast and in the advent that a future maintenance dredging event will be required then the APA will meet any regulatory requirements at that time to mitigate any environmental risks if such a requirement does in fact materialise at a future date.

6.4 Sediment Chemistry

2.8 While parameters are outlined for toxicants such as heavy metals, no mention is made of the introduction of a significant amount of anoxic material. In my experience and training, the Hydrogen Sulphide contained in these anaerobic layers of sediment is highly toxic. My concern is that dumping such large quantities of spoil, containing such large volumes of anoxic material could lead to reduce dissolved oxygen content on the sea floor as well as toxicity from the introduction of material containing hydrogen sulphide. The report makes no reference to the potential impacts of biological toxicants on the area surrounding the dump site.

The material to be dredged and disposed to the offshore disposal area has not been shown to be anoxic or containing high levels of hydrogen sulphide. Deep cores showed clean sand with little or no organic content. Any slight reduction in oxygen content in the material with depth would be quickly oxygenated by the action of the dredge and subsequent disposal with no measurable change on surrounding water oxygen levels. No mention of potential impacts of biological toxicants such as hydrogen sulphide were mentioned in the PER because none were detected as outlined in Technical Appendix 16.2.

8.10 Section 6.4.1 (pg. 68) Digging sediment in the proposed dredge site will disturb the metals which are present in the sediment surface, suspending them into the water column in the sediment plumes and re-distributing them into Princess Royal Harbour and King George Sound, and also re-locating them to the proposed disposal area. This will have a detrimental affect upon the marine ecosystems of the Harbour and Sound, as well as be detrimental to the mussel farms which are located nearby.

Porewater testing was undertaken in accordance with the NODGDM and approved by DEWHA to assess the impacts of contaminated spoil on the ecology of the spoil ground. This was as a result of the commitment to dredge the contaminated material without overflow and that the impact was then limited to the infauna and epifauna of the spoil ground. Porewater was determined to be the best method of assessment in this instance. However, the porewater data was also compared to the ANZECC/ARMCANZ guidelines. Porewater would have a much higher concentration of the contaminants of concern than would be present in an elutriate. As such the approach is far more conservative.

The analysis revealed that the only metals found in the sediments which are at levels just above screening (level at which further investigation of potential impact is required) were mercury and silver in sediments in King George Sound. These two metals were found to be non-bioavailable. The fact that they were not bioavailable means that they pose no threat to biota that come in contact with sediment containing them and as such the spoil is suitable for offshore disposal.

However, as a precautionary measure the sediments which contained these metals will be dredged in a manner to prevent the release of material (Figure 8.7) and then buried by clean material at the disposal site. This will effectively remove the metals from the environment and lock them away.

Other metals found in the sediments at low levels are naturally occurring and would be found throughout KGS and pose no threat to the environment or to the mussel farms in the region as a result of dredging.

8.16 Section 9.1.4 (pgs. 147-157) The suggestion that the TSHD will be able to selectively remove surface sediments contaminated with lead and silver, to be dumped in the centre of the offshore disposal area and then covered over with "clean" sediment to prevent re-suspension and mobilization of these metals, is ludicrous. This is an aquatic environment and even just moving this sediment from one spot to another will contaminate new benthic areas. The footprint of the disposal site will increase dramatically, and all of this sediment will be re-suspended and transported once shipping traffic starts passing over it and current, swell and wind conditions take effect.

With regard to this procedure, how long after the contaminated soil is shifted to the disposal site will the clean soil be dumped on top? With regard to the "aid" of the natural flow through the entrance of Princess Royal Harbour to dilute any minor nutrient flux that may occur from dredge activity (pg157), how will this be affected by the incoming tide?

This method of selectively removing sediment with elevated metals that are not bioavailable has been demonstrated to be effective in many locations throughout Australia and several within WA including Bunbury on two occasions, Cape Lambert, Brisbane and Cairns. The TSHD that will carry out the dredging will have a very accurate DGPS and positioning system installed that can accurately locate the position of the suction mouth of the draghead. This, coupled with multibeam hydrographic surveys will allow accurate removal of material. It is expected that the following tolerances can be achieved: Horizontal + 0.5m /- 0m Vertical + 0m / -0.3m

The footprint of the disposal site will not increase at all. The material was always proposed to be disposed of to the site and the only change is the staging of the process to ensure the contaminated material is removed first and followed immediately by clean material. The effects of wind, waves and shipping movements will not affect the spoil when disposed in 40 m of water. The disposal area is stable and material will not be affected at the surface, let alone buried several metres below.

The effect of tidal activity, both outgoing and incoming, will effectively dilute any nutrients that are liberated during the dredging of the surface materials for reclamation. A very small amount of dilution will be required to achieve this and is expected to be achieved without the need for tidal exchange.

13.16 Dredging could also result in the disturbance of contaminated sand during the dredging/dumping process and have an increased zone of impact due to strong wave action.

As the ocean floor will be approximately 35 m deep after completion of disposal the depth is well below the impact region of orbital velocities of the waves predicted to be passing above. This will be the deepest disposal site in Western Australia.

16.19 The proponent acknowledges that there is potential for contamination in sediments due to historical industrial discharges and agricultural and urban runoff. Therefore, disturbances to this potentially contaminated seabed within the harbour will be a critical component of this assessment.

Section 6.3.4 requires a map and details of associated methods identifying the sediment sampling program for each of the Dredge Areas (1, 2 & 3) and the two potential spoil disposal sites. Information on site selection, distribution, replication and depth of sampling is also required. This information is critical in assessing to what extent potentially contaminated sediments have been investigated. Furthermore, figures 6.7, 6.8 and 6.9 should be provided in the context of the bathymetry and benthic habitats and be cross referenced to a master map which should contain the full extent of the areas to be dredged. This will allow for cross checking of each of the sampling locations with the complete extent of the dredging footprint to ensure that all areas to be dredged have been adequately sampled. At present, it is difficult to assess whether the curved area in the channel between Dredge Areas 2 and 3 has been sampled. In addition, the proponent should be required to undertake an operational sediment sampling program to verify that sediment chemical parameters do not exceed National Ocean Disposal Guidelines for Dredged Material levels. The proponent should also be required to establish a survey program to determine the spatial and temporal extent of any changes in the physical properties of surface sediments including particle size and composition within the area of influence of the dredging.

Recommendation:

The methods used for sediment sampling should be clarified, and a demonstration that sampling has been undertaken across the entire area of influence should be provided.

The PER and sampling and analysis plan detail the information required above. The methods of sampling were in accordance with the National Ocean Disposal Guidelines for Dredged Material (NODGDM) and were approved by DEWHA. Details of sediment physical properties and sediment chemistry of sediments to be dredged in dredge areas one, two and three are included in Section 6.3.4 and 6.4.1 of the PER. Figure 6.6 provides a map detailing the three sections of dredge areas and Figures 6.7, 6.8 and 6.9 provide the sampling locations for each dredge area giving coordinate of each sampling point in Eastings and Northings. Further details on the sediment sampling program such as site depth, sediment description and distribution were included as Technical Appendix 16.2 of the PER (Figure 4 through to 7 and Table 15).

The ground truthing map showing BPPH sampling points correlates with the sampling points detailed in Figures 6.7, 6.8 and 6.9. This map is provided in the context of both bathymetry and benthic habitat as Figure 8.4 in this document.

16.20 The proponent should be required to undertake an operational sediment sampling program of dredge spoil to verify chemical parameters of sediment and undertake a spatial and temporal survey program to detect changes in the physical properties of surface sediments including sediment particle size and composition within the area of influence of the dredging.

Monitoring programs will be established 12 months prior to commencement of dredging activities to provide a set of baseline information. Real time monitoring will also be conducted during the dredging campaigns and after dredging has been completed. The framework for this program has been documented in a revised Dredge and Land Reclamation Management Plan.

The objective of the monitoring program is to determine the actual areas of influence and impact, detect variations from modelling assumptions and predictions including sediment properties, determine impacts of variations if any, and to enable APA to act on and prevent significant impacts from occurring.

17.10 It is noted from the PER and the SAP that the porewater concentrations for mercury exceeded the 99% species protection guideline level on a number of occasions and that the Peer Review has recommended that additional tests be undertaken. The EPA Service Unit is particularly interested in the proponent's response to this matter and the results of further investigations and how this will be managed and addressed in the Dredge and Land Reclamation Management Plan.

The porewater concentrations of mercury met the 95% level of species protection in accordance with that agreed by the DEWHA in the approved Supplemental SAP. The guideline was chosen to represent the level appropriate for a spoil ground which will receive the material containing the analytes of interest. This approach was deemed appropriate as the potential impact is targeting the sensitive receptors at the spoil ground, in this case infauna that would be exposed to pore water. Other tests are not suitable for the assessment of bioavailability of mercury.

The National Ocean Disposal Guidelines for Dredged Material (NODGDM) indicates that the test results have sufficiently demonstrated that the material is suitable for unconfined disposal to sea due to the fact that the metals of concern are not bioavailable. However, as a precautionary pro-active measure, the material will be dredged with no overflow and will be buried by at least a metre of clean material. This will effectively rule out contact of this material with biota.

The Peer Review of the SAP report did not recognise or take into account the fact that the SAP had been approved by the DEWHA and its implementation was in accordance with that advice. The NODGDM provide guidance; however, it is the agreed SAP that is the instrument for compliance of testing and evaluation of material for sea dumping.

The SAP report clearly demonstrates that no further testing is required and that the management of the material proposed in the PER is more than sufficient to reduce any risk to as low as reasonably possible. However, the management of the sediment containing elevated analytes does not appear in the Management Plan and this will be added.

6.5 Benthic Primary Producer Habitat

6.5.1 BPPH Mapping

16.7 The habitat maps provided are considered inadequate for this assessment for the following key reasons:

1. **Habitat maps do not include measures of condition or measures of density which are critical measures when assessing impacts on seagrass and designing appropriate trigger based management responses.**
2. **Habitat mapping has not been undertaken to species level which is achievable for seagrass in this area. It should also be noted that studies undertaken by the Department of Water (DoW) have mapped seagrass to species level in Princess Royal Harbour and this information should be provided.**
3. **Habitat maps were acquired from one day of satellite imagery and seasonal variations in habitat have not been addressed. It is unclear to what extent ground truthing has been undertaken and DEC requests that the methods used for ground truthing and satellite imagery analysis verification should be provided to enable an assessment of the accuracy of the maps provided. According to the PER (section 6.5.1), ground truthing has been undertaken in the dredge channel footprint, however further ground truthing should have been undertaken in areas throughout the zones of effect and influence in King George Sound and Oyster Harbour. Accurate benthic habitat information will be necessary for establishing benthic habitat health monitoring sites associated with the proposed dredge management program.**
4. **Oyster Harbour has not been included on the benthic habitat maps, however it is potentially in the area of influence (see figures 9.18, 9.19 and 9.20 in the PER).**
5. **State/Commonwealth boundaries have not been delineated on any of the maps throughout the document.**

1. The density of the seagrass is clearly shown on the figures although not in the typical broad-brush approach of shading. This was undertaken to accurately quantify the amount of seagrass present rather than including large percentages of bare sand between clumps. This approach was only possible due to high resolution satellite imagery and very clear water conditions at the time the image was obtained. The assessment of BPPH relies on quantifying the spatial area of BPPH not the density of the seagrasses living on it. Seagrass of 10% or greater cover are afforded the same status as 100% cover.

   The condition of the seagrass was assessed by divers and was not included in the habitat mapping as it will be the focus of the baseline and pre- post dredging monitoring program. However in summary, the seagrasses in King George Sound are healthy and free of any significant epiphytic growth. Seagrasses in Princess Royal Harbour are in also healthy but have moderate epiphytic growth.

2. There is no need to undertake seasonal habitat mapping of climax seagrass species. The seagrass meadows of *Posidonia* and *Amphibolis* species do not change in density seasonally to the extent that any imagery would detect changes. In fact, density changes in such meadows are seen over the course of decades not years.

3. The methods described for ground truthing was clearly described in text and locations shown in Figure 30 in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report contained in the Technical Appendices. The method used was spot diving and it covered all areas of seagrass cover. A map showing ground truthing locations for habitat mapping of Princess Royal Harbour and King George Sound has been included as Figure 8.4. An aerial photograph of the study area to enable an assessment of the accuracy of the maps is also included (Figure 8.1).

   The habitat mapping and numerical modelling results overlayed on it is sufficient to allow the site selection process for monitoring sites. At the time of the baseline survey the health of the seagrasses and their density will be quantified. This approach allows for accurate data to be obtained immediately prior to the project proceeding rather than months to years beforehand.

4. The details of the benthic habitat of Oyster Harbour have been obtained from the Department of Water and are included in Figure 8.3, and figures in Section 9.4. No seagrass will be affected in Oyster Harbour based on the numerical modelling predictions.

5. State/Commonwealth boundaries can be included on the maps; however, the project area and all benthic habitat mapping are contained within State Waters and no Commonwealth Waters are shown. There was no reason to extend the mapping further offshore when the predicted water quality effects and all dredging and disposal footprints are contained within State Waters. There may have been some confusion with Figure 1 in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report. A line demarcating State Waters and Waters within the Limits of a State (Inland Waters) is shown simply to delineate the jurisdiction of the Commonwealth for sea dumping on the two proposed spoil grounds. The Commonwealth has jurisdiction over State Waters for sea dumping but not Inland Waters.

16.23 The PER states that "The Harbour's intertidal sand flats support diverse communities of burrowing invertebrates and attract a summer population of several thousand migratory waders. These ecosystems are mainly in the shallow waters along the western and southern shores of Princess Royal Harbour. It is not anticipated that the Port construction activities or operations will impact these areas". However, the habitat map provided does not delineate these significant benthic communities, nor does the PER justify that these areas will not be affected by the project.

The habitat mapping is for benthic primary producer habitat which by definition for seagrasses is sub-tidal. No intertidal mapping was undertaken; however, it can be clearly seen from the modelling that the areas of intertidal habitat referred to are outside of the zone of influence.

16.24 Section 6.1 of the PER states that "Plumes may occasionally be visible in Oyster Harbour during the proposed dredging, however their intensity and duration will be such that no detectable effects on benthic biota or their habitats are predicted. The Project is therefore not anticipated to impact the sensitive sub and inter-tidal communities in Oyster Harbour or on the Western and South shores of Princess Royal Harbour' (page 49), however the proponent does not provide justification for this conclusion. Furthermore, Figures 9.18, 9.19, and 9.20 indicate that the area of influence extends into Oyster Harbour as turbidity generated as a result of dredging will affect waters in Oyster Harbour for all three seasons modelled. It is therefore important that Oyster Harbour be included in habitat maps and in calculations of the area of influence.

Modelling has shown that Oyster Harbour is outside of the impact zones of the dredging program for all three seasons. Habitat maps have been amended to include Oyster Harbour (Section 9.4).

16.30 The PER does not have any references to descriptions of BPPH in Management Unit 1, including the description provided on the sub-tidal granite rock pile dominated by Ecklonia radiata, nor does the proponent provide supporting references for the statement "on a regional scale, the rock is on the lower end of ecological significance when compared to the adjacent rocky shoreline as well as the wider King George Sound and offshore Island (page 79). The proponent should discuss the regional significance of these rocky shore communities followed by a discussion on the regional significance of the rocky outcrop proposed to be affected by reclamation activities.

The small rocky outcrop found in the footprint of the proposed reclamation area has been investigated and assessed. The ecological value of the small outcrop is not regionally significant in that similar habitat exists throughout the King George Sound area and no loss of function would result from its loss. The size of the rock is not sufficient to support a significant ecosystem not already present throughout the vast quantity of nearshore rocky reef areas in KGS.

The creation of the seawall comprised of granite boulders for the rock armour is effectively an offset for this habitat. The increase in rocky habitat resulting from this wall is an order of magnitude greater than the loss and will provide substantial habitat for both flora (*Ecklonia radiata*) and fauna colonisation.

17.2 In terms of the areas to be impacted by dredging, the EPA Service Unit will require a breakdown of the:

a) marine habitats in the proposal that have been previously dredged (e.g. area of existing dredged shipping channel, extent of dredged portion of the turning basin etc); and

b) marine habitats proposed to be dredged that have not previously been dredged/disturbed.

Confirmation is also required that the calculated areas for items a) and b) above include the batters of the proposed channels, basins etc. It is unclear whether the proponent's adoption of a channel option (as shown in Table 5.3) will have implications on the width of the proposed shipping channel and the dimensions (area and height) of the disposal site or whether the current proposed channel width of 215 metres (and 250 m around the bend) is a worse-case estimate. Please clarify.

a. The areas of habitat that has previously been dredged (and lost) such as in the existing shipping channel and turning basin are provided in Table 45 of the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report. In summary the area is 205.7 ha of seagrass in Princess Royal Harbour. The area of channel in King George Sound did not contain seagrass when dredged.

b. Updated information of the areas of marine habitats to be dredged that have not previously been dredged or disturbed is provided in Section 9.4 of this document. These data include the best, most probable and worst case scenario values and include the dredging footprint. However, the proposed disposal area has not been included in these figures as no BPPH was present. The area of the disposal area is approximately 250 ha.

The calculations of loss in the dredge footprint include batters for the proposed (revised) design specifications. Illustrations of loss and zone of influence footprints are included in Section 9.0 of this document.

Visual spatial comparisons of the various infrastructure footprints are provided in Section 9.0 (Figures 9.2 & 9.3).

17.3 Once the spatial extent of the proposal has been clearly identified and finalised by the proponent, the EPA Service Unit will require the submission of the revised spatial data for the key components of the proposal and also the predicted zones of influence, according to the following specifications:

- **Datum: GDA94,**
- **Projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA),**
- **Format: Arc view shapefile (.shp), Arc info coverages, Microstation or AutoCAD (.dgn, .dwg, .dxf).**

Spatial data to the specification of the EPA Service Unit will be provided in Arc view shapefile format.

17.4 Representation of the proposal in proponent's investigations/modelling

Upon providing a clear and final definition of the proposal, as requested above, the EPA Service Unit will require confirmation from the proponent on the adequacy of the modelling and technical investigations undertaken to date with respect to representing the key characteristics of the proposal, particularly with respect to items 1, 2 and 3 above. Will additional modelling simulations be required to adequately represent the key characteristics of the proposal?

Dredge simulations were carried out using a defined dredge scenario which a total dredge volume of 12 Mm^3 and a defined channel design to accommodate a vessel with a 16 m draft. Approval is sought on the basis of this dredge volume. A stand alone CSD task has been split from the main task and modelled independently to understand the fate and consequence of the material generated from this succinct activity. The results of remodelling and impact assessment are detailed in Section 9.0 of this document.

17.12 The EPA Service Unit requests the provision of appropriately scaled maps/figures showing the predicted zones of impacts superimposed over the locations seagrass communities in and adjacent to PRH and the proposed and existing port infrastructure (i.e. channel and reclamation areas).

A fine scale map of the habitat in the reclamation area and channel was provided in Figure 29 of Sampling and Analysis Plan and Benthic Primary Producer Habitat Report for this purpose. However, in consultation with the EPA Service Unit the specific area of concern will be delineated in appropriately scaled maps/figures showing the predicted zones of impacts superimposed over the locations seagrass communities (Figures 9.10 through to 9.12).

6.5.2 Seagrass

8.14 Section 7 (pg. 1211122) As part of an on-going school research project, students from A.S.H.S. have conducted a survey of the seagrass beds in Princess Royal Harbour. Their efforts and investment will have been wasted if the Proposal goes ahead. The seagrass beds are particularly vulnerable, and many have died due to Princess Royal Harbour becoming shallower closer to shore (due to operational activities which have been approved in the past) and then becoming bleached by the sun. This section is conceding that seagrass meadows will be lost as a result of this proposal (particularly those in the vicinity of the dredging and disposal sites), requiring a Seagrass Rehabilitation Management Plan to be developed prior to commencement of dredging. What has not been discussed is the fact that transplantation has a low success rate and "a like for like or better" cannot be guaranteed. This results in a definite loss of seagrass meadows due to dredging and disposal, but replacement of these meadows may not be successful and will also entail a "lag" time during which the inhabitants and functions of the original meadows will be lost.

13.14 Seagrass management and replanting of disturbed areas. Where will the replacement plants be sourced from? What would be the likelihood of success?

16.54 The proponent proposes to offset net losses of seagrass in Princess Royal Harbour by undertaking a "Seagrass Rehabilitation Management Plan". Evidence to support the techniques and success of seagrass rehabilitation should be provided. The proponent may also wish to consider, in addition to direct offsets proposed in the seagrass rehabilitation program, additional support to facilitate broader measures to protect and manage conservation values which may include contributory offsets such as research to better understand relationships between water quality, light and seagrass growth/recovery in Princess Royal Harbour and King George Sound.

Seagrass has previously been transplanted successfully in Western Australia in Cockburn Sound, Dampier, Geraldton and in close proximity to Princess Royal Harbour at Oyster Harbour. Work at Oyster Harbour has shown good success rates and it is anticipated that results will achieve, over time (several growing seasons), a like for like or better in Princess Royal Harbour, subject to the availability of suitable transplant sites. Previous seagrass transplants carried out using *P. australis* in Oyster Harbour have yielded a growth rate of approximately 0.5 m after two years as the plant initially has minimal shoot creation. The like for like growth in shoot density and cover is expected to be found in the fourth or fifth year where the seagrass backfills the shoot density to rival that of donor meadows.

Transplant material will be harvested from donor meadows within the dredge and land reclamation footprint prior to dredging. The methods and technical aspects of seagrass transplantation will be detailed in the Seagrass Rehabilitation Management Plan currently being developed. The plan will be prepared in consultation with the Department of Environment and Conservation, the Department of Water and a local seagrass expert and will be forwarded to EPASU once completed.

If impacts are within the allowable thresholds or appropriately offset in the case of PRH seagrass, there is no apparent obligation to provide “additional support”.

13.4 Section 6.4. It is stated that seagrass can recover from a storm event (p. 74). However, storm events are likely to generate different particle sizes from dredging events and what will happen if the dredging coincides with a run off event?

A reactive monitoring and reporting process will be put in place which includes Water Quality monitoring and Seagrass Health monitoring with a six level tiered management system. Staged management actions will be implemented based on exceedances of threshold values of water quality. Cumulative impacts including those resulting from dredging plus natural impacts will affect the threshold values and management strategies are in place for each level of impact. Ultimately dredging will cease and relocate should shoot density decrease by 50% in any area outside the area of permanent loss.

8.11 Section 6.4.3 (pg. 74/75) Figure 6.13 shows a satellite photograph of a seasonal fresh water intrusion into King George Sound which has a high level of tannin due to farm and bush run-off. The seagrasses in King George Sound are not detrimentally impacted by these events as they are part of the natural system, they do not become covered with high levels of sediment, and the turbidity clears quickly. This cannot be used as an argument for their continuing health and vigour once a dredging program begins as the turbidity caused by fresh dredging and disposal of sediments can remain for over two years, with associated long-term reduction in water clarity (and thus low light levels reducing photosynthetic capacity) and high levels of re-distributed sediment onto surrounding marine habitats. This is long enough to cause loss of surrounding marine habitat, including the seagrass beds of King George Sound. Other examples where this has happened include the Dawesville Cut and the port area of Geraldton.

The Water Quality Monitoring programme and Seagrass Health Monitoring Programme will ensure that seagrass loss does not significantly exceed the cumulative loss thresholds set out in Guidance Statement 29.

Although it is noted that it is an entirely different ecosystem than Albany, dredging at Geraldton Port demonstrated that seagrass have the ability to sustain and fully recover during and after prolonged dredge events. The effect on seagrass at Princess Royal Harbour is anticipated to be minor when

compared to that at Geraldton Port, which have demonstrated no notable significant differences between near field and far field sites over time, according to the findings of the CSIRO Marine and Atmospheric Research Division.

The APA has received advice from EPASU that stated that fresh water intrusion with high tannin levels cannot be referred to as natural due to the massive influence of anthropogenic events in the upstream catchment (e.g. land clearing and farming).

16.22 The proponent has not provided thresholds for stress on benthic habitat communities related to water quality and sedimentation parameters and this information is required in order to make an informed assessment as to the validity of the impact analysis and the thresholds for seagrass which must feed into the proposed seagrass health monitoring program.

There are presently no reliable measures of stress for seagrass that can be linked to water quality. Light attenuation is currently the best measure to determine the impact on seagrasses and is a sliding scale. Essentially the threshold used for temporary loss is a stress level at which the seagrass will recover. Taken to its limits, the same measure will cause permanent loss.

16.25 The proponent states "These [storm events] are short lived due to the rapid settling of the dense silica sands that are characteristics of King George Sound', then continues by stating that "the plume from the storm event does indicate the ability of seagrass in King George Sound to sustain themselves during prolonged turbid events without any apparent loss of health or vigour (page 74). Concerns with these statements are:

a. Without target benthic habitat surveys before and after storm events, it cannot be stated that seagrass maintain their vigour and health. Evidence of this, linked with Nephelometric Turbidity Unit (NTU), Suspended Sediment Concentration (SSC) and other water quality parameters needs to be provided to justify how seagrass communities respond to elevated levels of turbidity, decreased light and increased nutrients within the area of influence.

b. Storm events are usually short lived events. Given that dredging will continue for between four to seven months, there are likely to be extended periods of turbidity that may result in more chronic effects on water quality when compared to storm events. The proponent has not discussed the frequency and duration of background water quality exceedances expected during dredging and what consequences these changes will have on seagrass communities and other sensitive habitats.

The comments in the PER regarding seagrass health post storm events were based on discussions with a local independent seagrass expert with in excess of 20 years experience in the region.

As the dredger will be operating in different areas throughout the dredge programme the plume will be spatially and temporally intermittent and hence comparable with short lived storm events.

16.26 Dredging at certain times of the year can affect benthic communities differently and the proponent should discuss impacts on BPPH on a seasonal basis.

All impacts to BPPH have been taken into account and clearly outlined in both the PER and technical appendix 16.2 the Sampling and Analysis and Plan and Benthic Primary Producer Habitat Report. Impacts to BPPH will be largely managed through water quality monitoring which includes threshold values and a tiered management approach as detailed in technical appendix 16.7 the Dredge and Land Reclamation Management Plan. This management strategy will take into account any potential impacts to BPPH. In all 3 seasonal dredging scenarios the cumulative threshold levels for BPPH impact are similar and follow the intent of the guideline values set out in Guidance Statement 29.

16.27 The PER does not provide a fine scale habitat map of seagrass that will be affected by dredging and reclamation. Furthermore, it is questioned whether the proponent has included indirect/cumulative impacts on seagrass communities associated with land reclamation and dredging activities in benthic habitat Management Unit 1. The proponent should also discuss the regional conservation significance of seagrass in this area.

A fine scale map of the habitat in the reclamation area is provided in Figure 29 of Sampling and Analysis Plan and Benthic Primary Producer Habitat Report.

All impacts on seagrass in Princess Royal Harbour have been taken into account and are presented in Section 9.4. Historical reclamation and seagrass losses have been quantified as well as losses predicted from this proposal.

Ecological significance of seagrass can be broadly defined to include physical, chemical, biological and cultural attributes (Walker, Hillman, Kendrick *et al.,* 2001). Seagrasses have been identified as critical resources in many environments because of the habitat they provide for many important fish and shellfish species and because they contribute to productivity, help to stabilize bay-bottom sediments, and serve as sensitive early-warning indicators of water quality degradation. (Environmental Protection Commission, 2007). Seagrass meadows are physically and biologically significant in near-shore marine systems, trapping sediments and providing a refuge from predation for juvenile fish and crustaceans. Seagrass also performs an important role in stabilising areas of sand on the seafloor, acting to disperse wave energy and reducing littoral drift and major changes to shorelines.

APA recognises the importance of the seagrasses and hence the formation of an expert technical team to undertake the intensive and robust work evident in the formulation of the PER and related technical appendices.

16.29 DEC is aware of a recent seagrass mapping exercise of Princess Royal Harbour that has been undertaken by DoW. This information has not been used to derive habitat maps and contribute to the environmental impact assessment of this proposal and given it is probably the most up to date information on seagrass distribution and density, it is recommended that habitat maps used in this assessment incorporate this data set.

The DoW mapping has been reviewed as part of this project and in fact the mapping of King George Sound was provided to the DoW in exchange for the Oyster Harbour mapping as their project did not map King George Sound. The mapping for Oyster Harbour will be included in the revised mapping. The satellite imagery for this project was capable of more detailed data representation than that of the DoW aerial imagery and spatial methodology used and it allowed far better quantification of seagrass cover. The DoW report has not been released, however, the data that the proponents have been privy to thus far, have shown a very strong agreement between the two works.

17.11 Seagrass loss in Princess Royal Harbour

A key issue for the assessment will be the potential impacts and predicted loss of seagrass communities in and near to the PRH entrance. As recognised in the PER, the EPA's objective for PRH (Category F in Guidance Statement No. 29) is to ensure no net loss of benthic primary producer habitats and their associated communities, and where possible, a net increase through the use of environmental offsets.

It is unclear what the proponent means in practical terms by the statement that *'Loss of seagrass from Princess Royal Harbour will be offset through maximising the re-planting or seedstock from seagrass that will be lost to achieve the greatest areal extent possible from the donor material in an appropriate location …'*. The EPA will need to have a clear understanding of the progress the proponent has made (since the release of the PER) with respect to identifying and developing an environmental offset project. This should be further described in terms of: evaluation of potential/suitable sites in PRH and King George Sound; area and density of offset to be achieved; location of donor material (will all donor material be sourced from potential impact area?), etc. It is expected that the further development of the proposal, as mentioned above, would assist the proponent in developing the details of the offset project that is commensurate with the proposal's environmental impacts.

Seagrass stock for replanting will be collected from the project footprint that would otherwise be lost when dredging takes place. All donor material will be taken from this location using methods established by a local seagrass expert. This method includes taking larger clumps from outer edge of the donor meadow as this has shown to provide the quickest growth rate in nearby areas such as Oyster Harbour.

The offset package outlined in the PER in Section 9.2.6 is currently being further developed and a Seagrass Rehabilitation Plan is being prepared in consultation with the local seagrass expert and Oceanica Marine Consultants. This plan has been further developed since the PER to address the comments raised by EPASU. The plan's detail is well developed aside from some further fine scaled field work required to complete the plan. The consultants are scheduling in the requisite field work and the plan will be completed and forwarded to the EPASU and local DoW upon completion. The anticipated timeframe for delivery of this plan is during October 2008.

18.7 Lastly it is welcomed that the proponent has proposed transplanting of seagrass as an environmental offset to the loss of seagrass meadow due to dredging. While it is noted that the PER indicates that the quantum of seagrass to be loss through dredging will be consistent with the Benthic Primary Producer Policy, it is none the less welcome that efforts are to be made to reduce the loss of seagrass as much as possible.

This comment is acknowledged.

6.5.3 Coral

2.10 The report makes no references to several reef complexes situated in close proximity to the preferred disposal site. Below are co-ordinates for four reef complexes surrounding the proposed dump site, two of these are notably larger than Gio Batta patch. The lack of mention of these reefs shows a hole in the survey data. While these reefs may not show on a bathymetric chart, they are quite real. If the area had been properly surveyed, these reefs would have been revealed. Or, the area was properly surveyed and the location of these reefs was fiscally undesirable and therefore conveniently omitted from the report.

The response appears to only have coordinates for two reef complexes and one for an area of sand waves thus this response will deal with these data only. The two reef sites mentioned have been plotted and are found to be more than 3 km to the north of the disposal site. The modelled scenarios indicate that no significant turbidity from the disposal site will reach the reef sites indicated. This can be seen in the overlays of impact zones on the habitat map (figures 9.22, 9.23 and 9.24 of the PER).

The PER did not undertake a survey of the entire region but rather it focused on the area defined as the "zone of influence" demarcated by elevated turbidity predicted by numerical modelling. This is the standard method prescribed by DEC in undertaking Benthic Primary Producer Habitat assessments. The rationale is that it is only meaningful to survey habitat that will receive a change to water quality. Given that the reefs indicated in the submission are well outside of the zone of influence the biota associated with them are not at risk.

The location showing sand waves is in a water depth of between 25 and 30 m. This water depth in this area is markedly less than that of the proposed disposal site and is where the seabed slopes upwards into the more shallow regions of King George Sound. Sand waves would be expected and have been observed in shallower regions of KGS during surveys undertaken for this PER. However, the disposal site is in 10–15 m greater water depth which results in less seabed turbulence and consequently less resuspension of sediment and sand waves. As such the site photo provided does not represent the disposal site conditions and does not demonstrate the potential for seabed instability at the disposal site.

13.11 Section 9. Michaelmas reef and Gio Batta patch are important dive localities and are suitable habitat in KGS for sessile invertebrates such as sponges, soft corals and at least five species of hard corals. These will inevitably be affected by turbidity if dredge spoil is dumped in the preferred locality south of these reefs. The end of the dredged channel is also very near Gio Batta patch and Michaelmas reef. The zone of permanent loss (from dredging) almost touches Gio Batta patch: the zone of influence includes Gio Batta patch (March to July) and includes the whole of this reef (July-November). This is unacceptable. It includes part of Gio Batta patch (November to February) and nearly the whole of Princess Royal Harbour. From November to July the whole Middleton Beach area and the entrance to Oyster Harbour (Emu Pt) is in the zone of Influence. This will have a severe impact on the amenity of these areas which are heavily used during the summer and autumn months. This is unacceptable as dredging the channel will not be a once-off but will need frequent re-

dredging to maintain the required depth. The alternative offshore dredge disposal area is much more preferable than the preferred option.

The proposed disposal area(s). There is a history of strong wave action from South to North scouring the bottom of KGS and throwing benthos on to Middleton Beach and Emu Point - see Map (Fig. 5.2). The preferred dumping site directly upstream of reef patches which are virtually the only sites appropriate for rich hard substrate biota because of factors such as substrate type, depth, water flow, etc, seems an inappropriate siting. These reef patches are the likely sources of the benthos that reaches Middleton Beach and Emu Point. The less favoured dumping site is further away from these reef patches and it would seem likely that the impact would be less if the disposal area was further away.

The habitat of Michaelmas Reef and Gio Batta Patch will not be adversely affected by the dredging and disposal activities associated with this project. Figures in Section 9.4 illustrating modelled zones overlain on the habitat map clearly show that the zones that would lead to loss of Benthic Primary Producer Habitat do not include these reefs. The zone of influence is not a measure of impact but rather it indicates where elevated turbidity will occur at some time during the dredging program. This elevated turbidity will not adversely impact on flora or fauna during the program.

The fact that there is no predicted impact to the flora and fauna at Michaelmas Reef and Gio Batta Patch means that the proposed dredging and disposal is environmentally sound.

It is true that the elevated turbidity may affect the aesthetics of the area due to reduced water clarity but this will be limited to the dredging and disposal program. The capital dredging program is a one off and maintenance dredging may ultimately be required but if so, it will be of a much smaller scale program and Albany has only had one maintenance dredging program in its recent history, that being in 1985. Therefore, it is not anticipated that there will be a regular requirement for maintenance dredging post proposal completion.

The preferred disposal site is not the source of benthos that is deposited onto Middleton Beach and Emu Point. The prevailing wind and wave conditions moves material from the shallow areas immediately offshore onto the beach. This includes seagrass and macroalgal wrack as well as dead molluscs. This is a normal process but does not reflect scouring of the deeper offshore areas of King George Sound.

The preferred disposal site is not upstream of reef patches. It is a deep site that is relatively stable as has been shown by video footage of the seabed which does not show signs of wave action. Material at this depth and with protection from the shelf waves is not dynamic and both sediment and benthos is most unlikely to be mobilised by natural conditions. The disposal area can be classified as stable.

The alternative option of using the offshore disposal area was not deemed to be acceptable due to the nature of the prevailing currents which would distribute the turbidity and sediment more widely. Habitat in the vicinity of the alternative site includes reefs such as East and West Shoals and vast areas of hard pavement all of which is colonised by sessile benthos. The preferred disposal site is situated in an area of bare sand and habitat loss is not likely given the depth of water and the stable nature of the area.

The selection of the disposal site has been based on detailed numerical modelling and ecological assessment and not on economics or convenience.

13.5 Section 6.5.5. Corals. Michaelmas reef is substrate for more species than *Coscinaraea marshae* which is a south west endemic species not found north of the Houtman Abrolhos. *Turbinaria frondens, T. mesenterina, T. reniformis* and *Plesiastrea versipora* are known from KGS: the Western Australian Museum has specimen records for these species. Some other southern Faviid species are also likely to occur in the region. These species probably also occur on Michaelmas reef.

These coral species are acknowledged and their distributions recognised. The presence of corals does not necessarily imply they will be impacted. The reason for this is that these species grow on the sides and in some cases the top of the limestone reefs in the vicinity of the area to be dredged. This position along with the prevailing currents and wave action prevents sediment from settling onto the colonies thus minimising the impact of sedimentation. This is also true for naturally occurring turbidity generated in the area. The more offshore granite reefs and pavement often have coral

patches associated with them but they are well outside of the zone of influence and thus not subject to elevated turbidity or sedimentation.

16.8 There are deep ridges and reefs in the vicinity of Michaelmas and Breaksea Island Nature Reserves (Wilson *et al*, 1994). The proponent has attempted to map benthic communities in the area; however, this mapping has not included coral communities. The PER indicates that coral colonies found at Gio Batta Patch, Michaelmas Reef and "adjacent to the large offshore islands"(page 79) (assuming that these are referring to Michealmas and Breaksea) were not included on the map as they were less than one per cent cover and therefore didn't warrant mapping. DEC does not support the exclusion of coral from the benthic habitat maps for the following reasons:

1. **The conservation significance of these coral communities has not been discussed in the PER. The limited percentage of coral communities should not be used as a reason to dismiss the potential conservation significance/status of these communities.**
2. **Coral communities on the south coast largely consist of endemic species (for example three endemic Turbinaria sp are known to occur within King George Sound) and therefore these communities should be included on the habitat map as representing potential significant habitat potentially affected by dredging.**
3. **It has been noted that a few pinnacles at Gio Batta Patch extend laterally from the reef top and are dominated by encrusting invertebrate cover (bryozoans, ascidians and soft coral) and the areas that receive less light on reef walls and overhangs are completely encrusted with invertebrate fauna including black coral colonies (SKM, 2007). These reefs have not been discussed from an impact assessment perspective.**
4. **It has been noted that at Michaelmas Reef calmer waters provide for greater proliferation of encrusting fauna including numerous plate corals (Coscinaraea marshae) as well as gorgonian soft corals (SKM, 2007). This reef system has not been discussed from an impact assessment perspective.**
5. **The methods used for surveying these coral communities are not provided; therefore there is no verification of the cover and extent of these communities.**
6. **The estimated percentage cover of coral is directly related to the scale of mapping and therefore the mapping scale needs to be justified in ensuring high value and critical assets do not fall below the mapping threshold.**
7. **Low density and/or scattered communities can be mapped as forming a mosaic with the abundant communities they intermingle with, if it is not feasible to map individual occurrences.**
8. **Statements that the proponent does not anticipate that the dredging and related activities will have an impact on coral cannot be substantiated unless coral communities are presented adequately in maps and the proponent can demonstrate that the zone of influence (including areas of predicted sediment deposition) does not interact with reef communities. There is a high level of uncertainty with regard to the accuracy and adequacy of the BPPH maps provided. It is recommended that habitat maps are subjected to expert review.**

Habitat mapping was required in the area defined in the “zone of influence” only and this was not present in the area of deep ridges and reefs in the vicinity of Michaelmas and Breaksea Islands.

1. The description of the corals encountered at Gio Batta Patch and Michaelmas Reef has been described in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report. Coral communities with a percentage cover above 1% do not exist in the area covered by the zone of influence thus they have not been represented. In previous work CALM (now part of the DEC) had defined coral habitat as 10% cover. More recently SKM consultants have been informed by the DEC that this has been reduced to 5% but in this case we have assessed the cover to be less than 1%. In any case, habitat is not simply the presence of a feature but sufficient quantity to function as a habitat. Coral density less than 1% cover or even 5% cover is not a coral habitat because it does not have the ecological function of a coral habitat. Habitat mapping is in accordance with DEC practice.

With respect to the conservation and significance of individual coral colonies or a variety of species, the risk assessment process has determined that the coral (where they are presently found) are not at risk of the effects of dredging and disposal.

2. Endemnicity is not a factor in determining representation on habitat mapping. The *Turbinaria* spp found within King George Sound are not endemic to King George Sound. They are in fact tropical species at the southern limit in a distribution and all are found outside of Australia. In fact the literature shows that there are four *Turbinaria* spp which occur in KGS. There Australian distributions are as follows (clockwise direction):

   T frondens: Duke of Orleans Bay to the Lord Howe Island.

   T mesenerina: Recherche Archipelago to the Great Barrier Reef.

   T reniformis: Recherche Archipelago to the Great Barrier Reef.

   T. stellulata: King George Sound to Moreton Bay.

3. The invertebrate life, other than hard corals, on the vertical surfaces found at Gio Batta Patch and Michaelmas Reef have not been specifically assessed for potential impact resulting from this project. The reasoning for this is that, like the corals, they are on vertical surfaces which would not allow for sedimentation build up and the species present are not prone to turbidity impacts. Sponges and soft corals can tolerate high rates of sedimentation and turbidity for lengthy periods of time. The other species present such as molluscs, bryozoans and ascidians are also very tolerant of turbidity. The assessment focused on the least tolerant group which was the corals.

4. The wording in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report states the following with respect to the conditions at Michaelmas Reef:

   "However, unlike Gio Batta Patch, deeper areas in the middle of the reef and the seabed along the northern margin are protected from the scouring effect of the large seas and are covered in macroalgal assemblages including some red algae (see Figure 21c). This area of the reef is by no means calm but it is less prone to scouring and sand blasting during storm events."

   While Michaelmas Reef may not have the same degree of scouring it is still a turbulent area subject to significant wave action. These data were obtained during relatively calm conditions for King George Sound. Conditions deteriorate markedly during bad weather.

5. The method used to assess coral cover at Gio Batta Patch and Michaelmas Reef was both visual and photographic. The observer who undertook the inspection at the reefs and the assessment has had over 11 years of experience with this type of assessment. A quantitative assessment was proposed using video transect analysis but the conditions at the reef did not allow for this. The main reasons being the turbulent conditions prevent controlled video work and the size of the coral areas are far too small for such an analysis. The estimation of 1% cover was a deliberate over estimation of the coral present but this was deemed appropriate as a conservative approach.

6. The estimated percentage cover of coral has nothing to do with the scale of mapping. The fact that the coral cover falls well below the threshold required for consideration as coral habitat precludes it from mapping.

7. Mapping of corals by any means is not relevant to the assessment of impacts to Benthic Primary Producer Habitat when levels fall below the threshold of 5%. A description of the location of corals observed and the assessment of risk to those species as a result of the dredging and disposal is in itself sufficient to define risk of impact.

8. The fact that the zone of influence overlaps area of low coral cover does not imply impact. It has been clearly stated that the orientation of the small density of coral colonies at Gio Batta Patch and Michaelmas Reef and the turbulent conditions at these locations are the main aspects that would limit impact of sedimentation. Mapping is not required to confirm this fact.

The Sampling and Analysis Plan and Benthic Primary Producer Habitat Report has been subjected to peer review by Professor Paul Lavery of ECU. His review is available upon request but in summary he stated the following:

"The methods used for habitat mapping were appropriate."

16.9 DEC recommends that the eight abovementioned benthic habitat mapping deficiencies with regard to reef systems should be addressed. Habitat maps should be revised to include reef systems and seagrass density measures, species cover, condition and seasonality. These habitat maps should be subject to expert review and validation prior to the commencement of dredging.

The eight comments have been addressed above. The only modification to the habitat maps that is acknowledged as requiring amendment is the inclusion of Oyster Harbour.

The Sampling and Analysis Plan and Benthic Primary Producer Habitat report included as technical appendix 16.2 has been peer reviewed and the results are available upon request.

16.31 Section 6.5.5 of the PER indicates that there are potentially significant reef communities within the vicinity of the proposed dredging program. These coral communities could potentially be affected by the dredging program. These are Gio Batta Patch and Michaelmas Reef. A brief description of these reef systems is provided in section 6.5.5, however this lacks detail and does not describe the regional conservation significance of these reef communities. Information on the background sediment and water quality parameters of these reefs should also be provided in order to make, an informed assessment and to enable use of these reefs as reference (non-impact) sites during approval related monitoring. Please note the following concerns in relation to this issue:

a. Figure 4.2 does not label the reef systems, nor are the reef systems labelled on habitat maps showing areas of influence, effect and impact.

b. Figure 6.20 depicting reef systems should include the dredge channel, the zone of influence and the spoil disposal ground.

c. There are three endemic species of Turbinaria spp found in extensive areas throughout King George Sound. The proponent has not described these benthic habitat values, nor has the proponent referenced this information.

d. The distance/proximity of these reefs to the dredging and spoil disposal and associated zones of influence are not provided, nor are the confidence levels of the modelling provided, therefore it is difficult to have a high degree of confidence that these reefs will not be affected by dredging.

16.33 Figures 10.10, 10.1 1, 10.12 indicate that sedimentation is predicted to occur (above 100gmlm2) in the fringing benthic habitats of Breaksea Island, however Breaksea Island is not included in the zone of influence of this project (pages 181-185 of the PER). This discrepancy should be addressed.

Standard practice is to treat all reef communities as significant and to assess the potential impacts that would pose a risk to the flora and fauna of the reefs. The issue of corals has been addressed in the response to comment 16.8.

Section 5.2 of the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report describes the water quality of King George Sound and one of the monitoring locations (KGS5 in Figure 2) was adjacent to Gio Batta Patch. In summary the water quality of King George Sound is exceptionally good although periodically during high rainfall events the turbidity can be very high for several months (i.e. winter 2005).

During the sampling program there was no sediment found on Gio Batta Patch or Michaelmas Reef and the seabed at the base of each reef was heavily scoured and only a thin veneer of very coarse material was observed.

Gio Batta Patch and Michaelmas Reef have been labelled on the habitat maps (Figures 9.3, 9.4, 9.5).

16.32 Figures 9.7, 9.8 and 9.9 show the potential for the dredge plume during south-easterly, westerly and north-easterly winds respectively. It is recommended that the proponent demonstrates the consequences with regard to reef systems and other primary producer habitats (particularly around Breaksea and Michaelmas Nature Reserves and Gio Batta Patch reef system) should persistent north-westerly winds prevail during the dredging program.

A north-westerly figure could have been included but it is important to note that at no time do north-westerly winds persist for lengthy periods of time. The modelling does not represent constant winds during each scenario but rather the predominant meteorological conditions consistent with the time of year.

The results of the turbidity impact presented in Section 9.4 of this document accounts for all potential turbidity generated in the dredging program. As such this takes into account periods when turbidity is generated during north-westerly winds and the subsequent movement in the direction of reefs and islands. The assessment has concluded that there will be no impact to the offshore reefs and islands.

6.6 Marine Fauna

3.1 It is noted that the Fleshy-footed Shearwater was not referred by the proponent as a matter of national significance interacting with the Port Expansion proposal. (This is an offence under the EPBC Act). It is also noted that DEW, the agency requiring bycatch mitigation by the fishery in King George Sound, has taken no notice of threats the Fleshy-footed Shearwaters that may arise from the dredging proposal. It also clear the various programs within DEW are not communicating and the Commonwealth's approach to such issues is inconsistent.

4.5 We note there is no reference made in the PER (Section 9.3) on the potential impacts of dredging on Flesh Footed Shearwater that inhabitant Breaksea and Michaelmas Islands.

No impacts to Flesh-footed Shearwater are anticipated and it was therefore not included in the PER. Dredging operations will not affect the species directly as breeding centres are approximately 3 km from the nearest point of dredging. Potential indirect effects include a reduction in the availability of prey (fish). This is unlikely given the localised nature of the dredging, the generally low turbidity that will result from the dredging, and the mobile nature of the pilchard shoals in the sound. Should there be a reduction in the fish stock within the sound, it is likely that the shearwaters will be able to utilise alternate food sources from the wider pelagic environment.

16.43 There is very limited information on avifauna provided in the PER. Key gaps include:

1. **Mapping indicating key breeding/feeding areas.**
2. **Critical windows for migratory birds.**
3. **Conservation significance of species potentially affected by the proposal.**
4. **Lack of targeted biological surveys of the coast and adjacent areas potentially affected by the proposal.**
5. **Evidence to suggest that the proposal will not have an adverse impact on birds, in particular conservation significant species.**
6. **Reference to any information on the known little penguin population in the area.**
7. **Discussion on potential impacts on avifauna and associated habitats (i.e. land reclamation).**
8. **Discussion on the mitigation, management and avoidance measures that will be applied to ensure that impacts on avifauna, in particular conservation significant species will be minimised.**

Breaksea and Michaelmas are listed as important known breeding areas for Flesh-footed Shearwater in Australia. Breaksea supports a few thousand pairs; Michaelmas a few hundred. Little Penguin are known to breed on both of these islands and also Mistaken and Seal Island.

Flesh-footed Shearwaters are very common breeding visitors from early September to late May, and occur more widely around the SW coast during late April to late June and early August to early November. Adult Little Penguins are sedentary but immatures are dispersive. Adults are present at breeding colonies throughout the year, although numbers are lowest between the completion of moult (April) until the start of breeding in August. During the breeding season, adults generally remain within 15 km of the colony (Weavers, 1991) but may travel much farther during 2-3 day absences.

Flesh-footed Shearwater and Little Penguin are listed as Marine species under the EPBC Act. Flesh-footed Shearwaters are very common during the breeding season, Little Penguin are lower in number at potentially just 1000-1500 pairs. The population of Flesh-footed Shearwaters is stable (Baker *et al.*, 2002).

No impacts to conservation significant avifauna are anticipated and the alternative land reclamation design has been committed to so that impacts to the A Class Reserve will not occur.

Turbidity modelling (Sections 9.3 and 9.4 of this document) suggests that Seal Island will not be affected but the waters around Mistaken Island will experience a marginal increase in turbidity (1 mg/litre) no matter when dredging occurs. Michaelmas and Breaksea Islands will experience a marginal increase in turbidity (1 mg/litre) during south-easterly winds (March to June) and during westerly winds (July to October) but not during north-easterly (November to February) winds.

Sediment accumulation modelling suggests that there may be some low-level (100 g/m^2) sediment deposition occurring along the south-western corner of Breaksea Island under various dredging start date conditions. The modelled results assume that the sediment will be deposited but in fact the hydrodynamics of the area will result in the sediment being swept off of the shallow areas into deeper water through the process of resuspension. Depending on the start date there may be no sedimentation in this area up to a maximum of 200 g/m^2 (at 12 months if dredging commences in March).

Little Penguins no longer occur on the mainland in the region following the introduction of predators such as cats and foxes, but they breed colonially on Breaksea, Michaelmas, Mistaken and Seal Island support Little Penguins and the literature suggests that they are resident throughout the year (Storr and Johnstone, 1998).

Flesh-footed Shearwaters are absent until September when they begin to arrive at Michaelmas and Breaksea and it is at this time where modelling has shown the most spatially confined turbid plumes (Section 5.14, p. 38). These Islands are approximately 3 km away from the dredging operation at its nearest point. Little Penguins may be present year-round. Fish stocks in King George sound are similarly unlikely to be affected and should remain a source of food for both Flesh-footed and Little Penguin. No impacts to conservation significant avifauna are therefore anticipated.

The impact of slightly increased turbidity and sedimentation on the birds inhabiting these islands is expected to be minimal, particularly for flighted birds such as shearwaters. Demersal species such as penguins are also unlikely to be affected by an increase in turbidity, as the natural variation in turbidity is likely far greater than the 1 mg/litre anticipated around Mistaken and Seal Island. Prey species (fish) are similarly unlikely to be affected by dredging activities.

13.6 Section 6.6. Marine Fauna. Princess Royal Harbour western and southern sand flats. Marine biota as well as migratory birds. 'It is not anticipated that the Port construction activities or operations will impact these areas'. How has this assessment been determined? What about N and NE winds in summer and the clockwise current system within KGS?

The currents in King George Sound have little connection to Princess Royal Harbour. The exchange between the two systems was studied in detail (GEMS, 2007 - pp. 54-66). The flux between PRH and KGS was studied in very high resolution and it was shown that during each tidal cycle the total mass of water passing between the two systems does not change significantly from the present. These aspects were independently peer reviewed by both, the University of Western Australia and the CSIRO. There is very little activity proposed within Princess Royal Harbour from the proposed activities and the fate, consequence and any influence from the proposals have been demonstrated and assessed in the technical appendices.

8.13 Section 6.6 (pg. 89) This section states, with regard to the Harbour's intertidal sand flats and shallow water ecosystems, "It is not anticipated that the Port construction activities or operations will impact these areas". I strongly disagree - they will be affected (with subsequent consequences for the several thousand migratory waders which are protected by international treaties and agreements), just as the Woodchip Berth has already changed Princess Royal Harbour, with the shoreline in this area becoming shallower.

The impact of slightly increased turbidity and sedimentation on waders during the dredge operation is expected to be minimal particularly for flighted birds such as shearwaters. As detailed above prey species are similarly unlikely to be affected by dredging activities. Flesh-footed Shearwaters are absent until September when they begin to arrive at Michaelmas and Breaksea and it is at this time where modelling has shown the most spatially confined turbid plumes (Section 5.14, p. 38). These Islands are approximately 3 km away from the dredging operation at its nearest point. No impacts to conservation significant avifauna are therefore anticipated. There is no evidence to support the claim that the shorelines have been altered from the woodchip berth. This assertion is difficult to comprehend given the low energy climate within Princess Royal Harbour.

16.41 The proponent has not described the importance of the waters and islands within and in close proximity to the project area for pinnipeds. This information should be provided highlighting the importance of the area in a regional context. Furthermore, the proponent has not provided information on the management strategies that will be used to mitigate impacts on pinniped species.

An addendum to the PER should provide a discussion on the regional conservation significance of the area for pinnipeds and describe how the project will be managed to avoid and mitigate impacts on pinniped species.

Section 9.3 of the PER describes that the Australian Sea-lion and the New Zealand Fur-seal are found along the southern coast and on the islands off Albany. This section details that the pinnipeds use King George Sound for feeding and the exposed offshore rocks as resting areas. As works associated with the Albany Port Expansion will not impact offshore islands the risk that the two species of pinnipeds will be impacted is highly unlikely and it is not anticipated that there will be impacts to their food source as fish stocks are mobile.

Management of pinnipeds is discussed in Section 9.3.4 of the PER. The management strategy is based on management of impacts to benthic primary producer habitat and water with the aim that the food source to pinnipeds will not be significantly impacted.

16.42 The PER does not discuss the following information that is critical for this assessment:

1. **The importance on a regional scale, of Princess Harbour and the waters of King George Sound for cetaceans, in particular the Southern Right Whale.**
2. **The critical biological windows for cetaceans that are known to occur within Albany waters, for example, the seasons critical for breeding, resting, calving and associated locations (e.g. Goode Beach) within the harbour and/or sound.**
3. **A description of whether the proponent's proposed dredging program will overlap with critical biological windows for cetaceans and information on how potential impacts will be managed (particularly for Southern Right and Humpback Whales).**
4. **The proponent has not discussed specific management/avoidance strategies that will be used to minimise impacts on cetaceans, for example, the avoidance of whale migration periods during piling construction (pile driving) and maintaining constant watch over an exclusion area prior to the start up of dredging should be considered.**

19.5 APA has stated that vessels used in the dredging operations will comply with the Australian National Guidelines for whale and dolphin watching. As this is a dredging operation, more details are required on specific mitigation measures for avoiding potential impacts on whales if the dredging takes place during whale migration including observation zones and observation procedures prior to the commencement if dumping runs, to avoid collisions with cetaceans.

Section 6.6.2 in the PER sets out that the coastal areas from Albany to the Great Australian Bight are migratory paths for breeding areas for the Southern right whale and the Humpback whale.

The timetable for dredging has not been committed to at this stage and as such it is unknown whether the dredge programme will overlap with whale migration periods. The management of potential impacts to whales are outlined in the Section 9.3.3 of the PER and in Section 7.4 of Technical Appendix 16.7 the Dredge and Land Reclamation Management Plan (DLRMP). Specific management strategies can be found here such as surveillance of cetaceans from vessels and the Trailer Suction Hopper Dredge maintaining watch on the bridge to avoid potential collisions with cetaceans. Other strategies include that the operation of dredge vessels will be constant, where possible, to reduce intermittent vibration and sound emissions thought to disturb cetaceans and maintaining a distance of 300 m from cetaceans where safe and possible to do so. Vessels will comply with the Australian National Guidelines for Whale and Dolphin Watching (DEH, 2005).

The new mitigation measures that have been updated in the DLRMP are as follows:

- Prior to beginning dumping activities in the migratory cetacean season, a dredge crewman shall maintain a watch for such, using binoculars from a location that has a field of vision of 300 m radius (monitoring zone).
- Dumping activities shall commence if no cetaceans have been observed within a 300m radius of the vessel for 10 minutes immediately prior to a dumping run.
- If a cetacean is sighted within a 300 m radius of the vessel at the dumping site, then activities will not commence until 10 minutes after the last cetacean has left the monitoring zone.

16.44 The proponent should be required to develop a Marine Fauna Management Plan to the satisfaction of DEC should this project gain Ministerial approval. This plan should address all conservation significant species and identify management measures that will be implemented during dredging to avoid and minimise impacts on marine fauna.

Measures to avoid impacts to marine fauna and management strategies are largely to be achieved through the water monitoring and sediment quality monitoring. The strategies and management actions to minimise impacts to marine fauna were included with the PER in the Dredge and Land Reclamation Management Plan, Technical Appendix 16.7.

6.7 Fisheries and Aquaculture

2.1 The Specimen Shell fishery which involves 33 licensees in WA is not acknowledged in the PER.

4.6 There is no acknowledgement in the PER that a specimen shell fishery operates in the Albany region, including King George Sound. WAFIC is aware of one full time licence holder however it is likely that other licence holders also operate in this area. We note the comments from Downtime Shells that there are commercially important shell species that at are localised to King George Sound. We believe the impacts of the dredging activities (including disposal of soil) in these sedentary species require further investigation. Recommend that the impacts of dredging and disposal of spoil on sedentary species such as shells, particularly those localised to King George Sound, be further investigated.

These comments are acknowledged however, it is noted that these licences are not all specific to the Albany region. Potential impacts from turbidity have been discussed in detail in the PER and associated technical appendices, along with the mitigation and management strategies. As the dredge plume will be spatially limited and intermittent it is not predicted that there will be a significant impact to sedentary species in King George Sound.

2.2 The marine biology component has not included or acknowledged four key species of Zoila (Cowries) endemic to the area. Two of these species have forms which only occur in King George Sound and in very close proximity to the proposed dredge and dump sites.

2.11 The aforementioned reefs are keys areas to our business in that they are home to two very distinctive forms of Cyprea, namely, Cyprea zoila frendii vercoi and Cyprea zoila rosselli.

Lorenz (2001) explains that cyprea lack a veliger larval stage, and are reliant on the permanent presence of hosts (various porifera species). This makes them highly localised and unlikely to spread into other areas. While these two species of gastropod are not themselves rare, the forms that come from these areas are of a larger size and of a very distinct shape due to the localized nature of this population. This makes them highly sought after by shell collectors the world over and henceforth they are an important part of our income. We have been very careful to manage stocks to ensure future supply of these unique forms. The concern we have is that the "fallout" from the dredging operations could affect the sessile invertebrates that these shells rely on. Section 9.1.4.1(p.141) mentions four possible impacts of the increased water turbidity.

Zoila is a sub-genus designation within the cowrie Cypraea genus. The four species referred to are *Cypraea friendii, Cypraea rosselli, Cypraea venusta* and *Cypraea marginate.*

All of these cowries are found throughout the SW of WA and as such are endemic to Australia. Only *Cypraea friendii* is found outside of WA in SA and the form is called thersites. None of them are endemic to KGS as this implies they are found there and no where else. Shell collectors are most interested in the variability in colour and size of these species which they refer to as forms. For instance, *Cypraea venusta* is generally a cinnamon-black blotched cowrie with grey margins but it can also be found in deep water as a white-golden-peach colour which is more highly prized by collectors. None of these species and particularly the rarer colour forms are found in the dredging or disposal footprint or in any area that is predicted to be influenced by the project (Wilson, 1993). The closest they can be found to the dredge area is Michaelmas Reef and Gio Batta Patch while the closest to the disposal area is Bald and Limestone Heads. None of these areas will be adversely affected by dredging or disposal nor will the cowries be impacted.

3.2 Contrary to the PER there is no evidence that pilchards are important to Great-winged Petrels and this species is rarely seen foraging over the inner shelf.

This comment is noted and acknowledged.

3.4 The nutrient flux from Princess Royal Harbour could be altered by tide changes in bathymetry into Princess Royal Harbour and this may change the extent and location of phytoplankton blooms in King George Sound.

17.7 The EPA Service Unit does not consider that the information in the PER and associated GEMS report (Technical Appendix 1), as presented, convincingly substantiates the claim that flushing rate of PRH will not be reduced (and may be marginally increased) as a result of the proposal. The most significant information relating to the effects of the proposed works on the flushing of PRH is contained in the PER/GEMS report statement that: ' After the 15 day simulation, 77% of the dye had left Princess Royal Harbour in the post-dredging case compared with 72% in the pre-dredging case'. However, this statement is not accompanied by any further discussion and some critical contextual supporting information is missing.

However that case may well become convincing if this finding is discussed in more detail and supplemented with the following contextual information:

- **a more detailed description of the model tracer source: for example, whether it was continuous or instantaneous;**
- **three superposed plots of tracer mass vs. time (over the 15 days simulation period) for: (a) mass released from the source, (b) mass resident in PRH for the case of existing bathymetry, and (c) mass resident in PRH for post dredging/reclamation bathymetry case;**
- **a statement (and justification) of the numerical accuracy of the modelled tracer results; and**
- **confirmation that the bathymetry used to represent the proposal in the above modelling is for the maximum proposed bathymetric change specified in the final description of the key characteristics of the proposal requested in the first page of this advice.**

The EPA Service Unit looks forward to receiving this additional contextual information to support the conclusions presented in the PER.

The exchange between the two systems was studied in detail (GEMS, 2007 - pp. 54-66) and it was found that the currents in King George Sound have little connection to Princess Royal Harbour. The flux between PRH and KGS was studied in very high resolution and it was shown that during each tidal cycle the total mass of water passing between the two systems does not change significantly from the present.

The study showed that there are minimal changes to the currents anywhere in KGS or PRH (GEMS, 2007 – p.64). The only location where there will be some change is in the entrance to PRH where the current speeds will be slightly slower due to the greater bathymetric cross section.

A simulated dye tracer study was undertaken with the high resolution model involving the continuous release of dye (GEMS, 2007 – p.66). The results of two simulations for the existing and post-dredging bathymetry were compared and only showed minor differences. Further, it can be strongly argued that the proposed differences resulting from the proposal will result in a nett environmental benefit as the historically eutrophied waterway of Princess Royal Harbour will experience an increased exchange of seawater.

The proponent does not consider that the contextual information requested by the EPASU (superposed plots of tracer mass vs. time over the 15 days simulation period for mass released from the source, (a) resident in PRH for the case of existing bathymetry, and (b) resident in PRH for post dredging/reclamation bathymetry case) provides any further insight to the results and will not alter the conclusions made from the tracer studies as detailed on page 57 of TA 16.1. This is because the results for the mass flushed from PRH are already stated in the text on page 227 ("After the 15 day simulation, 77% of the dye had left Princess Royal Harbour in the post-dredging case compared with 72% in the pre-dredging case).

The two independent peer reviews were requested via their scopes, also forwarded to EPASU, to specifically interrogate the Princess Royal Harbour flushing dynamic issues and neither reviewer identified any material issues with this specific flushing dynamic. However, APA has requested its modelling expert to re-run these simulations and provide the requested information that is outlined in the document titled ‘A Study of the Princess Royal Harbour before and after the Proposed Dredging Program’ by GEMS, July 2008.

No physical tracer studies have been undertaken for verification of this computer simulation however, the current modelling that was undertaken has been verified extensively against data and the modelling of PRH was undertaken on a much higher resolution grid than other previous published studies.

There are some differences in the bathymetry modelled versus the refined channel design in that the cross sectional area has increased from the PER version that was previously proposed to finish at a an area of 5660m2 to the newly refined channel dimensions that equate to 6447m2 (Figure 6.1). However, this is likely to further enhance the increase in exchange of the historically eutrophied water body.

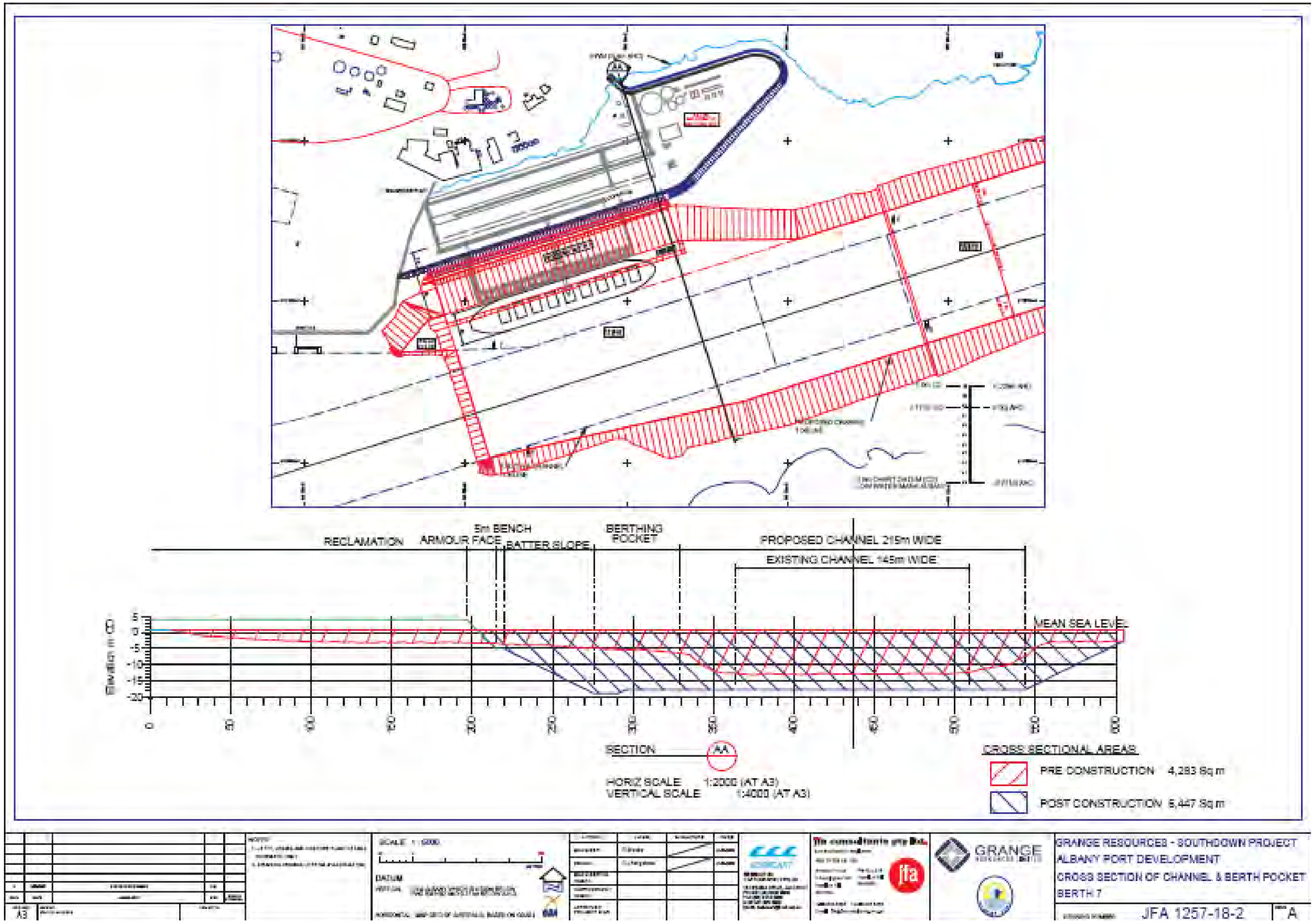


Figure 6-1: Cross section of Channel and Berth pocket

3.5 Filter feeding planktivores such as pilchards will be sensitive to turbid waters that may clog their gills when foraging. This could lead to short to medium term avoidance of King George Sound during and following dredging.

7.1 We have a fish-processing factory in Albany with our main product being Pilchards from both bait and human consumption Australia wide. Our concern with the blasting of the channel is the affect it will or could have on the fish stocks. The blasting, dredging and dumping of the sand will cause turmoil in the water - water colour change and in general the dynamics if the sound will change.

The works associated with the Albany Port Expansion do not include blasting of the channel. Filter feeding planktivores are unlikely to ingest sediment directly. Due to their mobile nature these fish are likely to move away from the impact zone and it is not anticipated that they will be largely affected by the turbid plume. In previous dredge scenarios, such as Geraldton, anecdotal evidence supports the argument that dredging has had a positive impact on fish and fishing.

3.6 Changes to bathymetry including the provision of deeper channels and a major sediment berm are likely to change the pattern of dispersion and availability of pilchards to both seabirds (also including Little Penguins, Crested Terns, Australasian Gannets and Pacific Gulls) and the fishing fleet with unknown consequences.

The availability of pilchards to seabirds is not predicted to change due to the mobile nature of the birds and the pilchards. APA has and will continue to liaise with the Department of Fisheries and industry representatives to monitor and discuss the existing fish monitoring programmes and stock assessments.

4.1 Contrary to the comments in the PER p 89, there have been significant numbers of juvenile pilchards in King George Sound in recent year. Please see 210 of the *State* of *the Fisheries Report 2005/06* produced by the Department of Fisheries.

The comment referred to was information obtained directly from publicly available reference material available from the Department of Fisheries website and included in the reference list. WAFIC may wish to address this issue directly with DoF if the information is incorrect.

4.2 There is widespread concern amongst Zone 1 licence holders that the proposed expansion, specifically the dredging activity and dumping of spoil, will severely impact and potentially close the fishing, as a result of:

- **Short term impacts on fish populations within King George Sound once dredging commences.**
- **Reduced access to their fishing grounds in the channel, the disposal site and the areas the plumes will occur (PER.Figures 9.7, 9.8 and 9.9). The proposed disposal site for dredge spoil is one of the key fishing areas, particularly over the summer months.**
- **Long term irreparable damage that results in pilchard populations no longer inhabiting King George Sound long after dredging activities ceases.**

Many fish species appear to be highly sensitive to increased turbidity and as it is proposed that dredge spoil be disposed in the entrance to King George Sound, which fishermen believe is the only access point by pilchards.

Every effort has been made to minimise impact as a result of the dredging and disposal program. However, in the unlikely advent that impacts to fish populations do occur they will be short-term and are highly unlikely to result in the closure of the fishery.

The Harbour Master has confirmed with the commercial fisherman that they will be able to fish the proposed channel outside the times directly prior to and following shipping movements and anecdotal reports suggest that the new channel will provide the pilchards with a favoured habitat type (steep banks) that may in fact, increase the kill efficiency, or catch per unit efforts of the pilchard fishery.

There is no reason to assume that the modifications to the seabed proposed will have any negative long-term effects on pilchard populations. Pilchards are filter-feeders in the water column. There is some anecdotal evidence that fishing activities and catches improve during and shortly after dredging (e.g. Port Hedland and Geraldton).

Elevated turbidity at the disposal site will be limited in area and will not block the access by pilchards.

4.3 We note the PER, p160 states *'It is anticipated that the dredge will not significantly impact mobile marine species in the Albany area as turbidity excluding natural background level will be spatially limited and temporally limited to a period of four to seven months.* ", It is not clear how this conclusion as been reached. It appears there has been no research undertaken on the impacts of dredging on pelagic marine species as part of this PER, so it is not known how widespread, either spatially or temporally, the impacts will be.

Modelling has demonstrated that the impacts from dredging will be spatially and temporally limited. As elevated turbidity will be time limited and intermittent it is anticipated that pelagic fish stocks will not be impacted due to their mobile habits.

4.4 Other concerns of the dredging activity include indirect impacts such as reduced food availability, changes to the currents resulting from altered bathymetry and the potential for contamination of pilchards from the release of mercury from the sediments which will render them unsuitable for human consumption.

The potential for contamination by metals has been assessed to be negligible in-line with NODGDM. This is due to the fact that the metals are not bioavailable and will remain bound to the sediments and as further precautionary measures the proponent has committed to disposal of this specific material by non-overflow dredging which does not allow discharge of plumes. The very small volumes of this material will be selectively dredged and subsequently covered by at least one metre of clean material effectively locking it up. The depth of water at the disposal area is greater than 40 m which will prevent the resuspension of the capping material. Examination of the site has revealed that the seabed is flat and shown no signs of wave induced sand ripples confirming the stability of the area for disposal.

5.1 We as a fishery have also got grave concerns in relation to both the dredging and dumping grounds (see attached maps). The dredge channel goes straight through our traditional fishing grounds (see attached fishing history), this channel takes out 1.8 sq kilometres of fishing grounds but it will also have the effect of locking fish in an area where we are not able access. The sardine by nature tends to find areas to lay up where there is deep water and steep banks, this channel will have both these attributes. Maritime law does not allow fishing activities in navigation channels and the fines for doing so are substantial (see attached document).

The Harbour Master has previously discussed with fisherman that access to these grounds will not be lost outside of shipping movements. The letter attached by the submitter outlines that no nets should be left 'unattended' in the channel or other related port infrastructure areas (e.g. turning basin).

7.3 Re: Section 6 .6 Marine fauna- Pilchard juveniles are unlikely to inhabit bays and estuaries in WA. Historically, that is correct but during the last five years there have been large tonnages of juvenile fish caught in King George sound, and many tonnes seen that were too small to catch. (Ref: Fisheries Research as they have samples of these fish)

Re: Section 6.8.5 - The pilchard quota mentioned of 1,500 tonnes is now 2,683 tonnes.

These comments are acknowledged.

18.1 A stakeholder asked how the fishing industry could be helped during the dredging component of the project. APA mentioned extensive consultation being undertaken with concerned stakeholders. Further consultation and management of impacts to the fishing industry needs to be addressed.

To date APA and Grange Resources have undertaken an extensive, diverse and successful range of engagement activities. However, notwithstanding our collective efforts in this regard to date, APA and Grange Resources are currently further developing their continued engagement strategies including, in particular, the fishing industry. It is noted that dredging, land reclamation and the movement of cargo and vessels through a working port are all normal activities for a port and the industries that have subsequently set up residence within the waters of the port recognised this as part of their business risk (i.e. on occasions there are activities that the port undertakes during it's normal business that may have the perception of influencing their enterprise), Further, the Western Australian Environmental legislation that is accredited under the Inter Governmental Agreement with the Commonwealth does not consider commercial or economic matters within its scope.

9.5 It is noted from the Albany Port Expansion Proposal that the risk to the aquaculture industry and the food chain is reported as minimal where adequate controls are in place. However, a management plan and response protocol should be included in the event that conditions that may adversely impact on the aquaculture industry in the region occur (or are identified). This should also include strategies in the event of increased turbidity and changes to heavy metal and microbiological levels that exceed the WASQAP guidelines.

A water quality monitoring programme will be in place during dredging and post dredging and a draft Dredge and Land Reclamation Management Plan was included as a technical appendix 16.7 in the PER detailing monitoring and management responses. APA has had a preliminary discussion with the Department of Fisheries on how best to supplement the existing WASQAP fish/aquaculture monitoring programmes and stock assessments in order to monitor these aspects. The agreed monitoring protocols will be developed with advice from DoF and incorporated into the DLRMP that will be finalised and approved by the EPASU prior to ground disturbing activity. Further, based on a discussion with DoF, APA agrees to the DoF suggestion that a WAFIC representative and DoF local Officer be nominated as representatives of the Dredge Management Group.

13.7 Mussels. Areas with respect to planned activities from which wild mussel spat are collected. It is stated that filter feeders are 'capable of adjusting their filtration rates to balance the amount of material filtered ... and the amount rejected as pseudofaeces'. This is correct but only up to a certain level and duration of turbidity.

This comment is acknowledged and agreed.

13.2 At various places in the document, the impression is gained that dredging is only planned to occur once. This is probably not the case in reality as a dredged channel would have to be maintained, which would mean dredging impacts would be ongoing as well as in initial port construction and would impact on 'wild' biota and aquaculture.

Albany Port has been blessed with predominantly siliceous sediments that are inherently stable and the dredge history and lack of maintenance dredging is evidence of the highly unlikely situation where on-going frequent dredging would be required. The capital dredging program is a one off and there is no evidence to suggest that regular maintenance dredging will be required. If maintenance dredging is required at a later stage it will be of a much smaller scale and managed appropriately in-line with all prevailing regulatory requirements. In a worst case scenario if maintenance dredging is required, then Albany's history indicates that the extent, frequency and duration of the event/s would be spatially and temporally limited such that resultant cumulative impacts are likely to have a negligible effect on biota and aquaculture.

13.20 Comments on dredging throughout the report do not stress that dredging would be repetitive, not only occurring at the time of installation, Also, ship movements would be ongoing, so turbidity would be frequently episodic if not constant and be in addition to normal winter storms (Fig. 6.14). Such turbidity would pose problems for bivalves such as mussels - wild & farmed) and other filter feeders (ascidians, some cnidarians, sponges etc.) that would have to shut down for longer and more frequent periods of turbidity. This disruption to their feeding regimes could impact on their health, growth rate, reproduction, etc.

Additionally, the time series of turbidity outputs provided in the GEMS report shows that turbidity outputs frequently exceeds 10 mg/L for the autumn period. Please provide more

discussion on the impacts on the mussel farms given the number of 'spikes' above the ANZECC Guidelines for TSS. How will these frequent turbid events impact on the aquaculture operations and how will they be managed to minimise impacts on aquaculture activities?

The APA has committed to enhancing and supplementing the WASQAP monitoring protocols throughout the project, including TSS to ensure the aquaculture operations are not negatively affected. The aquaculture operations will have representation on the Dredge Management Group via WAFIC and the Aquaculture Council of Western Australia and any potential issues that arise can be effectively resolved via this forum. In regards to management of potential TSS spikes there are a variety of strategies that can be employed dependant on the specifics of the issue and influence; these include alteration to the dredge area being worked.

Shipping movements are a requisite part of normal port activities throughout the globe and the Albany Port Authority is a designated industrial bulk cargo port and therefore; the designation of this activity is a conforming use under this authority. To this end, the overall shipping movements are anticipated to increase from an approximate average of three vessels per week to four vessels per week at peak Southdown production. The deep draft vessels that will be used in this proposal will have the same, if not more under-keel clearance compared to the vessels that currently traverse the area without any adverse detectable influence to the biota mentioned. On average three of the anticipated four ships per week will have a significant increase in under-keel clearance that will further decrease the likelihood of potential flow-on impacts raised.

Section 9.1.5 of the PER details the potential impacts to fishing and aquaculture. Modelling (Section 9.3 of this document) indicates that the average TSS over most of the aquaculture leases in the three dredge periods is 1 mg/L. Intermittent turbidity during an autumn meteorological pattern of easterly winds may reach an average of 5 mg/L at some aquaculture leases. This level is within ANZECC guidelines for the protection of aquaculture species.

The ANZECC guidelines provide a value of 10 mg/L for suspended solids for saltwater aquaculture production but this is for continuous exposure and does not reflect short-term spikes. The short-term spikes shown in the modelling will have minimal impact on the mussels being farmed on the aquaculture leases. The duration of the spikes and their intensity are not sufficient to harm or otherwise effect the production of the mussels.

13.13 With respect to the effects of dredging of the shallow areas for 'reclamation' for ship berths at and to the west of the passage to Princess Royal Harbour. Currently these are sites with inshore communities but there is no evidence that there has been a survey of their current use as nursery areas for fish, crustaceans and other phyla.

The area to be dredged and reclaimed has limited habitat which would qualify as nursery habitat. Habitat suitable for nursery areas for fishes, crustaceans and other phyla has been avoided in this proposal by minimisation of seagrass losses.

18.2 The document at section 6.8.5 briefly describes the aquaculture and commercial fishing activities in King George Sound. It should be noted that the South Coast Purse Seine Fishery targets pilchards that are processed locally in Albany and provides jobs in the town. An important point not mentioned in the PER document is that a feature of the pilchard fishery in King George Sound is that the fish are normally caught relatively close to the unloading jetty at Emu Point and consequently can be landed quickly and in very fresh condition. The fact that Albany pilchards are delivered to the processing works quickly ensures a high quality that attracts a premium price and market for the local product.

These comments are acknowledged. Emu Point is not anticipated to be affected by dredging and total suspended solids within Oyster Harbour are predicted to be less than 1 mg/L during two of the three dredge scenarios (March to June and July to October) and up to 5mg/L on the third (November to February).

10.7 In regard to Section 4.4,3 and Table 4.2 of the PER document, DPI is supportive of the alternative option for the land reclamation area which would create a rocky tidal pool and limit impacts on adjacent 'A' Class Reserve 27068. Section 6.7.8 of the PER provides further justification for this alternative option.

This comment is acknowledged.

11.8 The reclamation area will impact on a rocky shoreline and vegetation on an 'A' class reserve. A key aspect of the environmental impact assessment process is to avoid impact if practical - this is a primary step in the environmental assessment process. It can be argued that the reclamation area could be set back from the shoreline to avoid these impacts, and discussions have taken place locally to explore this possibility. Such a redesign, with an open area of water along part of the northern shoreline, would avoid the loss of the rocky shoreline habitat as well as impact on the terrestrial vegetation, and provide a clear demarcation between the 'A' class reserve and port area.

The environmental protection principles do not appear to have been applied with regards to the design of the reclamation area and its impact on the 'A' class reserve. As avoidance is possible, and the impact not justified in terms of need, then the reclamation area should be designed to avoid these impacts.

13.8 It is proposed to clear 0.31 hectares of native vegetation in Mount Adelaide A Class reserve no. 27068. An A class reserve should not be degraded in any way.

These comments are acknowledged and in response to concerns raised by both local regulatory agencies and the community the APA commits to the alternate design detailed in the PER in section 4.4.3.

In addition to the high resolution study of the flow through the entrance of Princess Royal Harbour, GEMS has established a very high resolution grid of the alternate design for the reclamation area to study the flushing of the backwater created between the reclaim area and the “A” class reserve.

The design investigated is shown in Figure 8.1. The GEMS 3D ocean model, which was used to study the flow through the entrance of PRH (GEMS, 2007 – pp 54-66), was used to study the flushing of this region over a period of a month to cover 2 spring-neap tidal cycles and a range of wind conditions. The results showed that the average time taken for 95% of the waters to be exchanged with waters from the PRH-KGS channel was 77 hours. Of course the flushing time will be shorter than this during spring tides and strong winds and longer during calmer conditions.

16.4 In section 4.4.3 of the PER the proponent provides information on an alternative option for the land reclamation component of the proposal. The preferred land reclamation option requires the clearing of 0.78 ha of vegetation of which 40 per cent is intact vegetation in the Mt Adelaide class A reserve for 'Recreation and Parklands' (reserve no. 27068 managed by the City of Albany). The proponent should describe the differing environmental/ecological impacts and benefits associated with the two options for land reclamation in order for DEC to provide informed advice on the benefits and impacts associated with each option.

APA believes the information provided clearly provides an accurate description of the positives and negatives between the two options (See Table 4.2 of the PER) and investigations into the dynamics of the tidal pool found the following:

The design investigated is shown in Figure 8.1. The GEMS 3D ocean model, which was used to study the flow through the entrance of PRH (GEMS, 2007 – pp 54-66), was used to study the flushing of this region over a period of a month to cover 2 spring-neap tidal cycles and a range of wind conditions. The results showed that the average time taken for 95% of the waters to be exchanged with waters from the PRH-KGS channel was 77 hours. Of course the flushing time will be shorter than this during spring tides and strong winds and longer during calmer conditions.

The development of the alternative was initiated, discussed and amended with advice from the local Department of Environment and Conservation (Mr Laurie Anderson) and Department of Water (Mr Chris Gunby). The reclamation area now no longer encroaches on the A Class Reserve thus removing the need to clear native vegetation in this area.

16.15 There is insufficient information throughout the PER to assess the potential impacts of land reclamation and associated sea wall construction. The proponent states that there is potential for contamination via elevated levels of nutrients and sediment disposed by the cutter suction dredge and states that "it is anticipated that this dilution will be achieved due to the position of the land reclamation in an area of high flushing at the entrance to Princess Royal Harbour? (page 39). There is no supporting information to justify the claim that the potential for elevated nutrients will be managed through natural processes. The proposed

impacts including changes in water quality and dredge spoil dispersal for land reclamation purposes, should be modelled and presented. In terms of stormwater management associated with land reclamation works, the potential impacts resulting from a significant rainfall event should be discussed and assessed. A Stormwater management Plan for the reclaimed area should be presented for approval prior to construction.

The potential impacts on BPPH from increased nutrient loads and sediment deposition resulting from activities associated with land reclamation and seawall construction should be discussed and scientifically validated.

A Land Reclamation Management Plan (including a requirement for stormwater management into Princess Royal Harbour and seawall construction management and monitoring strategies) should be required as a Ministerial Condition if this project gains Ministerial approval.

The proponent encourages the author who has technical questions and concerns to refer to the technical reports and appendices that address these concerns in detail, for example, Section 8.1 from the Dredging and Land Reclamation EMP that outlines the Water Quality Monitoring Programme.

There will be no increase to nutrient loading. Some of the nutrients that are already present will be mobilised into the water column at levels that have been assessed not to cause harm to the seagrasses. Much of the nutrient rich material will be locked away in the reclamation area thus leading to a reduction in nutrient loading in Princess Royal Harbour and therefore; can be considered a nett benefit to the water body.

The development of an approved Stormwater Management Plan has already been committed to by the proponent of EPA Assessment 1596. Page 39 in the PER document states, "Following completion of dredging the stockpiled material will be used to fill in the remaining ponded area. A final graded fall of approximately 1% will be trimmed back to the central area of the reclaim that will ensure any interim surface water accumulations infiltrate *in situ*. This final trim and grade will ensure that stormwater is ameliorated in the interim until the construction of an adequate stormwater system is implemented by Grange for their portside infrastructure."

There will be no increase to nutrient loading. Some of the nutrients that are already present will be mobilised into the water column at levels that have been assessed not to cause harm to the seagrasses. Much of the nutrient rich material will be locked away in the reclamation area thus leading to a reduction in nutrient loading in PRH.

16.16 Finally, it should be noted that there is a discrepancy between Figures 4.6 and Figures 11.9, 11 .10 and 11.11. Figure 4.6 indicates that land reclamation follows the existing shoreline and does not extend into coastal waters, however according to the computer generated images of areas to be reclaimed (Figures 11.9, 11.10 and 11.11) it is clear that the area of reclamation extends from the existing shoreline. Figure 4.6 is therefore misleading and should be adjusted to reflect the actual reclamation proposal.

The alternative land reclamation presented in the PER has now been selected as the preferred design (Figure 8.1). This diagram shows the configuration of the alternative design including contouring the land reclamation area on the eastern end of the landward face.

11.7 The reclamation area covers some 9 hectares, including a rocky shoreline. Diagrams in the PER do not demonstrate that the Grange Resources development will require all of this area, and the use of the area at the eastern end is not detailed in the PER. An overlay of the Grange resources development and the reclamation area is needed to better determine this.

The layout published on page 29 of the PER clearly demonstrates that Grange requires all the land reclamation area to accommodate its infrastructure and the angle of the eastern end of the reclaim is required for technical stability requirements in order to maintain structural integrity. It would be a very poor environmental and economic outcome if the seawall shape is changed for aesthetics and then subsides into the belying waters. As the alternative design for the land reclamation has now been selected the layout is being technically investigated and will be changed to accommodate the requisite filter plant and associated infrastructure within the smaller reclamation footprint. No further reductions in the footprint are technically possible at this time.

16.47 The PER states that Mt Clarence-Mt Adelaide Reserves contain the last remaining areas of relatively intact coastal vegetation representative of the Albany Vegetation System (Beard, ' 1979). On this basis, it is recommended that options to avoid impacts on the Mt Adelaide Reserve are further investigated by the proponent. Furthermore, it must be clarified to what extent avoidance of impacts on terrestrial reserves would result in further impacts on BPPH.

The alternative land reclamation presented in the PER has now been selected as the preferred design (Figure 8.1). This design will not affect the A Class Reserve and will not have any additional impact on BPPH.

16.48 It is noted that there are a number of priority, declared and/or weeds of national significance that have been recorded at the proposed development site. Given the close proximity to conservation significant values, it will be necessary that the proponent manages and controls weeds. In terms of other indirect impacts, the potential for the spread of dieback is a key concern to DEC. The proponent must demonstrate that adequate measures will be adopted to minimise risks to adjacent conservation significant vegetation.

16.49 The proponent should be required to develop a Flora and Vegetation Management Plan that has specific measures for weed, fire and dieback management to address these issues on site and in adjacent high conservation value areas. This plan should be developed in consultation with, and to the satisfaction of, DEC.

Weed, fire and dieback management will follow APA's current procedures to ensure the conservation area is not further impacted. As the alternative land reclamation has been committed that does not impact the A Class reserve there are no longer any interactions or access via vegetation and a management plan is therefore; no longer required.

16.46 It is noted that there are three taxa of conservation significant flora found adjacent to the proposed reclamation footprint. These are Thomasia discolor, Callistachys sp. south coast variant and Empodisma gracillimum. According to the PER the proponent does not anticipate having direct or indirect impacts on these species or their habitats. The proponent should undertake a vegetation/flora monitoring program to demonstrate the veracity of the claim that this project will not have adverse affects on these flora.

As the alternative design of reclamation area has now been committed to that does not encroach on the A Class Reserve, there will be no interaction with the vegetation and it will not be disturbed in any way.

6.8 Terrestrial Fauna

16.50 The proponent has not assessed any impacts on terrestrial fauna that may inhabit areas within or adjacent to the development site. An explanation for the exclusion of this information should be provided.

Recommendation:

An addendum to the PER should 'include justification as to the exclusion of terrestrial fauna impact assessment outlined in section 5.2 of this advice.

As the land reclamation will not be interacting with the reserve no impacts to terrestrial fauna are anticipated.

6.9 Noise and Vibration

9.1 This proposal includes activities in the "Lay Down Area" such as pile driving, construction cranes, haul trucks, excavators, dozer and dredger works. The Albany Port has advised additional management controls (such as barriers) will be required due to the EPA noise regulations being exceeded during all stages of proposal implementation. The noise regulations will be exceeded at the nearest commercial premises, and during pile driving at the nearest residential premises. An overall Noise Management Strategy is not clearly defined in the PER; however the Albany Port has stated that it will submit a specific Noise

Management Plan to the regional DEC for approval at least seven days before the commencement of works. It is recommended the Albany Port Authority also liaises with the City of Albany's Health Services Branch regarding the times of these activities and the application of their Noise Management Plan.

10.4 Section 9.5.5 of the PER document states that noise levels associated with the proposed expansion are likely to exceed EPA guidelines "without additional controls" being implemented. Given the close proximity of the Port to existing commercial and residential development in Albany's city centre, and to the future waterfront development along the Princess Royal Harbour foreshore, it is considered essential that a noise management strategy be prepared and implemented. This strategy should clarify and employ the "additional controls" that will be required in order to minimise amenity impacts on nearby land uses, as well as make the development compliant with EPA guidelines.

12.4 Because of the large scale of the proposed project, and the likelihood of the potential noise impacts, I would recommend that the proponent be required to develop a Noise Management Plan for the project under noise regulation 13, for approval by the relevant agency (either City of Albany or DEC).

A Noise Management Plan will be developed prior to construction at the port and a Noise Management Strategy will be prepared for all aspects of dredging and land reclamation. The plan will outline how noise will be reduced through design, operational procedures and will outline monitoring strategies to measure the effectiveness of these controls. The Albany Port Authority will develop this plan in consultation with the City of Albany's Health Services Branch and the local Department of Environment and Conservation and will liaise with them regarding the times of works. Where possible, construction work will be carried out between 7 am and 7 pm during any day which is not a Sunday or public holiday. If work is required outside of these hours site affected residents will be informed at least 24 hours before hand and site specific noise management plans will be prepared and submitted to the regional DEC office for approval at least seven days prior to the commencement of work.

The APA will liaise with both the regional DEC and the City of Albany's Health Services Branch regarding the application of the specific Noise Management Plans.

12.1 The proposed project involves dredging, land reclamation, disposal of excess dredge material and berth construction. The project is expected to commence in August 2008, and be complete by mid-2010. I agree that all activities and operations in the whole process of project can be treated as construction work, and the dredging and reclamation and berth construction areas can be treated as construction sites.

The proponent correctly proposes to manage the noise in compliance with the noise practices set out in Australian Standard 2436-1981, which will limit the construction work to daytime only and the use of the quietest reasonably available equipment. It is also correct for the proponent to propose additional controls and to seek an approval from DEC regional office seven days in advance if an out-of-hour construction is required.

The predicted noise levels from piling and from other construction activities of the two stages were assessed against the assigned noise levels at the nearest residence (Rl) and at the closest industrial/commercial premise (R2). Though the noise from construction activities does not need to comply with the assigned noise levels, assessing the construction noise against the assigned levels is helpful to demonstrate the potential noise impacts.

These comments are acknowledged.

12.2 However, I have concerns about noise from pile driving and from material transport that the proponent may need to address, as follows:

Piling noise

The noise from pile driving is predicted to be about 60 dB(A) at R1 and 77.8 dB(A) at R2. It can be seen from the plan that R2 is only about 100 m from the piling site, Though it is not clear what the likely duration of piling is or the number of piles to be driven, the piling noise level of 77.8 dB(A) will have significant impact on the occupiers of R2, especially if there are offices or caretaker residency in it.

The excessive piling noise level at R2 is not only due to the close distance, but also due to the conventional impact pile driver with sound power level of 130 dB(A) proposed for the project. The proponent has already identified this noise issue, and stated in the PER document that they will "assess other type of pile driving methods that have lower sound power".

Instead of just an investigation of other types of pile driving methods that have lower sound power, I would recommend that the proponent make the use of pile driving methods as a firm commitment. I would also recommend that the proponent consult with the occupiers of R2 regarding the piling noise, and make an arrangement with them that minimises the piling noise impact.

Under the Environmental Protection (Noise) Regulations 1997 the construction activity at the Port is categorised as 'construction work'. Regulations for 'Construction Sites' state for Regulation 7 does not apply if the occupier, amongst other points, shows that that equipment used on the premises was the quietest reasonably available.

A conventional diesel hammer was used in noise modelling detailed in the PER. There are geotechnical and engineering limitations that prohibit the use of some alternative methods of pile driving for instance screw piles would not be practical for piles driven to these sorts of capacities. Investigations have shown that a hydraulic hammer is at least one order of magnitude less and is between 110 to 120 dB (A). APA commits to complying with the noise regulations.

APA will roll out regular project updates and communications to the public via the local media prior to and during the construction phase of the project to give the public and any potentially affected parties' notice of upcoming works and the potential for unusual activities (e.g. piling phase).

16.51 It is noted that the PER states "aspects of the land reclamation construction that will generate excessive noise, such as pile driving, will be undertaken during daylight hours where possible" (page 204 of the PER). On the basis that the site is within close proximity to residential areas it is recommended that construction be confined to normal working hours (i.e. 0700-1900 hours Monday to Saturday inclusive). A Noise Management Plan should be required and any work outside these hours should be approved by the City of Albany and DEC.

Recommendation 35:

A Noise Management Plan should be developed that includes requirements for the proponent to undertake construction between 0700-1900 hours Monday to Saturday inclusive and to demonstrate that best practice noise minimisation techniques will be utilised.

These comments are acknowledged and it is agreed that APA and Grange commit to using other types of pile driving equipment where practicable. Construction will be confined to normal working hours where practicable and a noise management plan will be prepared. This plan will be provided to the DEC and those who are affected outside of these times will be notified with at least 24 hours notice. Additionally, APA will continue regular communications with the public to inform them of impending works and progress to date via the local media.

9.9 The PER does not address whether the proposal (during construction and/or operation) requires substantial transport of raw materials, products, people or wastes, which may affect the amenity of the local area or pose a risk to the environment along transport routes. It is recommended that consideration is given to the potential impacts of transport on local communities, including noise, changes to traffic volumes and periods of use.

Construction activities will make use of existing transport infrastructure and will not affect the amenity of the local area or pose a risk to the environment along transport routes. As construction work will be carried out between 7 am and 7pm where possible and traffic volumes will not be evidently increased. The volume and duration of additional traffic derived from the construction phase will be limited in their extents, volume, duration and impacts.

6.10 Visual Amenity

1.1 The size of the port expansion and the shed is out of scale with the natural environment and will damage the visual amenity of the harbour entrance from a number of view points.

The shed does not form part of this assessment. The Environmental Protection Authority will make recommendations on the visual aspect of the port expansion and APA will adhere to these. The seawall will be armoured with granite to maintain visual consistency and the DPI are supportive of this. Grange Resources the proponent for EPA Assessment 1596 have committed to implementing all feasible measures to minimise the visual impact of the infrastructure such as the construction of an enclosed storage shed to reduce visibility of the stockpiling and ship loading operations. Grange will engage an architect to oversee the specification of the materials / colours for construction of such infrastructure and may employ strategies, such as the use of neutrally coloured, non-reflective materials.

8.22 Section 9.6.3 (pg. 207) The construction of the shed associated with the Albany Port Expansion Proposal will block out the view of Semaphore Point from the Harbour (a historically significant maritime site). The large size of the shed will also deflect the easterly winds, turning Attaturk Passage into a wind tunnel.

Semaphore Point is a highly disturbed and degraded piece of land that has been used extensively for a variety of intensive commercial activities over many decades and its current land zoning is appropriate for the proposed adjacent development.

Any structure, be it a ship at a berth or a building will create a variation in wind strength and direction at the specific structure itself, however, to assert that the shed will in effect turn “Attaturk Passage into a wind tunnel” is unrealistic. The construction of the shed will not alter the velocity of the winds any more or less than occur already through the passage.

8.18 While dredging is in progress the visual amenity for local residents, recreational boating, scenic tourist sites and charter boat tours will definitely (not "may" be, as stated here) be affected. The statement the "...the socio-economic benefits of the proposal to the region will outweigh any potential short-term disruptions to amenity" is short-sighted, as the detrimental environmental effects that this proposal could cause will definitely have long-term social and economic ramifications, for all parties mentioned above.

The proposal is undergoing a rigorous approval process and substantial effort is being made to minimise, manage and mitigate any potential risks and impacts. Contrary to the authors comments there are very substantial long-term (20 plus years) social and economic benefits to the region that could be realised if the project is to proceed.

The region appears to cope perfectly well with no indication of any social or economic downside to greater levels of turbidity experienced during large storm events from river discharges (e.g. the floods of 2005 that caused extensive and prolonged turbidity in the Albany waters). The proposed dredging related turbidity is largely within the levels experienced during the 2005 flood events.

The visual impact of the dredging programme may actually be of interest to tourists and charter boat operators and their fee paying passengers. For instance, at a similar dredging project carried out in Esperance in 2000 a local tour boat operator varied their operations so that tourists and sightseers could see the dredging and seawall construction as it added considerable interest to the tours being operated at that time.

13.9 Section 11.2.6. Predicted outcome for visual and landscape values. It is stated in the document that there will be a 'slight' reduction in amenity for several viewing locations in high sensitivity areas. The decrease in amenity is unacceptable for views from the Boardwalk (Figs. 11.15-17) and Ataturk's Memorial (Figs. 11.18-20).

10.1 The large shed proposed as part of the Port expansion will be visually polluting - its size will detrimentally impact the aesthetics of that area and will create a wind-tunnel effect through the Passage.

It is considered that visual impacts on the shoreline and landscape of the entrance to Princess Royal Harbour would more accurately be described as 'significant' or 'highly significant', rather than 'slight'. The reclaimed area will occupy a site that is prominent from a number of important view locations in Albany. The berth will be located immediately adjacent to the prominent rocky headland that forms the northern side of the natural entrance to Princess Royal Harbour, and it will be almost directly opposite Possession Point, which comprises the south side of the entrance. Although the shoreline to the immediate west on the northern side of the entrance has been altered, the shoreline that will be modified as a result of this proposal currently forms a buffer between the industriailsed port landscape and the natural landscape of the Harbour entrance.

DPI recommends: Visual Impacts have been reduced by orientating the eastern edge of the reclaimed area back towards the shore at a tight angle, thus protecting a portion of the natural shoreline at the headland on the northern side of the Harbour entrance. It would be desirable if this angle could be even tighter, to protect a longer section of shoreline. However, an angle that is too sharp may contrast too much with the more gentle curvature of the natural shoreline. A balance needs to be found between the desirability of protecting the natural shoreline, and creating a new shoreline that looks more visually compatible with the shoreline's natural configuration.

It is noted that local granite is proposed to be used for the outer rock layer on the edge of the reclaimed area. This is supported as the colouring will blend better than other options (such as orange lateritic rock) thus helping to Integrate the berth into its landscape setting.

The surface of the reclaimed area would look less intrusive from elevated positions above the site if material of a dark colour is used, for example black asphalt, as opposed to a light, reflective colour such as concrete or crushed limestone.

In respect to structures proposed for the reclaimed area, such as storage sheds, the choice of colour and the overall design would be of vital importance in reducing potential visual impacts. The advice of an architect should be sought in finalising the design of any structures.

Simulations should be produced showing several colour and design options for structures proposed within the reclaimed area. The simulated of storage sheds presented in the PER use a dull, dark grey-green colour for the illustrated shed. The difficulty with greens is that they tend to fade to a yellow tone over time, and it is rare that the green chosen actually blends with the particular green of the surrounding vegetation. Dark grey may be preferable and could be chosen to blend with surrounding rock outcrops, specifically those areas that are stained darker by algae, wave action etc. The grey would blend with both nearby rock outcrops and the water.

The shed depicted in simulations is a simple; single structured that stands out due to its bulk; largely its length as opposed to its height or width. The appearance of the shed's large scale-could be reduced by utilising features such as ridges, ribs or flat roof sections of a different colour (e.g. lighter tone of grey) at even intervals along the shed's length. For example, if the shed had the appearance of being divided into four segments, each individual segment would be more comparable in scale to nearby existing infrastructure. All sheds on the site should be of similar design and the same colour. Other infrastructure may differ in colour from storage sheds but should still look visually compatible, in the sense that structures should not draw attention by displaying a marked contrast in colour from each other.

The post construction views from the prominent view locations will not be significantly impacted by the proposal. Mitigation measures will be put in place as much as possible to reduce visual impact from these view locations and an architect will be employed to provide professional advice.

There are land requirement and technical stability issues that determine the lay-out and angle of the reclaimed area and seawalls containing it that override the visual amenity aspects. It would be a very poor outcome, both environmentally and economically if the seawall was to fail due to amenity alterations. However, APA has committed to an alternate design that reduces the impact to the rocky shoreline identified (see comment: 11.8, page 43 - 44).

The light colours of the computer generated images of the reclaimed area were used to highlight the spatial footprint of the view for adequate representation to the reader. The new land reclamation area colour will be no more reflective than the existing port land areas which are also all reclaimed land from previous dredging. The land will not be covered with asphalt due to stormwater management issues that would require an increase in the size of the reclamation to accommodate infiltration ponds capable of attenuating the runoff from a large bitumised catchment.

The comments on the construction materials of the proposed shed are outside the scope of this proposal. However, Grange Resources Limited, the proponent of that proposal (EPA Assessment 1596) is committed to incorporating the comments and suggestions in regards to shed colour and interval colour breaks. The positioning of the shed is so that from viewing across the Sound the shed is seen on a 45 degree angle rather than square on in order to reduce visual impact whilst keeping the reclaim area to a an absolute minimum.

An architect will be commissioned by Grange under EPA Assessment No. 1596 to assist in the final design to mitigate the visual impact of the shed and other infrastructure on the site.

Simulations will be produced based on the final, architect designs and colour selections.

15.2 The real impact appears to be in relation to the views from Mt Adelaide and Mt Clarence. These places have been heritage listed in whole or part in the State Register and the Register of the National Estate. They are important as heritage places, recreational reserves and tourist attractions in Albany, and the expansive views over King George Sound are important parts of their amenity. The PER predicts a 'slight reduction in amenity' and that 'visual quality will be slightly affected' (page 247), which is surely an understatement. The evidence of Figures 11.9, 11 .I0 and 11.17-1 1.20 suggests a highly adverse impact on visual amenity as a consequence of the reclamation and new berthing facilities.

It is not clear how that impact can be ameliorated given the nature and location of the proposal.

It is noted that interpretation from the computer graphic images (CGIs) is myopic in comparison to human sight, which coarsely views landscapes at approximately 160 degrees, unlike the CGI's that are telescopic in projection (i.e. there is a tendency for the CGIs to appear a lot worse than the actual construction). It is also noted that the visual amenity, particularly CGIs and their individual interpretations are extremely subjective and variable from person to person and opinion to opinion. The western end of the boardwalk and a significant route and approach to such, are through the heart of an intensive commercial activity zone and port/industrial zoned lands. The view shed referred to is a very small section at the western commercial end of the boardwalk. The view shed from Attaturk's memorial is best described as a slight reduction. The progression eastward around the boardwalk commencing from town is pronounced in its transition from central business area, urban development, port/industrial and then through into the scenic walk. Rather than unacceptable, it could be equally argued that the proposed development enhances the transition and interest of the walk into the natural area as the variance, diversity and transition from built forms through to land and sea-scapes is enhanced. Further, many local residents and tourists are interested in viewing a working port from such a vista, hence the popularity of the lookouts perched high above the port on eastern end of Marine drive (the City of Albany has recently bituminised and kerbed these hardstand lookouts due to their usage).

16.52 It is important that the EPA recognises that the proposed development area is in a significant historical site in a local and State context. There is a well promoted heritage walk trail to the summit of Possession Point and therefore there is potential to significantly impact on the amenity of this heritage walk as a result of the development of sheds and port infrastructure. This matter needs to be addressed in close consultation with the local community and various stakeholders.

Recommendation:

A visual impact management strategy should be developed in consultation with the local community and key stakeholders to ensure that local concerns can be addressed as far as practicable in site design parameters.

Albany has a very long maritime history and its settlement is directly linked to the port, which allowed the region to prosper as a vibrant community and has done so in excess of a 180 years. A visual impact management strategy will be implemented including the appointment of an architect to finalise the shed and infrastructure aesthetics.

6.11 Air Quality Dust

9.2 The Dust Management Plan is absent from the PER. It is recommended a dust management plan be incorporated into the construction phase of the development and for continual monitoring of air emissions during port activities. Dust monitoring should be at nearby locations representative of those sites where the highest impacts may occur, and incorporate adaptive management practices so as to respond proactively to conditions likely to generate dust from loading (or 'storing) activities.

The National Environmental Protection Measure (NEPM) for Ambient Air Quality prescribes an ambient air quality standard for inhalable airborne particulate matter (PM_{IO}) of 50 pg/m³ averaged over 24 hours. This is to protect human health and well-being, and applies in Western Australia at population centres and places here people live or congregate. In the absence of equivalent standards for the protection of vegetation, for the purposes of this assessment referents should be made to these environmental guidelines for protection of the human population, as these are expected to be highly conservative with respect to protecting vegetation health.

It is considered that the small size of the reclamation area and associated construction activities will not cause a significant environmental impact through dust. Dust is unlikely to be created at significant levels as construction will involve wet materials. A dust management plan will however be developed for construction. The APA is responsible for monitoring dust at the Port and will continue to do so throughout the land reclamation and construction phases. In addition to the comments above, APA is continuing the development of an operational dust monitoring program that has some substantive capital expenditure allocation in the current budget cycle in order to monitor their daily operation. This programme has been developed for existing operations and it would be further developed in time when changes, such as the operation of new infrastructure take place.

6.12 Social and Cultural Environment

8.4 It is not acceptable that heritage sites can "potentially be affected by sediment deposition from the dredging". Areas such as Semaphore Point (just inside the Harbour - a significant maritime heritage site where messages were sent to shipping traffic by flags) and Ataturk Passage (the entrance to Princess Royal Harbour) will be impacted and altered by sediment deposition.

The predicted outcome that no registered aboriginal sites or marine heritage sites will be adversely impacted by the Albany Port Expansion Proposal does not take into account Semaphore Point (which is a historically significant maritime site.

Figure 9.11, Chart 2619 “King George Sound” and “Princess Royal Harbour” (Corrected 6.7.1956) shows that Semaphore Point is shown well inland and as the name implies it was at an elevated position in order for it to be used as a Communications source. As such the area of activity associated with Semaphore Point is likely to be well away from the shore line. Further, the area identified has a long history of commercial activity and is highly developed, utilised and ecologically degraded land.

13.9 Section 6.8.2. Maritime Heritage. We note that the proponent has undertaken limited desktop analysis including some liaison with staff from the Western Australian Museum. The sources cited in the document are the City of Albany Municipal Heritage Inventory List of Maritime Sites and the Western Australian Museum's Department of Maritime Archaeology Shipwrecks Database, which are both publicly available. These resources are not complete listings of sites and associated literature and, therefore, should be used as a starting point for research into a particular shipwreck or area. Ideally, a more thorough desktop analysis

utilising primary archival and summaries of secondary sources should be undertaken by a qualified archaeologist.

The Department of Maritime Archaeology did provide APA with their input and a map with sensitive sites was supplied by Mr Jeremy Green and incorporated into the PER S.6.8.2. If there are errors and /or omissions in this information APA will address and assess the potential risk to such sites if known or identified by the Department of Maritime Archaeology.

13.10 Sections 6.8.3 and 9.6.3. Impact on Indigenous Heritage values. In the port area per se there appears to be no Indigenous Heritage impediment to the Albany Port Expansion. There does not appear to have been any consideration of the possibilities or probabilities of Aboriginal heritage materials being found in the area to be dredged - given that the current sea levels have only been stabilised for around 6000 years and that there is evidence of Aboriginal occupation of this area for over 20,000 years, it is possible that earlier material lies below the harbour.

With regard to the pipeline and other works [see Appendix 16.41 there are clearly issues relating to Aboriginal heritage sites and any work would need to follow the legislative requirements of the *Aboriginal Heritage Act 1972.*

Grange Resources on behalf of the APA has completed heritage surveys and consultation for the port expansion, mine site and associated works. The Department of Indigenous Affairs confirmed that the port expansion has no heritage sites and no issues or concerns are apparent. The legislative requirements of the *Aboriginal Heritage Act 1972* are being followed and a section 18 Notice will be lodged.

The ability to carefully examine stone and shell pieces (which could be less than 20 mm long) to consider if they are artefacts, in 12 million cubic metres of dredge spoil, is limited, and could stretch the project over many decades. The pipeline infrastructure is not part of this proposal and forms part of EPA Assessment 1596.

13.17 Section 9.6.4. Management of Maritime Heritage Areas. Table 9.14 (Management Procedure for Discovery of Potential New Maritime Sites) does not include the involvement of an archaeologist either in a watching brief capacity or at the very least part of the site identification team. This is a reactive rather than proactive approach to identifying and managing potential archaeological resources. We note that the Albany Port Authority (APA) will consult with the Western Australian Museum staff if they find anything they believe to be significant but this is, in essence, the problem. While it is encouraging to see the APA including archaeology in their baseline assessment, they are not archaeologists who are trained and ethically bound to identify, survey and report artefacts/shipwrecks. It is our preference that a qualified and suitably experienced maritime archaeologist be engaged during the dredging/land reclamation phase of the project. This will ensure that site identification can be carried out quickly and efficiently, thereby avoiding any misinterpretation of sites and delays to the project. We understand that the dredging will take place over a four month period and, therefore, it is not practicable to have an archaeologist on site for the entire time. We have been advised by APA that a magnetometer survey is scheduled for mid 2008 (contract awarded to G-tek). It would be useful to have an archaeologist involved in the survey phase to identify possible archaeological features and then on site during the dredging phase when these features are physically Identified. This should provide a reasonable compromise for the developer and management of the underwater archaeological resource.

Given their expertise and statutory obligations, the Western Australian Museum is the preferred proponent for undertaking any survey work. The Western Australian Museum can also recommend external archaeologists if necessary.

APA supports the review of the results from the magnetometer survey with Museum staff and any possible archaeological features that may be identified being examined by divers before dredging begins. Further, APA has already made a commitment to the Western Australian Department of Maritime Archaeology that the results of the survey will be forwarded upon receipt. If identified archaeological features within the dredge footprint are encountered, then upon the advice from WA Museum, they will need to be managed, depending upon their significance, before dredging begins.

Therefore, APA does not support the suggestion that Museum personnel should be on site during the magnetometer survey or dredging task at the expense of the proponent. However, the staff would be welcomed on site if they were in the region under their own budgetary allocations.

14.1 The proponent has completed heritage surveys and consultation for the port expansion, mine site and associated works. The port expansion has no heritage sites and no issues or concerns are apparent. The mine site and associated works will impact three of the five Aboriginal sites in close vicinity. There are four other sites at risk, which at the time the heritage report was prepared (2005), were under negotiation for avoidance or salvage. The proponent's consultant recommends the lodgement of a section 18 Notice seeking consent as issued by the Minister for Indigenous Affairs under the provisions of the Aboriginal Heritage Act 1972 (Act).

This set of actions demonstrates the proponent's compliance with the Act. Accordingly, there are no problems with the port expansion proposal.

This comment has been acknowledged.

15.1 There do not appear to be any impacts on the physical fabric of heritage places. There are no historic heritage places within the footprint of the proposed development, and only two immediately adjacent: Point King Lighthouse and the Pilots' Houses, Semaphore Point.

This comment is acknowledged.

6.13 Monitoring

4.10 WAFIC recommend that a monitoring project be put in place to measure the impacts of the dredging activity on pilchard populations prior to, during and after completion of the dredging operation. This could perhaps be a collaborative project with the Department of Fisheries (Research Division) and or industry. The research could benefit both the proponents and industry in demonstrating the cause of any changes to fish populations and potentially reduce the need for litigation. We would welcome the opportunity to assist in the development of such a project.

APA will liaise with the Department of Fisheries and industry representatives to monitor and discuss the existing fish monitoring programmes and stock assessments.

9.3 The PER document indicates that increased shipping operations could potentially impact on water quality and marine sediment quality in the port area due to vessel maintenance, TBT, other antifoulants, ballast and spills. It is important for the Albany Port to incorporate a management plan is developed which incorporates the foresaid. An ongoing monitoring program is also recommended for locations close to recreational beaches and mussel farming activities.

Agreed, please refer to the Draft Dredging and Land Reclamation Plan in the PER appendices that addresses these factors.

9.6 It is recommended that an increased sampling program (in addition to current WASQAP testing requirements for the harvest areas in the region) is implemented during the dredging program and for a reasonable period following dredging to monitor the water quality for aquaculture suitability. This would need to include sampling of the water and mussels/oysters.

11.10 The mercury and silver content of marine sediments is noted. As these levels are elevated, the monitoring of mercury and lead in shellfish is suggested as a monitoring exercise, to assess the impacts for the nearby aquaculture industry. This is an example of monitoring aimed at protecting the existing values of the harbours.

The local mussel farmers existing monitoring program should be considered and if appropriate be used or expanded (at APA expense) as a method of monitoring for mercury and silver levels. Please refer to Section 7.1.3.4 from the Draft Dredging and Land Reclamation Management Plan.

9.8 Dredging and stormwater runoff (draining into harbour) may also increase microbiological levels in recreational waters that have the potential to cause harm to swimmers in the area. Sampling in accordance with the Guidelines for Managing Risks in Recreational Waters, 2005 is recommended for known recreational areas. It is recommended the Albany Port Authority identify their jurisdictions regarding recreational waters located on the coastline. The City of Albany's Health Services Branch may already have a water sampling program of popular swimming sites in the area and it is recommended you liaise further with them.

Agreed and acknowledged APA or its agents will liaise with the CoA Health Services Branch in regard to monitoring and maintaining recreational values in accordance with the appropriate guidance.

11.1 The management of the sediment plume is arguably the most significant environmental factor for this development. The PER provides considerable information on this, but provides a management response that is based on modelling of the predicted plume, an explanation of management methods used to minimize the plumes, and a responsive water quality monitoring program and seagrass monitoring program. The main thrust of the management of sediment plumes is to have a tiered management response that is based on seagrass density loss. It is felt that this is inappropriate for a number of reasons.

Timeliness - a monthly water quality report framework, plus a two weekly moving average for water quality information, when added to investigation and interpretation of seagrass density loss, will mean a considerable period of time between unacceptable environmental impacts and any significant management responses. Minor management responses (such as altering location of dredge operation) are suggested at the lower end of the tiered management response, but significant changes (including ceasing of work) would not be possible to implement under the plan put forward for weeks if not months after the impacts are known. This is not considered acceptable.

It is recommended that water quality criteria be used as trigger points for significant management response, rather than seagrass monitoring. Seagrass monitoring should still be used, but more as a means of confirming seagrass impacts and environmental offsets that are required. Sediment plume management should be guided by water quality parameters, determined beforehand.

11.2 The environmental and amenity values of the Albany harbours have been well documented in the PER, but water quality targets and minimum levels for these values have not been detailed. These water quality characteristics should be agreed upon; and the dredging operation managed to remain within these limits. Such an approach, which was used in the last port dredging operation, provides certainty on the acceptable impacts and allows immediate management as the water quality monitoring can be measured daily (unlike seagrass).

At present there is too much uncertainty over these acceptable water quality characteristics as they relate to the values listed. For example, the PER states there is a possibility that the dredging operation will impact on recreational use of Middleton Beach, through minor changes in turbidity. The PER states that if the impacts are greater than predicted, 'consideration will be given to the establishment of a sampling program along Middleton Beach". This type of statement provides too much uncertainty - over what could be the acceptable impacts, what would need to be monitored, and most importantly when water quality impacts are unacceptable and works should cease.

8.19 "Management of Recreational Water Quality", in the form of monitoring once the proposal has taken place, cannot prevent or reverse the degradation of the marine environment; it only helps to track it. The movement of sediment from the proposed disposal site due to shipping and natural oceanic processes, and the associated environmental effects this would have, cannot be undone once it occurs.

18.3 In section 9.1.5 water quality issues are discussed in relation to Fishing and Aquaculture. It is noted that the average turbidity modelled for King George Sound and Princess Royal harbour is relatively low and that it is predicted that impact on aquaculture and fisheries will be insignificant. None the less, the modelling refers to average values and it

will be important to implement a detailed dredge management plan to identify triggers and management actions to apply should unforseen factors result in turbidity, not in keeping with the modelled outcome, that impacts on aquaculture, fisheries or benthic biota.

The water quality monitoring and seagrass monitoring programmes are detailed in the Dredge and Land Reclamation Management Plan. Monitoring of recreational waters post dredge commencement will occur along the length of Middleton and Goode Beaches if dredging occurs in summer or if the zone of influence transpires to extend beyond modelled outcomes. Monitoring will focus on the use of trigger values to ensure that the swimming beach water quality complies with the National Health and Medical Research Council's Australian Guidelines for Recreational Use of Water at all times. The tiered management approach to be used in water quality monitoring involves site specific trigger values that initiate staged management actions and controls to minimise turbidity throughout the dredge programme. Light attenuation will be measured daily and water chemistry weekly and compared with reference sites on a 14 day running average. For instance if water quality exceeds the 95th percentile of threshold values Level 2 Management will begin additional to Level 1 Management strategies. This includes minimising the draining of excess water on the Trailer Suction Hopper Dredge en route to dumpsite and temporarily restricting the areas that can be dredged to minimise impacts and reduce turbidity.

APA commits to engaging with the City of Albany's Health Services Branch to formulate or supplementing an appropriate recreational water quality monitoring program for the proposed activities.

Modelling has demonstrated that sediment will not disperse from the disposal site as dredged material will be too deep for wave action to produce significant resuspension. Details of the modelling showing sediment accumulation are detailed in the PER in Section 10.3 and in Technical Appendix 16.1.

18.4 The Dredge Management Plan should include a consultative mechanism, such as a dredge management committee, where by the South Coast Purse Seine fishery can provide input on any unforseen impact on the pilchard fishery and input on management responses. This will be important if the dredging results in impact on the viability of the pilchard fishery. This could arise if dredging activity drives pilchard schools out of King George Sound, and into more distant waters. Such an outcome is not anticipated, on the basis of the modelling provided in the PER, but it is important that a mechanism is available to address the situation should it occur. The Dredge Management Plan at appendix 16.7 does not recognise the potential for impact on the economic viability of the pilchard fishery and does not address the need for a dredge management committee. This should be rectified.

18.5 While it is not anticipated in the PER that dredging turbidity will impact on aquaculture in Albany waters, it is recommended that a mechanism be established to allow marine farm operators to have an input into management of the dredging program through a representation on the dredge management committee.

The Dredge and Land Reclamation outlines Water Quality Monitoring in Section 8.1 and Seagrass Monitoring in Section 8.2. Level 6 of the tiered management approach includes convening a Dredge Management Group where options will be discussed following dredging ceasing if seagrass density is decreased by 50%. APA is amenable for DoF to be part of this management group.

17.9 Section 3.6.6 of the Sampling and Analysis Plan (SAP) and Section 9.1.4 of the PER states that the Inner Harbour is considered to be a 'highly disturbed' system and the channel and disposal area in King George Sound to be 'slightly to moderately' disturbed system where the water quality guidelines are considered to be 90% and 95% species protection level, respectively.

Given that there are large areas in King George Sound that are likely to be in a 'slightly disturbed' condition or better, and a body of data on ultratrace background concentrations of key toxicants in state marine waters, it should be noted that the EPA will be assessing the impacts of the proposal on water quality in terms of its achievement of the 99% species protection guideline levels for toxicants in marine waters.

These comments are acknowledged. However, APA believes that the appropriate level of species protection for King George Sound is 95% as its usage and current designation as a commercial bulk

port is clearly defined under the auspice of the Port Authorities Act, 1999. To categorise and manage the proposed project area as being the equivalent to a marine protected area in a clearly designated and appropriately zoned current and future use as a commercial port is highly questionable. Therefore, APA does not support this assertion and categorisation of King George Sound as a marine protected area.

11.3 Similarly, with seagrass impacts, an acceptable and unacceptable level of turbidity should be set, rather than reliance on measuring seagrass impact. Acceptable water quality for aquaculture, diving and other values are not detailed in the report, and the absence of this information will inevitably lead to later disputes on the acceptability of the dredging operations impacts during the operation. These can only be managed if acceptable impacts on values, determined by set water quality characteristics, are detailed up front and prior to works starting.

The reliance on modelling, certain management methods (see later) and water quality monitoring leading to seagrass monitoring will not provide a quick management response to sediment plumes that may adversely impact on seagrass or other values.

These water quality parameters, related to values, should be detailed in the final dredging management plan.

As previously covered there are presently no reliable measures of stress for seagrass that can be linked to water quality and light attenuation is the best measure to determine the impact on seagrasses. Water quality thresholds have been set and the tiered approach management strategies are detailed in the Dredge and Land Reclamation Management Plan, attached as Appendix 16.7 to the PER.

11.6 The present Dredge Management Plan is considered inadequate, given uncertainty over the timing and monitoring program. Once the dredge time has been determined (it is recognised that it is not practical yet), then the dredge plan needs finalising. The plan will need specific details on the monitoring program, e.g. sampling points, water quality, threshold levels, and unacceptable water quality levels as recommended above.

The Dredge Management and Land Reclamation Plan will be finalised in consultation with the Department of Environment and Conservation and the Department of Water prior to ground disturbing activity. The current plan outlines water quality, recreational water monitoring and seagrass health monitoring. Threshold values are used for each category of modelling with specific management actions outlined if values are exceeded.

17.14 Dredge and Land Reclamation Management Plan (DLRMP)

The EPA Service Unit has not undertaken a detailed appraisal of the proponent's DLRMP because there are a number of issues with respect to the PER's impact predictions which need to be addressed and discussed prior to the EPA progressing with its assessment.

However, from a cursory examination the EPA Service Unit considers that the Plan is not currently of a standard to provide confidence that an appropriate environmental protection outcome would be achieved.

For example:

- **The proposed environmental performance indicators and trigger levels are currently ill-defined. The indicators to be included in the proposed monitoring program should be clearly defined and relevant to the stressor and the environmental value to be protected.**
- **The monitoring program and, specifically the exceedence of trigger levels, are not clearly and explicitly linked to dredge management actions. Nor have the management actions listed in the DLRMP been demonstrated to be effective and capable of allowing the proponent to achieve the relevant criteria and desired environmental outcome.**

The EPA Service Unit's detailed consideration of the proponent's DLRMP with respect to marine impacts is dependent on the production of further impact predictions and information to address the issues raised in this attachment (i.e. proposal definition, seagrass loss,

sediment contamination, baseline information etc.) and the recommendations of the Peer Review. Consideration of components of a management and monitoring program such as the setting of trigger levels and thresholds, identification of reference sites, monitoring regimes and linkages to management actions is restricted without a better understanding of the areas raised in this letter.

The EPA Service Unit also requests that there should be a stand-alone management and monitoring program for marine impacts for dredging and reclamation.

The performance indicators set for loss of benthic primary producer habitat within the three management units has been developed in compliance with EPA's Guidance Statement No 29: Benthic Primary Producer Habitat Protection for WA's Marine Environment. Management Unit 1 is the only area where the recommended allowable loss of seagrass is anticipated to be materially exceeded and APA will offset seagrass loss in Princess Royal Harbour through planting to ensure no additional loss occurs.

The performance indicator of no introduction of marine pests from vessels associated with the dredged and land reclamation programme is definable and suitable to measure this potential impact.

The remaining performance indicators for marine fauna, noise and harbour access will be further defined in the final Dredge and Land Reclamation Management Plan to include quantitative values.

Indicators for water quality monitoring are clearly defined in the Plan. Baseline data will be collected at sampling sites within Management Units 1 and 2. Precise locations of sampling sites will be provided before commencement of the dredge programme. Sampling may include but is not limited to the following:

- pH, salinity and temperature;
- Total nitrogen, nitrate/nitrite and ammonium;
- Total phosphorus and orthophosphate;
- Chlorophyll *a* concentration;
- Microbial water quality;
- Mercury and Silver; and
- Turbidity (TSS and secchi)

The tiered management approach has been developed and specific management actions are linked to exceedances of the 80th percentile, the 95th percentile and the 99th percentile of the reference site threshold value.

Proposal definitions including dredge quantity and dredge period have been provided. Approval is sought for 12 Mm^3 of dredge material, the volume used in modelling. The dredge period is estimated to be between four to seven months.

A response has been provided to the peer review conducted on the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report and is included with this response document.

The Dredge and Land Reclamation Management Plan outlines the impacts requiring management, provides APA's approach to risk management and outlines the proposed monitoring program for marine impacts of the dredge programme. Whilst the document includes impacts to terrestrial vegetation and flora and noise, the potential impacts are predominantly marine related. All marine impacts, management and monitoring are covered within the Dredge and Land Reclamation Management Plan.

16.18 According to Section 6.4.3 of the PER, a baseline water quality monitoring survey was conducted within Princess Royal Harbour in September 2000. This only provides one month of baseline water quality data. Further water quality profiling was undertaken in August 2006

(page 72), however this is only presented in relation to water column data. There is inadequate baseline water quality data presented to conduct this assessment and to determine to what extent water quality will vary from background levels. Figure 11 indicates that water quality sampling locations are limited, only showing four sites that have been used

to collect baseline data. It would be expected that a number of samples would be taken at both spoil ground disposal sites and distributed further across the dredging activity area. Water quality baseline sampling should have also been undertaken in Oyster Harbour and in all areas that support sensitive benthic receptors including the reef communities and the island nature reserves, Michealmas Reef and Gio Batta Patch. Without adequate baseline water quality data from sites strategically distributed across impact and reference areas, it would be difficult to establish reasonable and meaningful water quality management triggers during the dredging program. The proponent should be required to demonstrate that an adequate baseline water quality dataset is available prior to the commencement of dredging and land reclamation.

Recommendation:

An adequate baseline water quality study, developed in consultation with DEC and DoW, should be undertaken at appropriate impact and reference sites throughout the study area prior to the commencement of dredging and land reclamation activities.

APA have committed to undertake baseline data collection and having this data available prior to the start of the dredging and disposal. The sampling details are outlined in the DLRMP and this will be finalised and agreed to by the DEC and the DoW prior to ground disturbing activity. Sampling sites will be determined in association with the DEC and the DoW and may include Gio Batta Patch and Michaelmas Reef. The Water Quality Monitoring Programme is detailed in the Dredge and Land Reclamation Management Plan and the final version of this plan will be agreed and approved by the Department of Environment and Conservation and the Department of Water.

16.38 A Water Quality and Benthic Community Health Monitoring Program should be developed and implemented to the satisfaction of DEC to demonstrate that management criteria are achieved during the dredging program.

These programmes are detailed within the draft Dredge and Land Reclamation Management Plan. The draft plan has been developed in consultation with DEC and DoW, further consultation with these departments will occur in order to approve the plan.

16.39 DEC is concerned that baseline water quality data for reference and impact areas have not yet been collected for use during the proposed dredge management program. Prior to a decision on this proposal, the proponent should be required to undertake baseline sampling of reference and impact sites and define management triggers based on water quality, light attenuation and sensitive receptors.

The following comments are made with regard to the Water Quality Monitoring Framework outline in Figure 9.15:

1. **It is questioned how the proponent intends to use exceedances of BPPH threshold values when these are not discussed in the PER and data from reference and impact sites throughout the zones of impact, effect and influence have not been collected.**

2. **Water quality measures should include nutrients, saturation irradiance values and light attenuation. It is difficult to base water quality triggers on turbidity when there is no clear relationship between turbidity measures and seagrass health/recovery in this area.**

   Therefore, measures for water' quality triggers must be based on light penetration measurements in addition to turbidity, but not on turbidity alone. Furthermore, water quality monitoring should be conducted using real time loggers at impact and reference sites.

3. **The commencement of seagrass health monitoring only once the 99th percentile of the threshold value is triggered, is not appropriate as sub-lethal or lethal effects may have occurred prior to this exceedance. It is recommended that the seagrass health monitoring be required on a fortnightly basis at all impact and reference sites during the proposed dredging program, with results reported to DEC fortnightly.**

4. **Given that the proponent has predicted that Michaelmas and Gio Batta Patch reef systems are outside the area of influence and therefore won't be impacted, reference**

sites at Michaelmas and Gio Batta Patch reef systems should be established with specific dredging management responses should exceedances of the 80 percentile background value be detected during monitoring.

APA have committed to undertake baseline data collection and having this data available prior to the start of the dredging and disposal. However, the approval of the project should not be contingent upon these results as the data is only to provide baseline data and not impact assessment. It is agreeable for a Condition to be placed in the Ministerial Conditions that requires the proponent to have undertaken baseline water quality data collection at reference and impact sites prior to commencement of dredging and disposal through the vehicle of the Dredging and Land Reclamation Management Plan.

1. The threshold values (light attenuation) used to predict permanent and temporary loss of seagrass and their calculation are described in detail in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report, included as Technical Appendix 16.2. The measurement of reference sites and the calculation of percentiles are used to set thresholds of areas outside of the impact zones using a 14 day running median. The background data gathered would be used instead of estimate originally proposed in order to generate light attenuation values to be monitored. The threshold values in the Management Plan will be amended once the baseline data is available.

2. The measurement of nutrients light climate and light attenuation is the basis of the monitoring in the Management Plan. Turbidity is not proposed but TSS is required to validate the predictions of the model. If this is not clear in the Management Plan then it will be amended accordingly. The ability to measure light in real time is presently not possible but it will be investigated further.

3. The monitoring program will have periodic seagrass monitoring events at all sites; however, a reactive monitoring program must have water quality thresholds that trigger both management and more direct monitoring of seagrass. This is an accepted and well considered approach that has been prescribed by the EPA in the more recent dredging programs in WA.

   Establishment of monitoring sites at Gio Batta and Michaelmas Reef will be investigated. The main issue with this is that there is no seagrass thus the 80th percentile thresholds do not apply to the flora and fauna found there. In addition the macroalgal BPP that dominate the habitat are seasonal leading to significant variability. However, regular surveillance monitoring at these reefs is warranted and will take place.

16.35 The proponent should be required to design a monitoring program to demonstrate that the following limits can be met in relation to the proponent's activities:

1. No net loss of seagrass communities in Management Unit 1

2. No more than five per cent loss of seagrass within Management Unit 2.

3. No loss of any benthic primary producer habitat within Management Unit 3.

4. No loss to the diversity and abundance of significant infaunal communities in Oyster Harbour.

5. No effect on the water quality parameters that support coral encrusting invertebrate communities at Gio Batta Patch Reef, Michaelmas Reef or the reef systems fringing the Michaelmas and Breaksea Islands.

A Seagrass Rehabilitation and Offset Plan will be produced in consultation with the Department of Environment and Conservation and the Department of Water. This plan will outline details of monitoring. As described surveillance monitoring of coral at Gio Batta Patch Reef and Michaelmas Reef will be developed.

16.34 The proponent proposes to use a water quality and seagrass health monitoring program to assist in the management of the dredging program. There are a number of related dredge management issues that need to be resolved before the proponent can establish an adequate water quality and benthic community health monitoring program that will be useful during dredge management. These include:

I. Revising and verifying habitat maps to ensure that all sensitive habitats are adequately represented including coral/reef communities (refer to section 2.1 of this document).

2. Revision and verification of the zone of impact, zone of effect and zone of influence (refer to comments in 2.2.2).

3. Acquisition of adequate water quality data at impact and reference sites in order to establish exceedances of the 80th, 95th and 9gth percentiles.

4. An understanding of the ecological/biological thresholds of benthic habitat receptors to changes in water quality parameters (e.g. NTU, nutrients, SSC etc). This information is not discussed in the PER document.

5. Oyster Harbour is predicted to be subject to levels of turbidity associated with dredging and related activities. Oyster Harbour is not within the proposed management units in this project.

6. Verification of the suitability of the three proposed management units and the levels of detectable change within each management unit (consistent with EPA Guidance 29).

Recommendation:

The six abovementioned information gaps should be addressed during the development of Ministerial Conditions for management triggers associated with dredging should this project achieve Ministerial approval.

16.40 The following comments with regard to the Seagrass Monitoring Program are provided:

1. Appropriate seagrass health monitoring sites must be established in consultation with DEC.

2. Seagrass health monitoring should be extended to the monitoring of significant reef systems in the event that an exceedance of the 80 percentile baseline level for water quality/NTU at these sites is detected during dredging.

3. The methods consisting of shoot density require a cease dredging and/or relocation management response only after shoot densities decrease by 50 per cent. Justification for this should be provided given 50 per cent reduction in shoot density is considered a significant reduction.

4. Methods should include fixed transects to ensure the same areas are surveyed fortnightly.

5. The design of the Seagrass Monitoring Program should be reviewed by an expert with seagrass expertise and knowledge in this area.

6. Some form of monitoring is required to demonstrate that any changes to sensitive receptors within Oyster Harbour are not attributed to the dredging program.

7. It is unclear what actions will be taken in the event that seagrass 'loss' exceeds the thresholds assigned to each management unit. It is recommended that, in the event that this occurs, there is a clear requirement for seagrass rehabilitation and that the Seagrass Rehabilitation Management Plan clearly specifies the remedial actions to be undertaken.

The proponent should commit to rehabilitating seagrass using the Rehabilitation Management Plan and Completion Criteria should limits for "loss" be exceeded in any of the management units (including Oyster Harbour).

1. The establishment of the monitoring sites will be undertaken in consultation with the DEC, DoW and EPA Service Unit.

2. The monitoring of the nearby reefs will be added to the management plan; however, the design of the monitoring will be substantially different than that for seagrass due to the difference in the dominant communities present.

3. The staged approach to management based on seagrass shoot density decline will be reinvestigated to see if the threshold levels for density are appropriate; however, a 50% reduction in shoot density over a short period of time is completely reversible.

4. Monitoring sites will have fixed locations for repeatability of sampling measures.

5. The design of the seagrass monitoring program will be reviewed by a seagrass expert prior to its implementation.

6. Oyster Harbour has been demonstrated to be outside of the impact zones of the dredging program. However, a seagrass monitoring program has been ongoing for several years and can form the basis for comparison of effects. This will be investigated.

7. An offset program for seagrass in accordance with Guidance Statement 19 Environmental Offsets has been proposed for the proposed loss in Princess Royal Harbour.

Should seagrass loss exceed the allowable threshold values in King George Sound or Oyster Harbour then the Dredge Management Group will be consulted and appropriate action taken.

Gio Batta Patch and Michaelmas Reef have been labelled in accordance with the DEC's request (Figure 9.3).

16.53 Due to the high local profile of this project and the potential for ongoing local community issues and enquires, it is recommended that the proponent be required to provide fortnightly reports to DEC on monitoring results that will be collected throughout the construction phase of this development (e.g. water quality, benthic habitat health, sediment, noise and dust monitoring results).

APA is agreeable to this and where practicable will provide fortnightly monitoring results to the DEC.

17.13 Due to the limited availability of marine water quality baseline information, it is requested that proponent continue to collect and maximise the temporal and spatial coverage of baseline information. This should be ongoing and occur during the EPA's assessment of this proposal and continue through the approvals process (if found to be acceptable), until prior to the commencement of dredging and reclamation. The collection of baseline information should focus on potential impact and reference sites, and the early warning indicators of excessive shading and sedimentation of seagrass communities such as bottom light levels and total suspended solids. This would further inform the development of trigger levels in the proponent's Dredge and Land Reclamation Management Plan.

APA is agreeable to this comment.

8.17 Section 9.1.6 (pgs. 165-166) Cheynes 3 Dive Wreck (off Michaelmas Island) should be included in the main areas for contact recreation. This would also be affected by sediment deposition from the dredge program.

Known wrecks were provided by the Department of Maritime Archaeology. Michaelmas reef is not within the predicted zone of turbidity or sedimentation for any of the three dredge scenarios so it is unlikely that the Cheynes 3 Dive Wreck will be affected.

9.4 The area is fished and crabbed recreationally as well as frequented by SCUBA divers. Mussels (Mytilus edulis) are also farmed in the Albany harbour. There are 12 Albany Port Authority leases and Department of Fisheries licences issued to aquaculturists in King George Sound.

This comment is acknowledged.

6.14 Dredge Management

11.4 The reclamation area is intended to be filled through the use of bunds, internal bunds, geotextile material and weir box to manage sediment plumes. The use of these methods in the previous dredging operation did not prevent extensive sediment plumes, although these tended to move along the northern shoreline of Princess Royal Harbour.

The PER makes mention of the use of silt curtains, both internally within the cells and outside the discharge point. Reference to the fact they "may be used" is felt inappropriate, as the use of best practice should be a requirement. Past operations show the management methods proposed will not prevent extensive sediment plumes. The Albany foreshore development is presently using a sediment curtain, to much positive effect. As such, the use of these curtains should be a requirement not a matter for later consideration.

Similarly, the infill of the reclamation area should be undertaken by the suction dredge alone, not with both types of dredge as put forward in the PER. The suction dredge has been demonstrated to have the less impact on turbidity, and as such should be used in the most sensitive area of Princess Royal Harbour.

The use of best practice can be applied to the dredging operation to further minimize environmental impacts, and this is recommended.

APA commits to using a silt curtain on the reclaim outlet in addition to the other proposed controls to reduce turbidity from the overflow / weir box. From APA's recent experience the use of silt curtains in the open water is less than ideal and largely ineffective and therefore; the focus will be put into adequately controlling the internal bunds including the use of silt curtains.

With respect to the type of dredge used to fill the reclamation area APA intends to use a cutter suction dredge to fill the majority of the reclamation area, however not all of the material in the entrance to Princess Royal Harbour can be placed into the reclamation area as:

a. there is insufficient capacity within the reclamation area to hold all the material
b. some of the material is not considered to be suitable for reclamation and further construction due to its geotechnical properties.

Where a Trailing Suction Hopper Dredge is to be used in this area, management measures such as commencing dredge run, therefore minimal overflow and absolute minimum turbidity, have been proposed to minimise the creation of turbidity.

16.6 The proponent indicates that the south-east to north-west alignment was selected as it provides a 'no rock' channel and that dredging of a 'no rock' alignment minimises the environmental impacts of dredging on marine fauna and benthic primary producer habitat as

"no blasting is required and no rock flour is produced" (page 21 of the PER). As blasting is not required as a component of this project, any approval of this project should verify that blasting is not a permitted activity. Should the proponent encounter granite or limestone during the dredging of this preferred channel alignment, further approvals and assessment should be required in consultation with DEC.

This comment is acknowledged. Further approvals will be sought if necessary.

18.6 Another feature of the dredge management plan will address the issue of Introduced Marine Species. The Department of Fisheries should be consulted about the wording for the environmental conditions that will apply to the movement into King George Sound of the dredge, equipment and support vessels (it is noted that the Department is not included in the list of Stakeholders in the plan at Appendix 16.7). As a general principal the vessels and equipment should be free of any potentially invasive biofouling however discussion is required in order to determine the most effective and efficient means of achieving inspection and certification.

These comments are acknowledged and DoF will be included on consultation regarding introduced marine species.

16.37 A Dredge and Dredge Spoil Disposal Management Plan should be required as a Ministerial Condition, should this project be approved. This plan should be developed to the Satisfaction of DEC.

This comment is acknowledged.

19.6 In relation to the selective removal of sediments from the channel for burial at the dump site, APA needs to provide an estimate of the amount of material to be removed. How much material will be used to cover these sediments to ensure the material is confined? In addition, APA should outline how they proposed to undertake the confined disposal.

Up to 359,528 m^3 of the material that is suitable for unconfined disposal at sea under the NODGDM will be selectively removed by the dredge using non-overflow methods and transported to the disposal grounds. The material will be unloaded and the remainder of the clean campaign material not used in the reclamation subsequently placed over it.

6.15 Evaluation of Disposal Sites

6.15.1 Disposal Site Stability

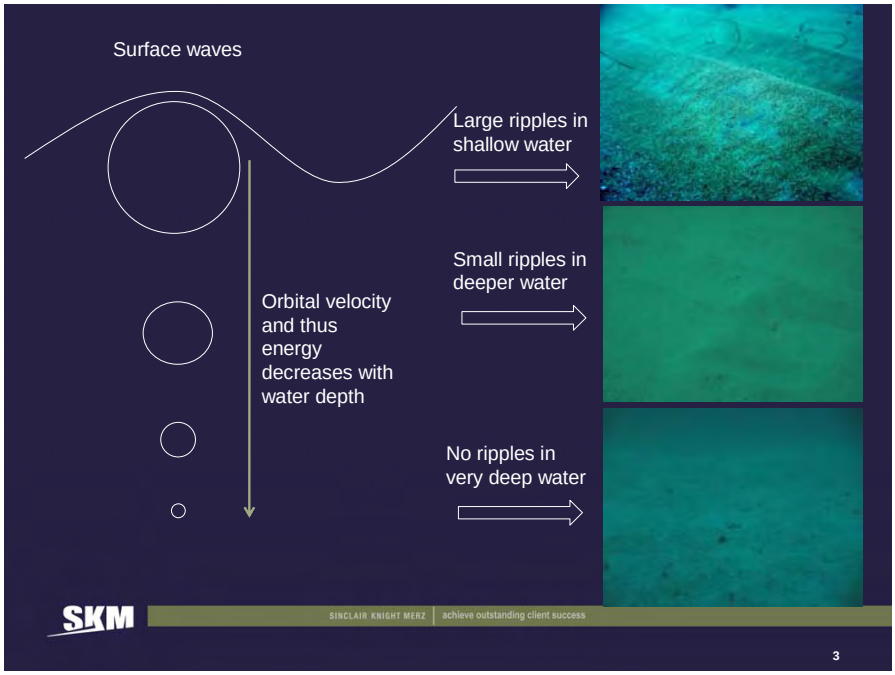
2.9 Section 6.3.2 (p.56) makes reference to a "shelf wave" which would make the alternate disposal site unsuitable. I find it hard to believe that a shelf wave which could affect the alternate disposal site could have no effect on a site placed only a couple of nautical miles away and in shallower water. Furthermore, while this site may be "inside" King George Sound as far as port limits are concerned, this site is still exposed to the majority weather. This would appear to be a fabricated justification for a site in closer proximity to the dredging area and therefore more economically attractive.

Shelf waves follow the continental shelf and do not propagate across the shelf towards the coast and, as a result, the currents at the inner spoil ground are not affected by this phenomenon. This conclusion was supported by the current data collected at the inner disposal site which confirmed the relatively weak bottom currents. Please refer to Section 10.3 of the PER and technical appendix 17.1 which details sediment dispersion from the disposal sites.

5.2 The placement of the preferred dumping grounds is another major concern. We have been told by the relevant scientists that the spoils will not move from this area. He also told us that the ocean swells don't get large enough in KGS to cause any bottom movement. Unfortunately the amount of spoil will raise the seabed in this area from 42 metres to 34 metres over a 250 hectare area (in one of our major fishing areas). If you look at the chart of this area you will notice that the area has been scalloped out to its present depth over in any years, add the huge southerly and southeast swells (that the above scientist does not see in to acknowledge) that have happened over the last decades, the spoils could end up anywhere.

The selected site is up to 40 m deep. The ocean floor will have a minimum finished depth of approximately 35 metres deep after completion of disposal. This depth is well below the impact region of orbital velocities of the waves predicted to be passing above, even during significant storms as demonstrated in Technical Appendix 16.1. This is an area of flat seabed with no signs of wave action (ripples) and has been shown to have low velocity currents (Figure 6-2). The site is protected from swell from the south west and does not have corals, seagrass or other sensitive habitat communities.

Figure 6-2: Flat seabed without wave action



8.3 Section 5.1.6 (pg. 40) 1 strongly disagree with the statement that the disposed sediment is "extremely unlikely to be transported as the seabed current strength at the site is insufficient to re-suspend the dredged material." The predominant currents move around Bald Head and into King George Sound, over the disposal site in the South Channel. This statement also disregards the effect of south-easterly winds and water movement caused by shipping traffic moving over the site. The predicted 250 ha footprint containing the dredged material will expand to a larger area in a short period of time.

8.23 Section 10 (pg. 210) The 250 ha disposal site will shift and disperse to cover a much larger area (due to reasons previously given) in a short time.

8.26 Section 10.3 (pgs. 217-218) The preferred disposal site will also experience strong current speeds with currents moving around Bald Head and into King George Sound. The Leeuwin Current moves around Bald Head at approximately 4 knots. Therefore the risk of re-mobilisation at this site cannot be stated to be any lower than the alternative site. It does not make sense to locate the disposal site this close to the coast where there is a real risk (despite the stated "anticipation" of no adverse impacts to benthic habitat, recreational areas, aquaculture and fisheries by re-suspension and migration of dredged material.

The disposal site will be 35 metres deep after completion of the program. This is far too deep to be affected significantly by ships propellers or any other re-suspension mechanism.

Re-suspension of bottom sediments during dredging was taken into account during the dredging simulations, and therefore incorporated into the results (GEMS, 2007 – pp.45 and 79).

16.17 To support the preferred option for the spoil disposal ground, the proponent should provide further information on the following aspects:

1. **An analysis on the likely sensitive receptors to be affected by spoil disposal activities is required. It is noted that some information is provided in Section 10.1, however these biodiversity values need to be described in the context of regional conservation significance.**
2. **Evidence to support that disposal to King George Sound will result in spoil (fine sediments) that "drops out rapidly and do not move from the seafloor".**
3. **Evidence to support the claim with regard to the preferred option that "seabed current strength at the site is insufficient to re-suspend the dredged material (page 40)".**

4. Modelling of the alternative site (as per Figures 10.9 - 10.14) that demonstrates that sediment accumulation and re-suspension at the preferred site has a better environmental outcome than that of the alternative site. At present, modelling on sediment accumulation is only provided for the preferred site in the PER.

The only flora, fauna or communities that are within the impact zone of the disposal site are mobile epifauna and infauna. These communities are widespread on bare sand in similar water depths throughout the south coast of Western Australia and as such are not locally significant nor do they have any conservation significance. The fauna present on the disposal site will be buried; however, fauna will not be affected outside of the disposal site boundary. As has been previously stated, infauna and epifauna will recolonise the disposal site over a predicted period of 2–4 years and return to a similar condition thus the impact will be short-term and reversible.

6.15.2 Evaluation of Alternative Sites

4.8 WAFIC recommends relocating the dredge disposal site well south of Bald Head (further south than the "Alternative Material Disposal Site"). We believe most of the impacts on the fishing industry will be avoided if this occurs.

8.21 Section 9.2 (pg. 170) One of the management goals of the BPPH is to "Minimise direct loss and disturbance to marine habitat during dredging and dredge material disposal activities". This could be better achieved, if the proposal does go ahead, if the disposal site was located further out to sea away from the shipping lane and King George Sound.

There are no BPPH in the preferred disposal site and the site is twice the depth of any other current disposal site in Western Australia at approximately 40 m deep. The preferred disposal site is stable and sedimentation modelling indicates that the sediments are largely non dispersive and will not re-enter King George Sound. Many points were considered in the selection process of a suitable disposal area and these are outlined below in response to submission 16.5.

8.25 Section 10.1.1 (pg. 213) Figures 10.3, 10.4 and 10.5 reveal that there is greater species richness and abundance in the preferred disposal area in comparison to the alternative disposal area. Surely this would mean that on environmental grounds alone the alternative area is preferable?

There is in fact greater species richness and abundance of infauna at the preferred disposal site than the alternative site. However, this is a reflection of the habitat rather than an ecological significance. The preferred site has a greater depth of sand which is required by infaunal communities. The alternative site is subject to the effects of the shelf waves which removes the sediment layer leaving only a thin veneer. Shallow highly dynamic sediments are less conducive to infaunal community structure.

The infaunal community at the preferred disposal site will be smothered; however, recolonisation will take place. It has been shown in other locations of WA and Australia that recolonisation is relatively rapid and over the course of 2–4 years the community is completely re-established. This is because the infauna community surrounding the disposal are un-affected and is a source of recruitment and the physical properties of the disposal area will be similar to the pre-disposal condition. The disposal site is habitat that infauna will quickly recolonise as it is an open ecological space.

Habitat in the vicinity of the alternative site includes reefs such as East and West Shoals and vast areas of hard pavement all of which is colonised by sessile epifauna. The prevailing currents at this site would spread the sediment over areas occupied by sessile biota that grow on hard substrate. Disposal there would lead to a long-term or even a permanent loss of that habitat as the epifauna cannot colonise sand.

16. 5 The PER (section 4.4.4) indicates that the preferred spoil disposal site is located within deep water within King George Sound "to minimise re-suspension of deposited sediments and dredging cycle times" (page 22). It is unclear as to how the proponent selected the two spoil disposal options and why only two options have been discussed. The PER states that dredge material generated will be between 7.8 5Mm³ and 13.54Mm³. The proponent has not defined the exact volume of material that will be generated and dredge depths have not been defined. It is therefore questioned how the modelling could have taken

place in absence of a defined volume to be dredged and without clarification of the depth of the dredge channel. It is also questioned whether the two spoil ground options have been modelled for the worst case scenario, i.e. 13.54Mm³ of spoil disposal. Further information is required on the spoil ground selection process based on the volume of spoil to be disposed that adequately justifies the preferred option.

The following points were all considered in the selection process of a suitable disposal area (not in order of priority):

- Site should not be in an environmentally sensitive area.
- The available water depth at the site when dumping is complete should not impact on the surrounding habitats, pleasure or commercial vessels.
- The dredged material when dumped should not be able to be remobilised and spread into the dredged channel or encroach onto areas well beyond the disposal site itself.
- It had to be large enough to cater for volume from a 16 m draft vessel.
- It had to be relatively close to the dredge area, keep distance from the centroid of dredge area to the centroid if the disposal area as short as practically possible.
- The site should be relatively easy to steam into and deposit the material and leave, without the need for special vessel manoeuvres to ensure safe and accurate disposal.
- The site should be easily accessible during night shift, and the overall dumping sequence carried out in a safe and efficient manner.

Areas that were considered included Princess Royal Harbour and the whole of King George Sound. Whilst there are many sites in King George Sound that meet the above criteria it was decided to position the dump site well beyond (seaward) the dredged channel in very deep water simply to minimise and allay any environmental concerns.

The alternative Disposal Site was selected after APA received comment from a stakeholder who felt that the recommended site was subject to remobilisation of the dumped material, contrary to the empirical evidence and modelling outlined in the PER and TA16.1.

Modelling was undertaken based on 12 Mm³ of dredge material generated and it is this amount that approval is sought for.

6.15.3 Disposal Site Epifauna and Infauna

8.24 The epifauna recorded at the proposed offshore disposal area includes unidentified species of sponges and sand dollars. These species should be identified before the disposal site is approved so that their ecological importance is known. The statement about the epifauna that none are rare or endangered" is made erroneously by the consultants if they have not been able to identify all species.

The species of sponges and sand dollars were obtained from video footage and as such were not sampled in a way as to accurately confirm their identity. There are no rare or endangered sponge or sand dollar species in WA thus those species are likely to be common in the region and elsewhere in WA.

13.15 Environmental Management Commitments (page xxxv - no. 9&10): diversity and abundance of soft-substrate organisms (clavagellids and other invertebrates apart from Posidonia, sea pens, sand dollars, mussels, etc.). See also page 211:

Comments on 'very sparsely distributed epifauna: Was this only observed by video recording? Video of soft sediments would fail to record species buried in the substrate. How often were the survey sites observed and at what time/s of day? At what season or seasons of the year did sampling occur? How typical are the images (Fig. 10.2 a-d)? No similar data or photos are presented for the outer, less-preferred disposal site.

Epifaunal observations at the preferred disposal site were undertaken using a video camera. The depth of the alternative site and the strong currents prevented video recordings. Deeper sampling at both disposal site options was facilitated using a Van Veen Grab to assess infaunal communities.

The information on the methods used to describe the fauna (infauna and epifauna) at the disposal sites is contained in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report contained in the Technical Appendices.

In summary, the infauna and epifauna were each assessed once during daylight hours. It is recognised that epifauna presence will be variable between day and night but deep sampling was undertaken with a Van Veen Grab to partially account for this. Infauna varies little between day and night and at a water depth of more than 40 m there is no seasonal pattern either.

13.18 Section 10.1.1. Infaunal Assemblages - No reference is given as to whose data the figures were based upon. They suggest that the infauna in both areas is rich, which is in contrast to the statement on page xxxv. What do the numbers given for species richness in Table 10.2 mean? Do they indicate the number of species taken? I f so, by what method were they taken, and who determined the species? Also, how was the abundance (#/m2) counted?

The information on the method of collection, identification and the determination of richness and abundance are provided in the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report contained in the Technical Appendices.

In summary the samples were collected using a Van Veen Grab (0.1 m^2) and the material remaining on a 1 mm sieve was preserved. The sorting and identification was undertaken by staff at the Marine and Freshwater Research Laboratory. The species richness is a measure of the total number of species found in the samples. The abundance was the number of organisms in a given sample multiplied by 10 to correct the sample size from 0.1 to 1.0 m^2. Richness and abundance are relative measures with no clearly defined criteria; however, the data were intended to characterise the two disposal sites and provide a comparison between them.

7.0 Miscellaneous

9.10 Mosquito Borne Disease Controls- All site water-holding infrastructures must be designed and managed in a manner that will not create or exacerbate breeding of nuisance or disease-carrying insects, especially mosquitoes. This includes wastewater and stormwater infrastructure, water holding tanks, overflow areas, scouring underneath or leaking of pipelines, etc. The port area will need to be kept free of any form of container that will hold water thereby providing habitat for container-breeding mosquitoes that may arrive at the port on board international or interstate vessels and cargo. Please refer to AQIS requirements for exotic mosquito management and monitoring in this regard. Alterations of topography (e.g. resulting from earthworks / pipeline installation) that enhance retention or impoundment of rainwater and runoff, or that promote scouring should be avoided so as to minimise opportunities for mosquitoes to breed. The PER states that modelling has shown there will be almost no change to water levels as a result of land reclamation. If this was to change however, and water levels were to increase (leading to increased inundation of low-lying coastal land and saltmarsh areas) it could result in increased mosquito breeding. If this occurred, a mosquito management program would need to be implemented and appropriately funded to control any resultant mosquito breeding and minimise potential for mosquito-borne disease transmission.

Information about developing a mosquito management plan and guidelines for appropriate design and maintenance of storm and wastewater Infrastructure can be obtained from the Department of Health's Mosquito-Borne Disease Control Branch.

These comments are acknowledged. A mosquito management program will be implemented if water levels change significantly more than anticipated.

9.11 Along with the contingency management plan for oil spills, it is recommended the Albany Port Authority incorporate an Emergency Risk Management Program in order to manage other environmental emergency situations through appropriate planning, including identification of potential emergency situations and implementation of training and drills (i.e., under IS0 14001:2004 Section 4A.7). This is to reflect all existing and future materials handled during ship loading activities, water runoff and events such as flooding or storm surges.

APA has an EMS based on ISO14001:2004 (see Technical Appendix 16.8 included in the CD-ROM at the rear of the PER) and an existing Emergency Response Plan that addresses the significant risks associated with their current operations. This will be expanded and developed to incorporate the areas identified in the submission if the project proceeds in-line with ISO14001:2004.

10.5 State Planning Policy 2.6 'State Coastal Planning Policy'

The proposal appears to come within the exemption for physical processes setback under Schedule One *G(c)* of SPP2.6, which states that industrial development demonstrably dependent on a foreshore location such as a port facilities and associated infrastructure may be exempt from coastal process setback requirements.

This comment is acknowledged.

10.6 Figure 5.1 in the PER shows two alternative routes for the proposed slurry pipe - Cuming Road or South Coast Highway. Use of either of these routes may have environmental implications, as the area is known to have a moderate to high risk of Acid Sulfate Soils (ASS) being present. On this basis it is recommended that the proponent be required to undertake site investigations and prepare and implement ASS management plans prior to construction and installation of the slurry pipe in this locality aligning the slurry pipe along the Cuming Road louts alternative may also have implications for future urban development in the locality, as Cuming Road demarcates the southern boundary of the City of Albany's draft 'South Lockyer Conceptual Structure Plan'. It is recommended that the proponent engages with the City of Albany specifically in relation t o this matter, prior to the route for the slurry pipe being finalised.

The pipeline does not form part of this Assessment (1594) and is incorporated in EPA Assessment 1596. However, a Pipeline Construction and Operational Management Plan will be developed and implemented before pipeline construction begins. The plan will identify the environmental impacts of construction and operation and outline control procedures for these impacts. As part of this plan site specific acid sulphate soil management strategies will be outlined which will set out the procedures required to minimise the creation and spread of acid sulphate soils and monitor the effectiveness of controls. The plan will ensure that effective rehabilitation can be achieved. The proponent will liaise with the City of Albany in relation to finalising the pipeline route.

11.5 The Department of Water's powers, with relation to the Waterways Conservation Act and control re dredging are mentioned in the PER. However, the proposed water quality monitoring, seagrass mapping, seagrass offset and reporting are all presently in consultation with the Department of Environment and Conservation, not the Department of Water. To date the Department of Water has been the lead agency in relation to the environmental management of the Albany harbours, particularly with regard to seagrass and water quality management. In light of this it is advised that Department of Water should be referred to in relation to the above commitments and work in relation to seagrass, water quality and dredging.

A dredging licence from the Department of Water will be required under the Wateways Conservation Act, which will need to detail the dredging methods, management measures and monitoring program.

These comments are acknowledged and the proponent will consult with both the Department of Water and the Department of Environment and Conservation to develop and implement the water quality and seagrass health monitoring and reporting.

The proponent is aware that a dredge licence is required from the DoW.

13.7 Section 6.6.4. Introduced marine species are said to include *Crassostrea gigas.* However, there is no entry in the bibliography for the reference 'CRIMP 1997'(covering the AAPMA/CRIMP survey of 1996) and so no ready access for readers to the literature in which they could check the statement that this species, and other introduced species, are present in Princess Royal Harbour and Oyster Harbour. Japanese oysters of this species were introduced into the Albany harbours and other Australian localities by CSIRO in about 1950. There has never been any evidence that they survived in the Albany area - even in 1954 Thompson *(Aust, J. Mar. Freshw. Res.* 3(1): 64-73) stated that they had survived only in Tasmania. But there has been an uncritical acceptance of the presence of this species in WA since publications on introduced species became popular (see Furlani, D.M., 1966, A guide to the introduced marine species in Australian waters. *CSIRO Division of Fisheries Centre for Research on Introduced Marine* Pests Tech. Rep. Number 5).

The omission of the appropriate CRIMP reference is acknowledged. The comments on the presence of Japanese oysters in the Albany region is also acknowledged. Although not directly relevant to this project, Dr Fred Wells from the DoF who is currently working on strategic reserve project funded by the Commonwealth government and being trialled in Albany would probably be interested in discussing the Japanese oyster phenomenon further with the relevant Museum Officer.

17.8 The text of the PER is written in an imprecise manner (examples follow):

- **S11.1.3 (p223, third dot point): would read better as "alteration to erosion and sediment transport processes".**
- **S11.1.3 (p 225) It is not stated whether the conclusions with respect to *current directions* apply both to Princess Royal Harbour and King George Sound. Reference to "wave current directions" in the middle of a discussion of tidal and wind-driven currents is confusing and most likely inappropriate in the context of the information given, since there is no discussion of wave modelling in this sub-section. In the absence of information on wave modelling and wave energy and direction at the shoreline in this sub-section, the conclusion that "*Dredging and land reclamation***

***therefore are not anticipated to alter alongshore erosion and sediment transport processes*" is not supported.**

- **This section refers to the dye as being "buoyant" – this should read "neutrally buoyant" as stated in the GEMS report.**

The comments regarding alteration to erosion and sediment transport processes and neutrally buoyant dye are acknowledged.

The conclusions regarding current direction apply to both Princess Royal Harbour and King George Sound.

In Section 11.1.3 'wave current directions' should have referred to 'current direction'. The major factors governing erosion and sediment transport are wave action and strong currents. The results (see Figure 11.5 of Technical Appendix 16.1) have shown that the currents through the entrance to PRH will decrease slightly as a result of the development and remain the same elsewhere hence no increase in erosion or transport is expected due to variations in currents. The wave modelling studies showed excellent agreement with the observations from wave measurements in KGS and, when run with the dredged channel included, no discernible variation in any of the wave parameters was detected; hence no change in wave induced processes is anticipated.

The comment referring to dye being neutrally buoyant is acknowledged.

8.0 Figures

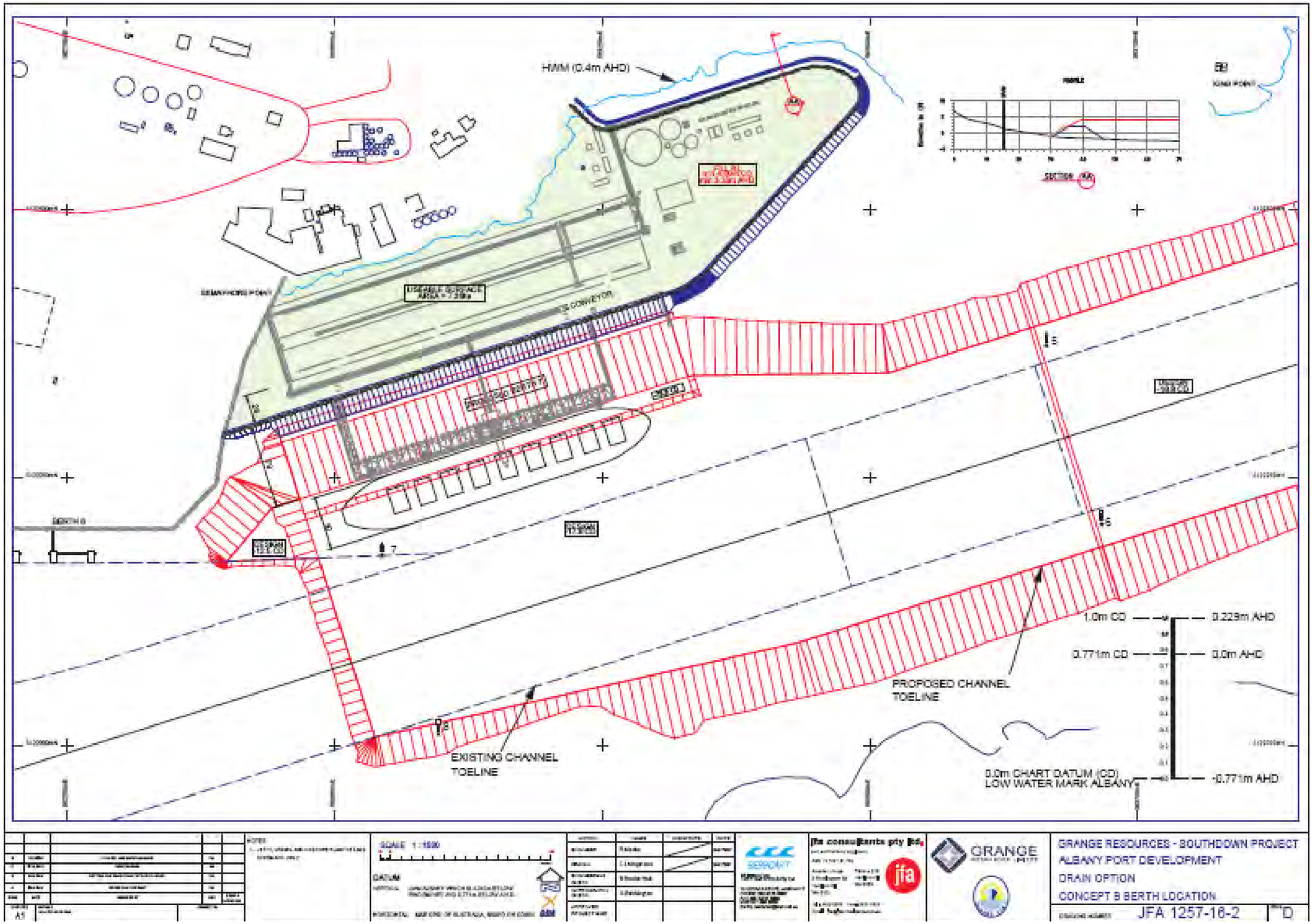


Figure 8-1: Drawing of the modified reclaim area to create separation from the ''A'' Class Reserve

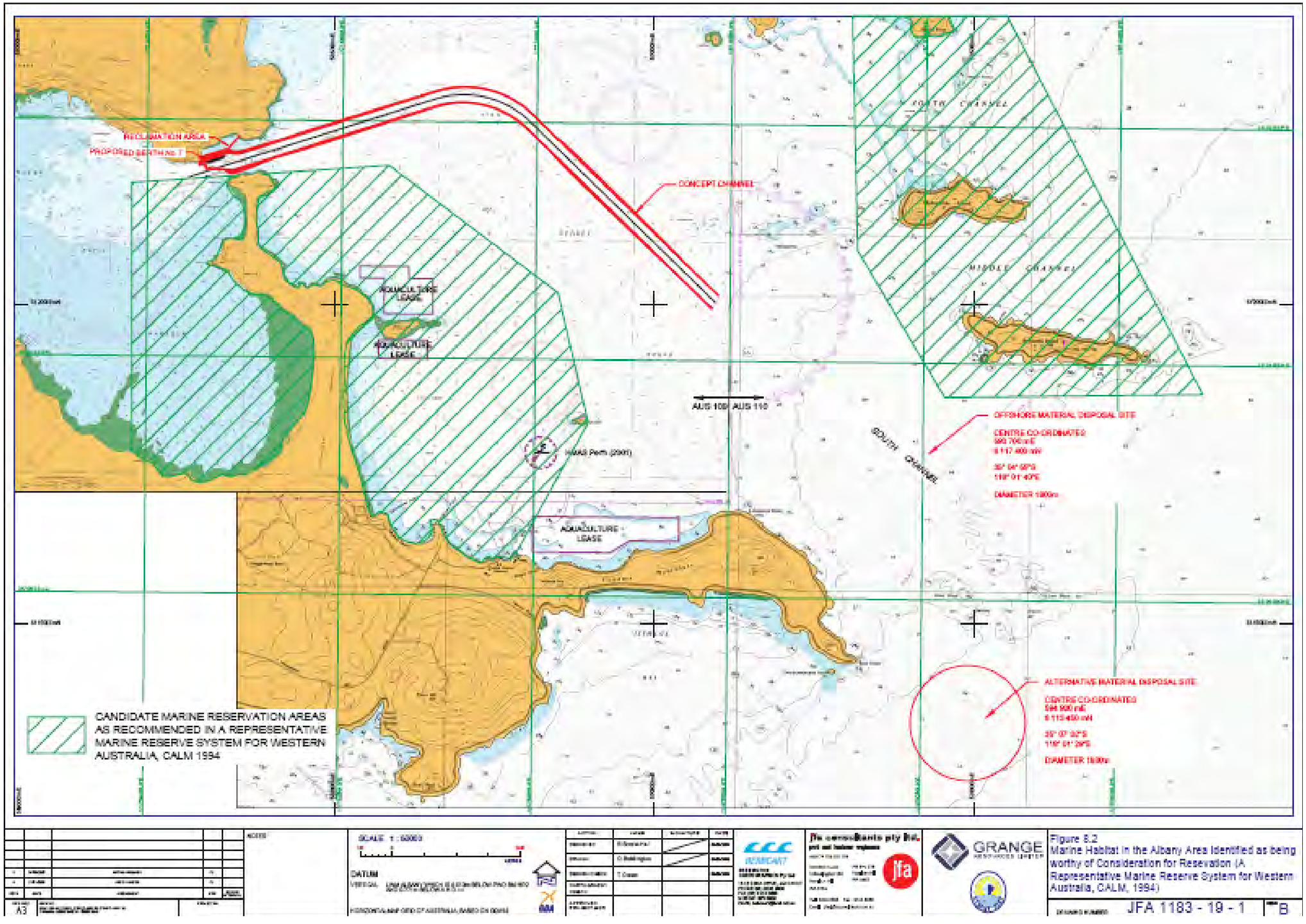


Figure 8-2: Marine Habitat in the Albany area Identified as worthy of Consideration for Reservation(A Representative Marine Reserve System for Western Australia, CALM 1994)

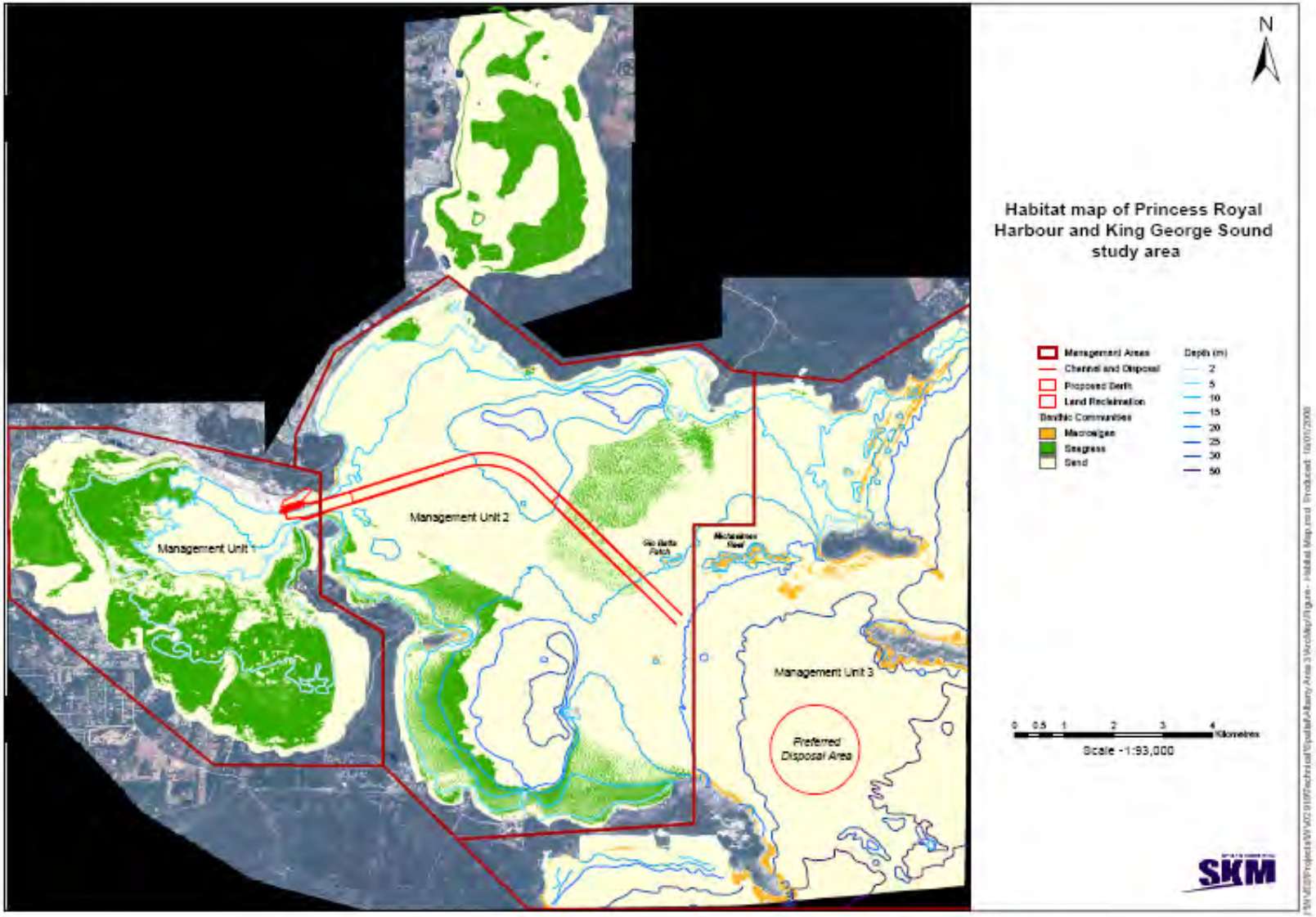


Figure 8-3: Habitat map of Princess Royal Harbour and King George Sound study area

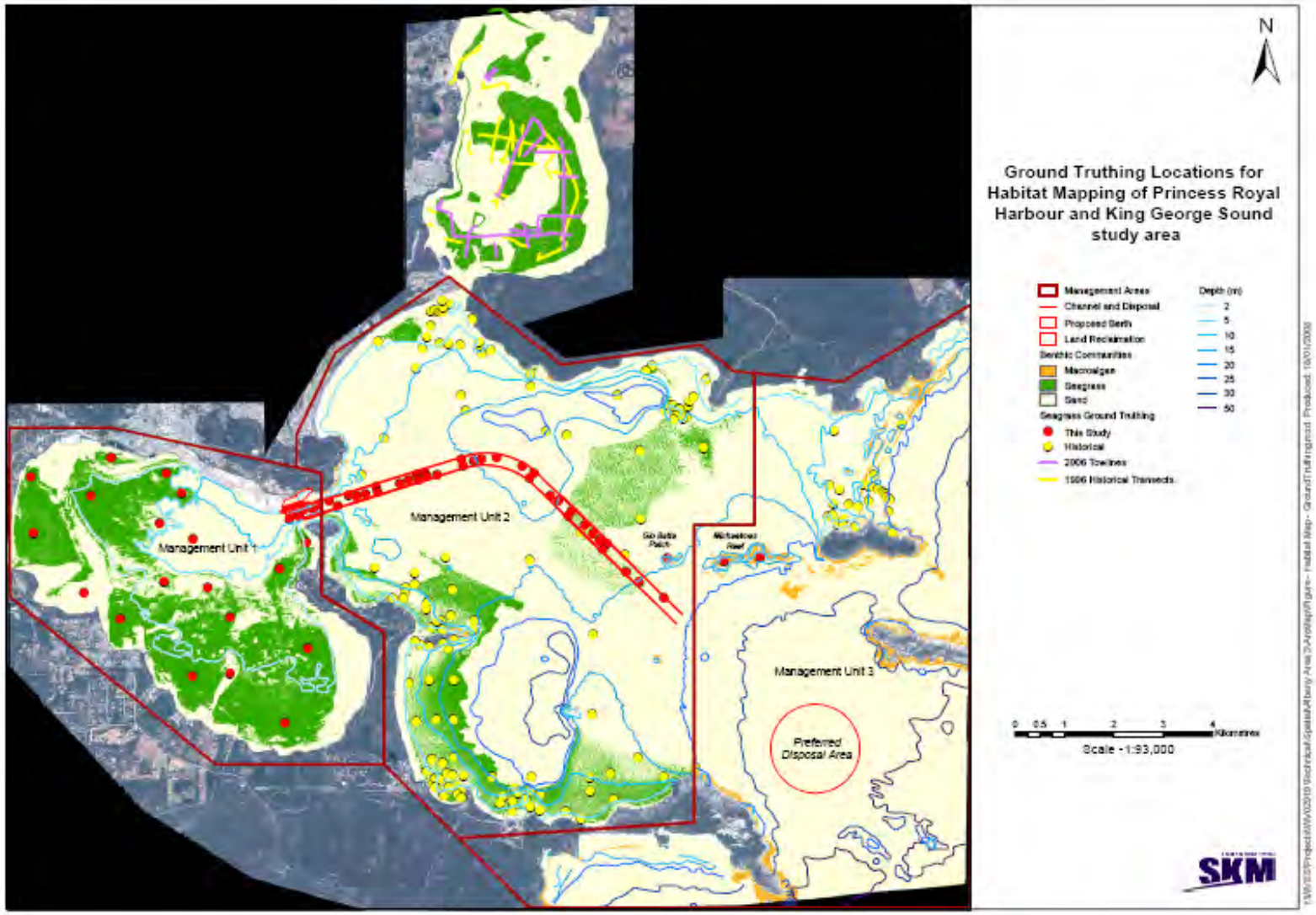


Figure 8-4: Ground Truthing Locations for Habitat Mapping of Princess Royal Harbour and King George Sound study area

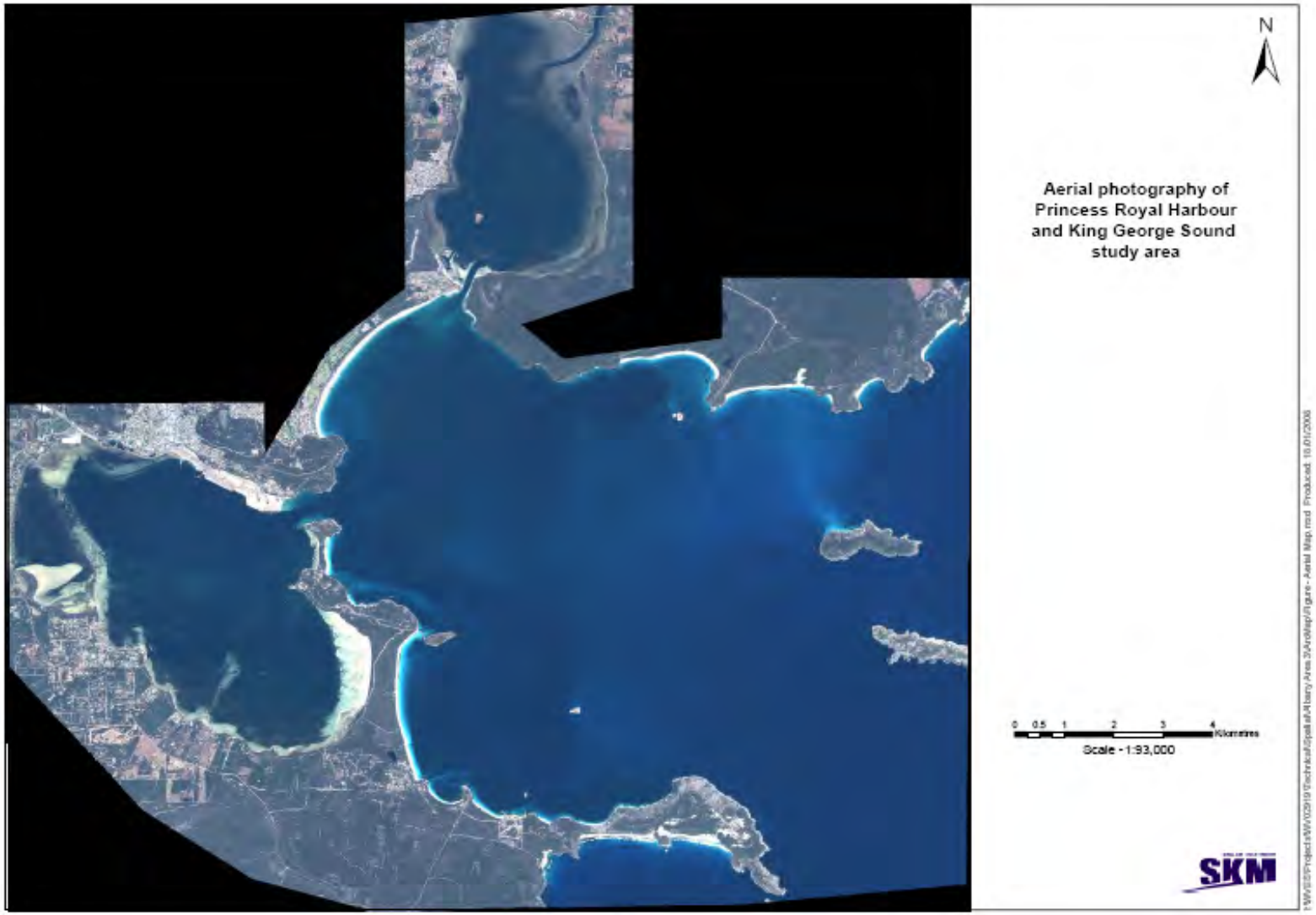


Figure 8-5: Satellite imagery of Habitat Mapping in Princess Royal Harbour and King George Sound study area

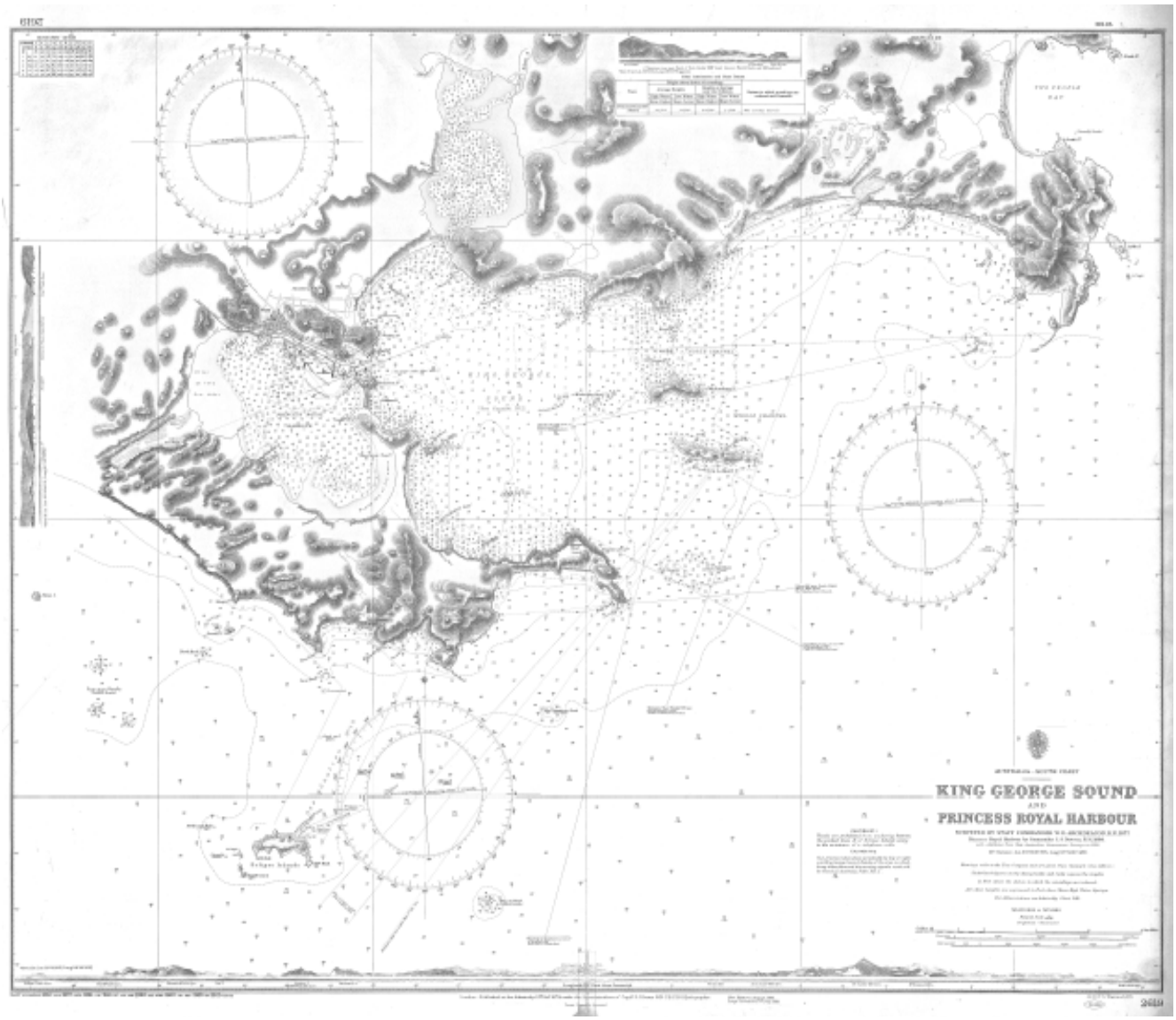


Figure 8-6: Chart 2619 "King George Sound" and "Princess Royal Harbour" (Corrected 6.7.1956)

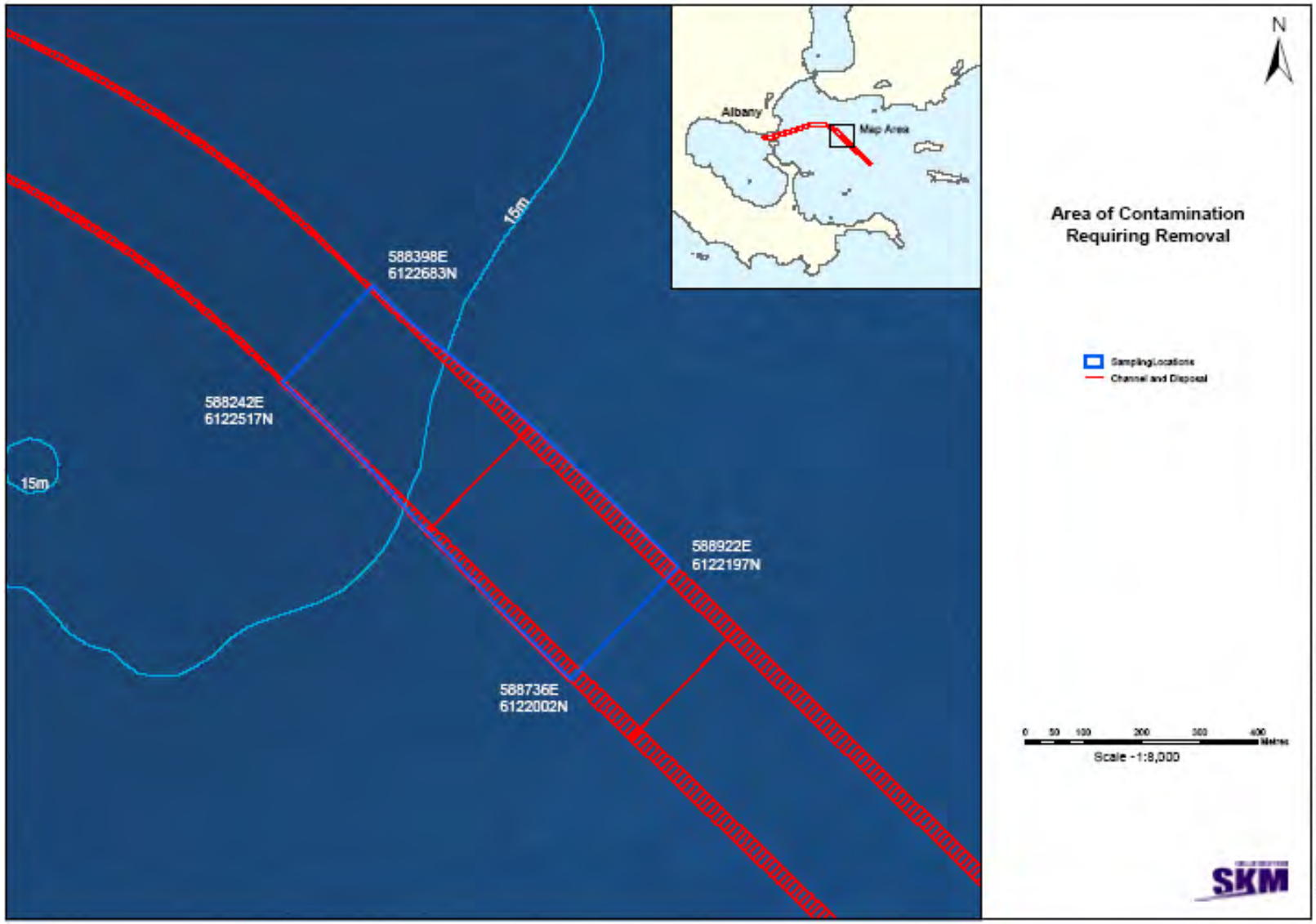


Figure 8-7: Area with contaminated material suitable for unconfined offshore disposal in-line with NODGDM.

9.0 Revised Dredge Program and Modelling Outputs

Albany Port Authority has been in on-going consultations with regulatory and non-regulatory stakeholders since the release of the PER in September 2007. Having taken stakeholders' concerns into consideration as part of project feasibility designs, the dredge program has now been amended to further balance environmental outcomes with practical requirements.

This section describes the current dredge program being pursued, how this differs from that proposed in the PER, and new information available since the release of the PER. Turbidity models and impact footprints based on the revised dredge program and new information, and additional considerations of minimum light requirements of BPPH are then presented.

9.1 Dredge and Land Reclamation Program

9.1.1 Channel Design

The channel design has been refined (Figure 9.1 and Figure 9.2) with the volume of material requiring dredging remaining unchanged at 12 Mm^3.

9.1.2 Dredging

The dredging program has been split into two distinct phases, dredging of the initial berth pocket and dredging of the remainder of the berth pocket and the channel. These programs could occur independently of each other depending on the availability of the different types of dredges required.

Standalone dredging of the initial berth pocket and construction of the seawall and land reclamation area is expected to take three months and will require a Cutter Suction Dredge. The balance of the dredging will take between 4.5 to 7 months and will require a Trailer Suction Hopper Dredge. Both dredging campaigns will commence on availability of a dredge contractor, the timing of which is currently unknown. However, a targeted commencement in 2009 is targeted subject to regulatory approvals and financial close.

There is a possibility that a small volume (up to a maximum of 87 000 cubic metres) of geotechnically unsuitable material for land reclamation may be present at the berth pocket that may have potential acid forming properties. This material will be dredged and ultimately disposed of offshore. If dredging of the berth pocket coincides with that of the channel, this material will be contained in the TSHD and disposed offshore without exposure to the surface. In this way, there is no risk of potential acid generation through oxidation. If dredging of the channel does not coincide with that of the initial berth pocket, this material will be brought to shore by the CSD and held in a contained area. The material will be tested for its acid forming potential and managed in accordance with DEC guidelines. Management of acid forming material will include storage of the material in a lined compound and ensuring that surface runoff drains to a similarly confined and lined facility. The material will be treated with pH ameliorants if and / or as required and tested prior to offshore disposal to manage any potential for adverse environmental impacts.

9.1.3 Land Reclamation

APA has amended the land reclamation footprint and removed the need to impact on native vegetation in Mt Adelaide A Class Reserve (Figure 8.1 and Figure 9.3). The area to be reclaimed will still remain at 9 ha as this is the required space for the ship loading facilities for the Southdown Magnetite project.

9.1.4 Offshore Disposal

There is no change to the offshore disposal location or the volume of material (up to 12 Mm^3) requiring disposal.

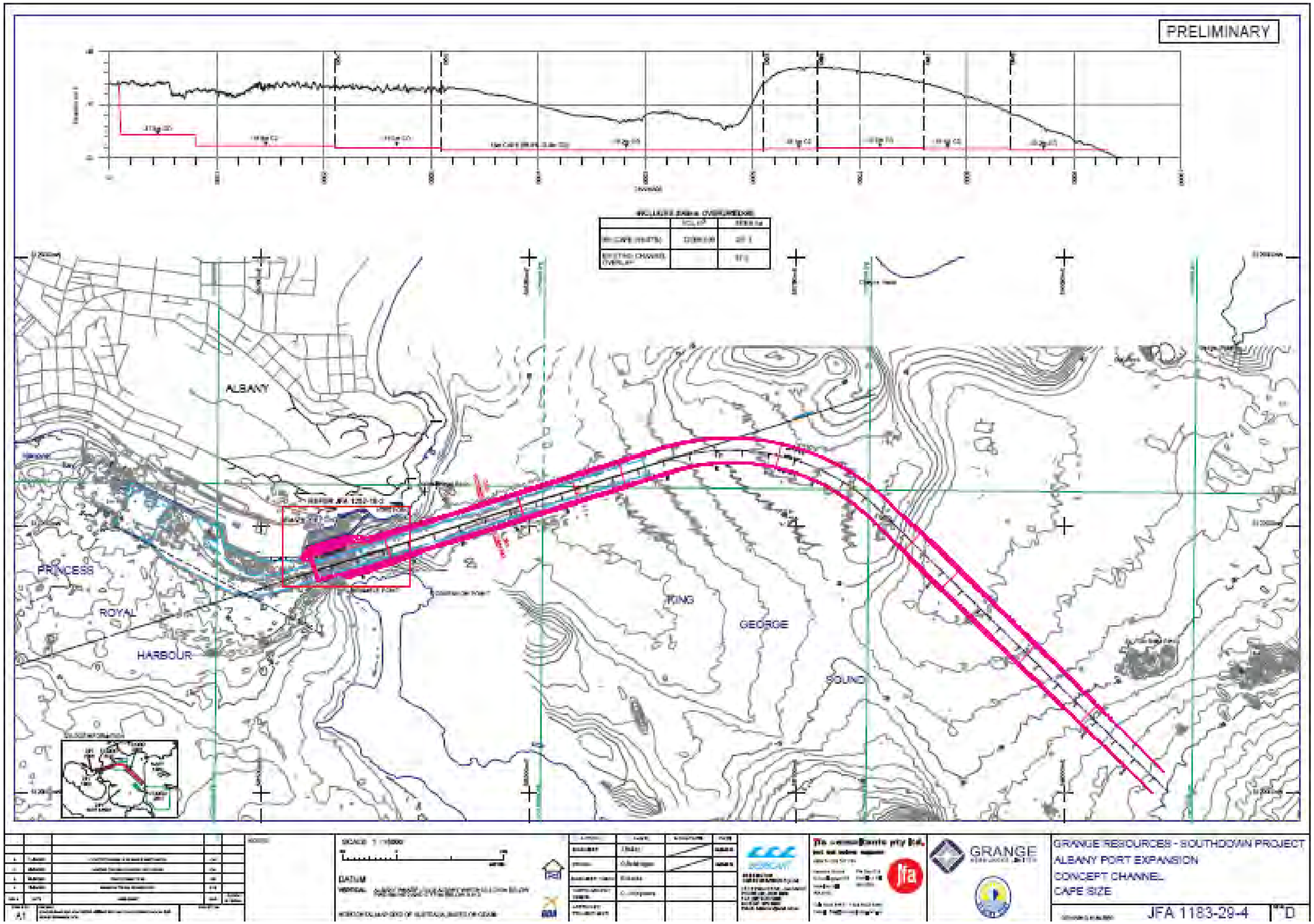


Figure 9-1: Revised Channel Design Footprint

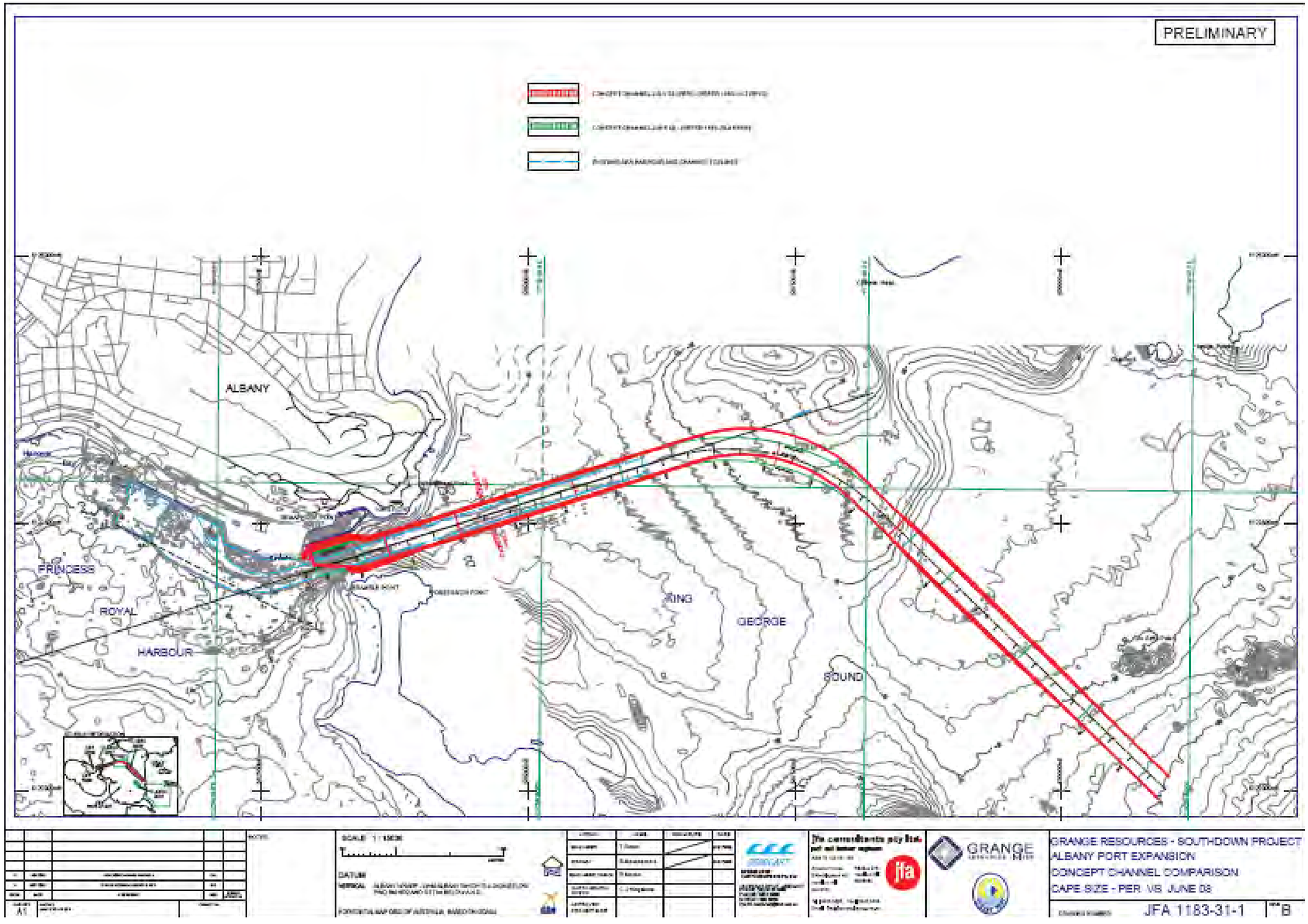


Figure 9-2: Previous, Revised & Existing Channel Design Comparison

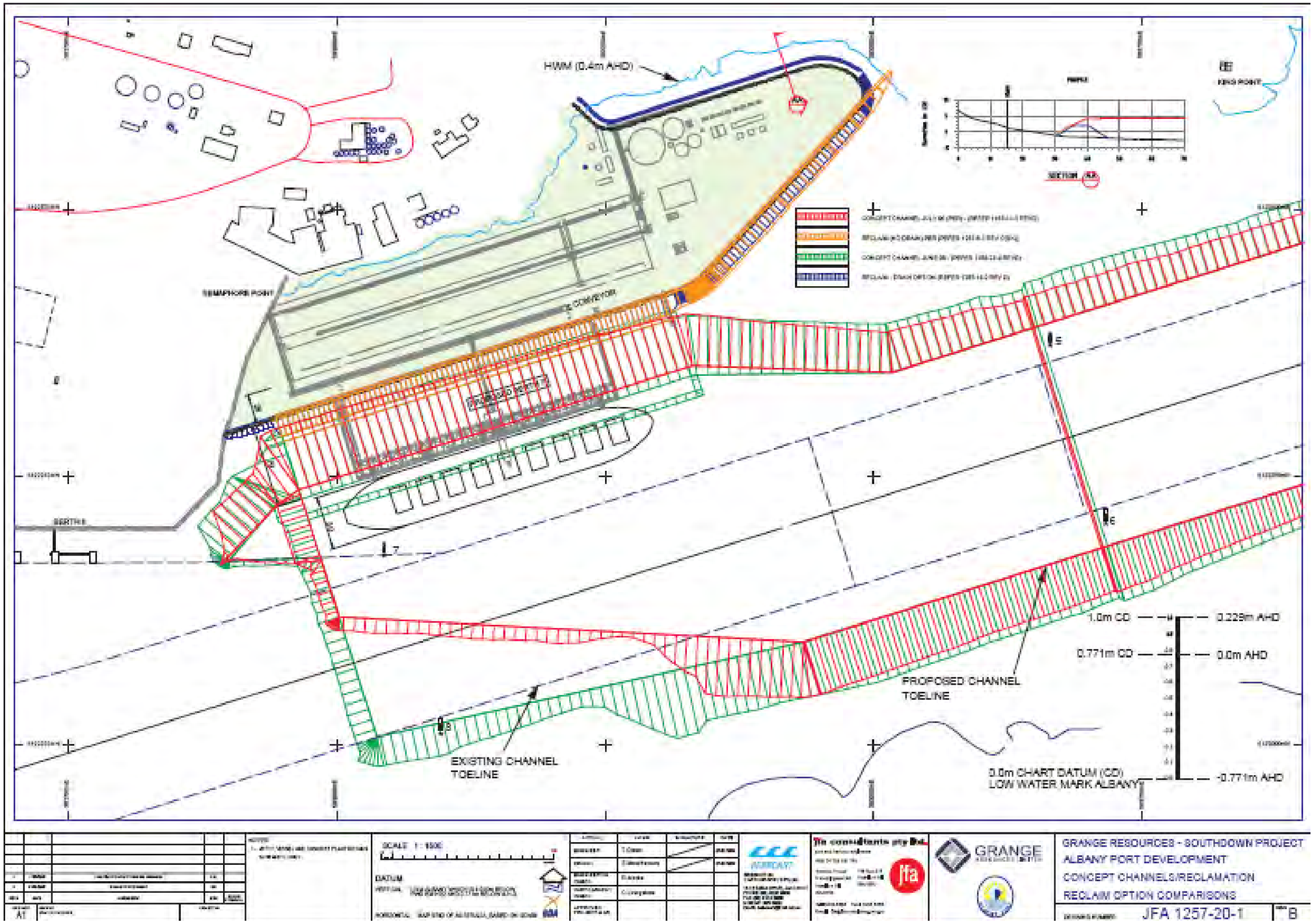


Figure 9-3: Previous vs Revised Land Reclamation and Berth Pocket Footprint

9.2 New Information

Since the release of the PER, the project's hydrodynamic modelling work and BPPH impact assessment work have been subject to independent peer reviews.

- The GEMS Pty Ltd 'Oceanographic Studies and Dredging Program Simulation Studies' Report was reviewed by Dr Jason Antenucci (University of Western Australia (UWA) Centre for Water Research) and Dr Kathleen McInnes (CSIRO Marine and Atmospheric Research).
- The SKM Sampling and Analysis Plan and Benthic Primary Producer Report was reviewed by Professor Paul Lavery (Edith Cowan University Centre for Ecosystem Management).

The results of these reviews have been provided to the EPASU. The reviewers concluded that the methods for modelling and impact assessment are inherently sound.

A key finding from the review by Dr Jason Antenucci of UWA highlighted an error in the sediment settling velocities supplied by the CSIRO that were used to determine the project's turbidity footprint. This was investigated, corrected and amended settling velocities were used and the model was re-run to re-determine the project impact predictions (as presented in Section 9.3 and Tables 9.2 & 9.3, respectively).

9.3 Remodelling of Turbidity Generation

Remodelling of the dredge program took into account the amended sediment settling velocities and new dredging durations. The following scenarios were modelled over a 12 month period:

- A distinct three month dredging campaign of the initial berth pocket by the CSD.
- A combined 4.5 to 7month dredging campaign of the berth pocket by the CSD and the channel by the TSHD.

9.3.1 For the Period July to October

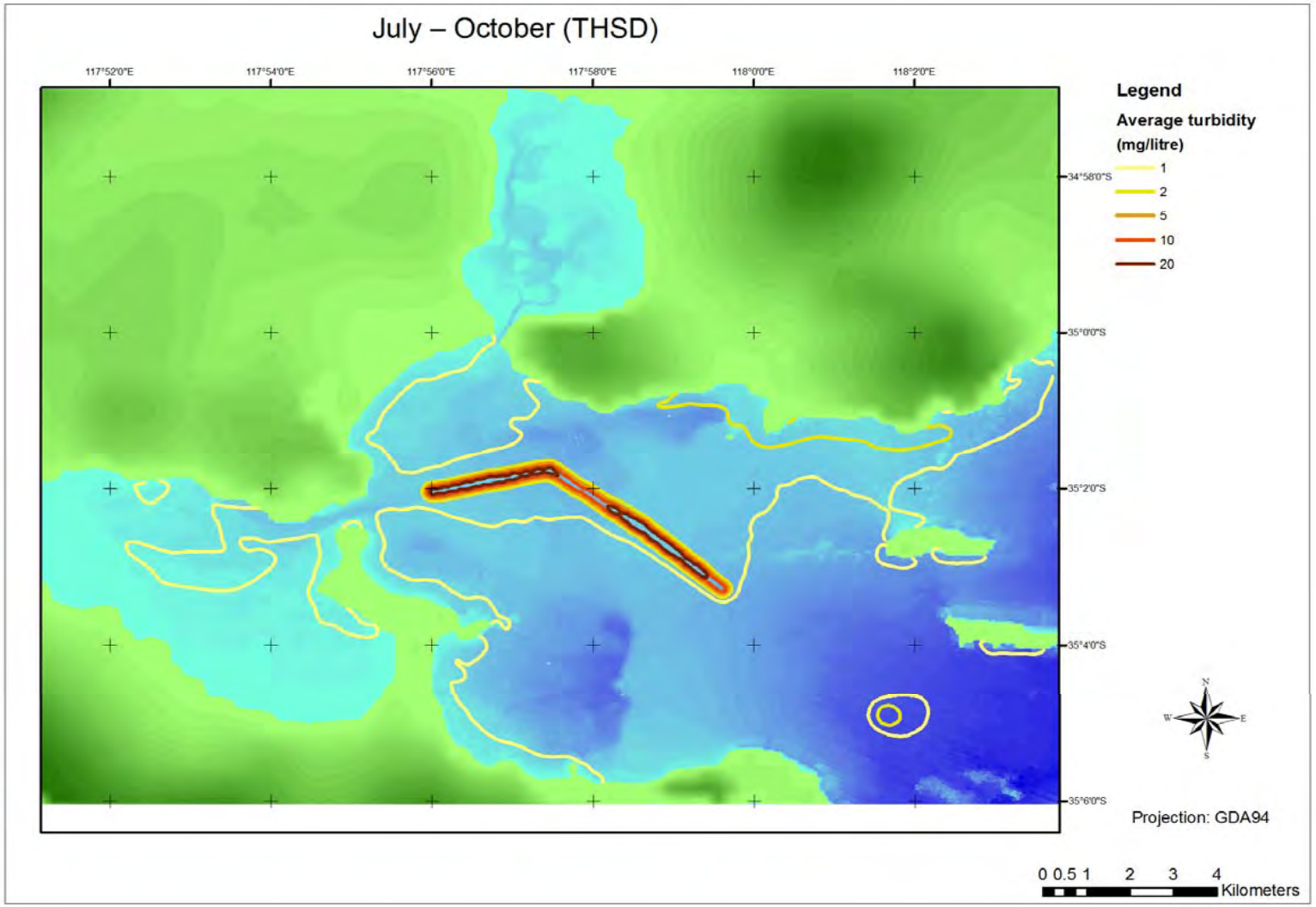


Figure 9-4: CSD and TSHD Combined Campaign Turbidity Generation (July to October)

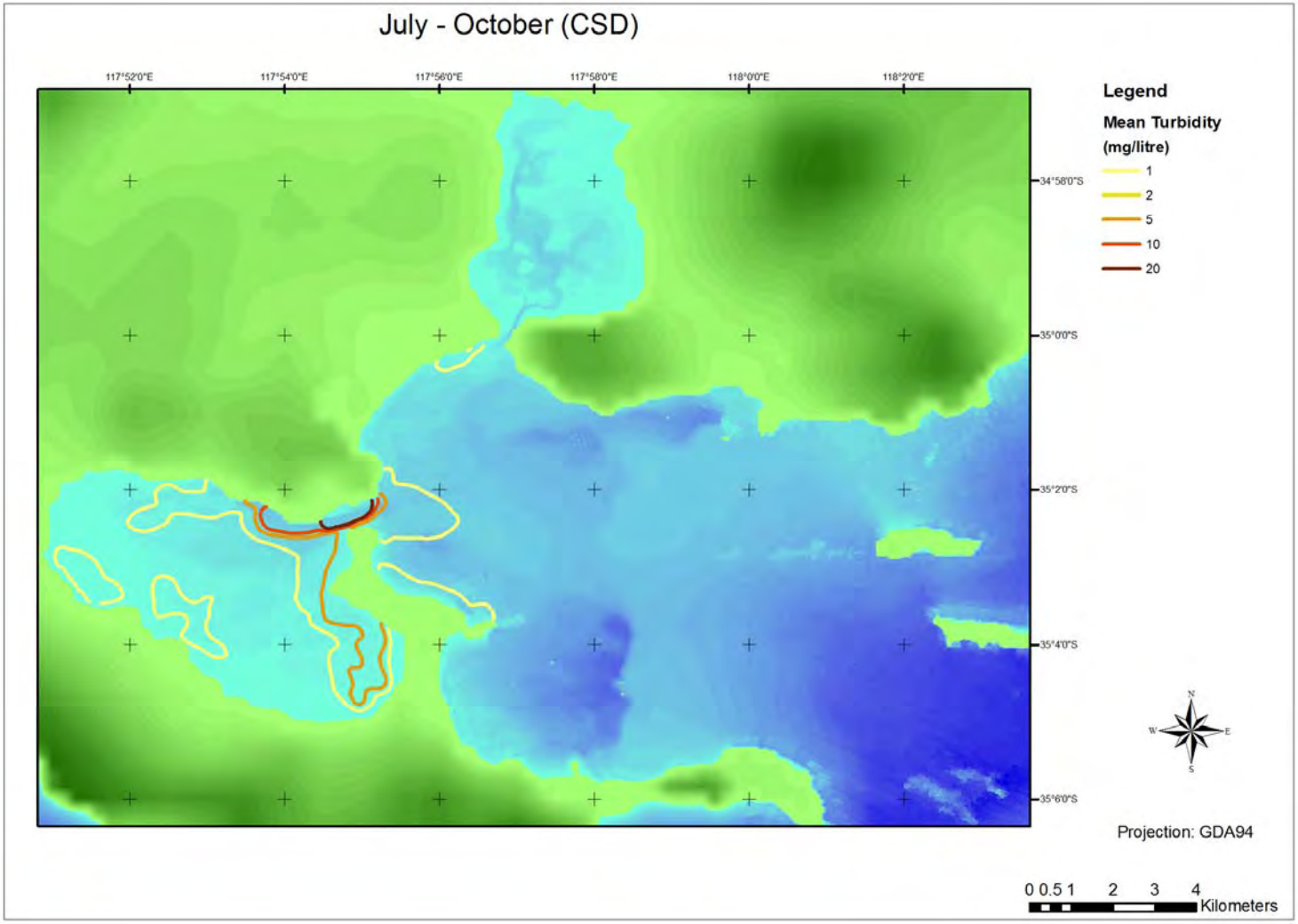


Figure 9-5: CSD Berth Pocket only Turbidity Generation (July to October)

9.3.2 For the Period November to February

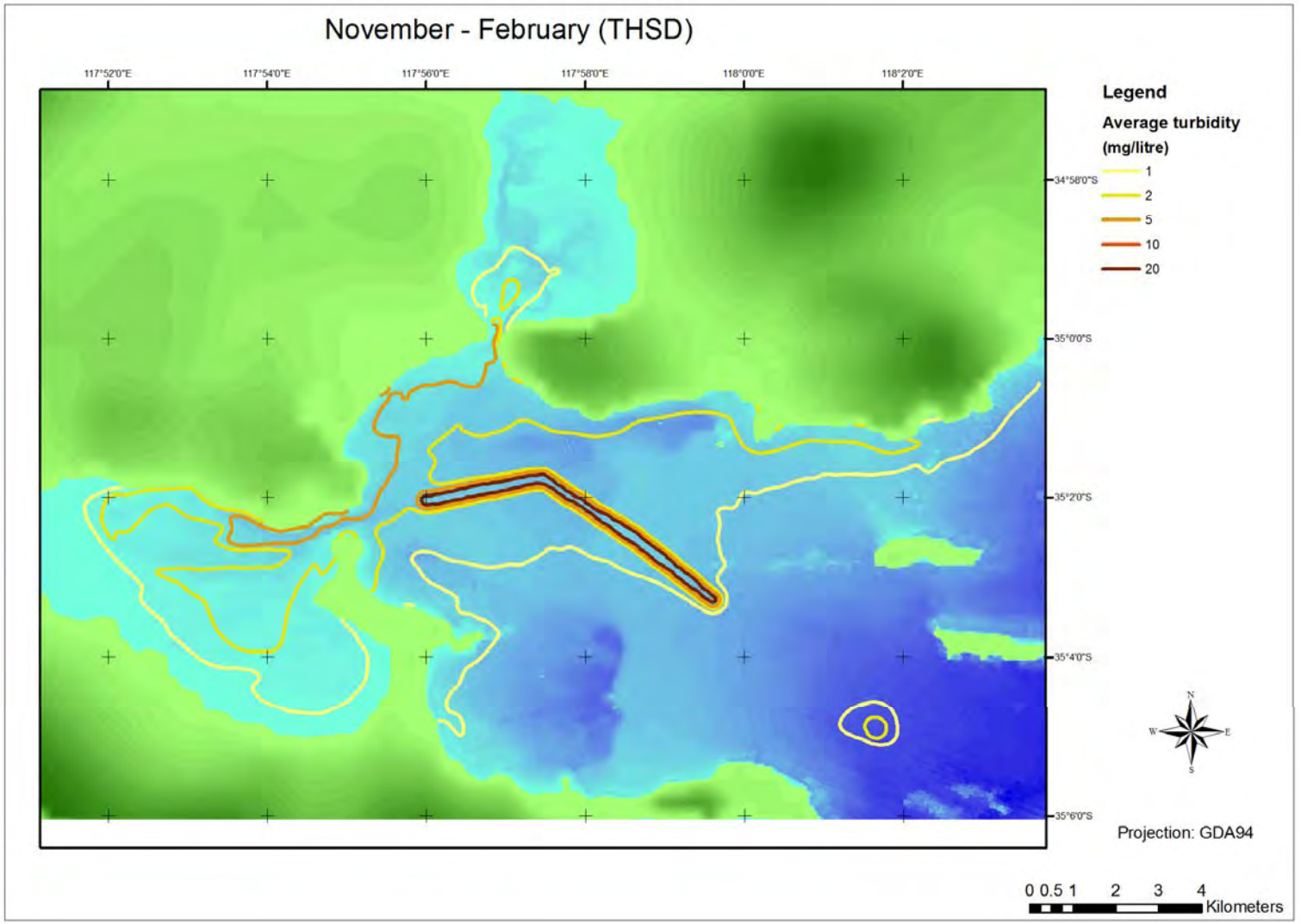


Figure 9-6: CSD and TSHD Combined Campaign Turbidity Generation (November to February)

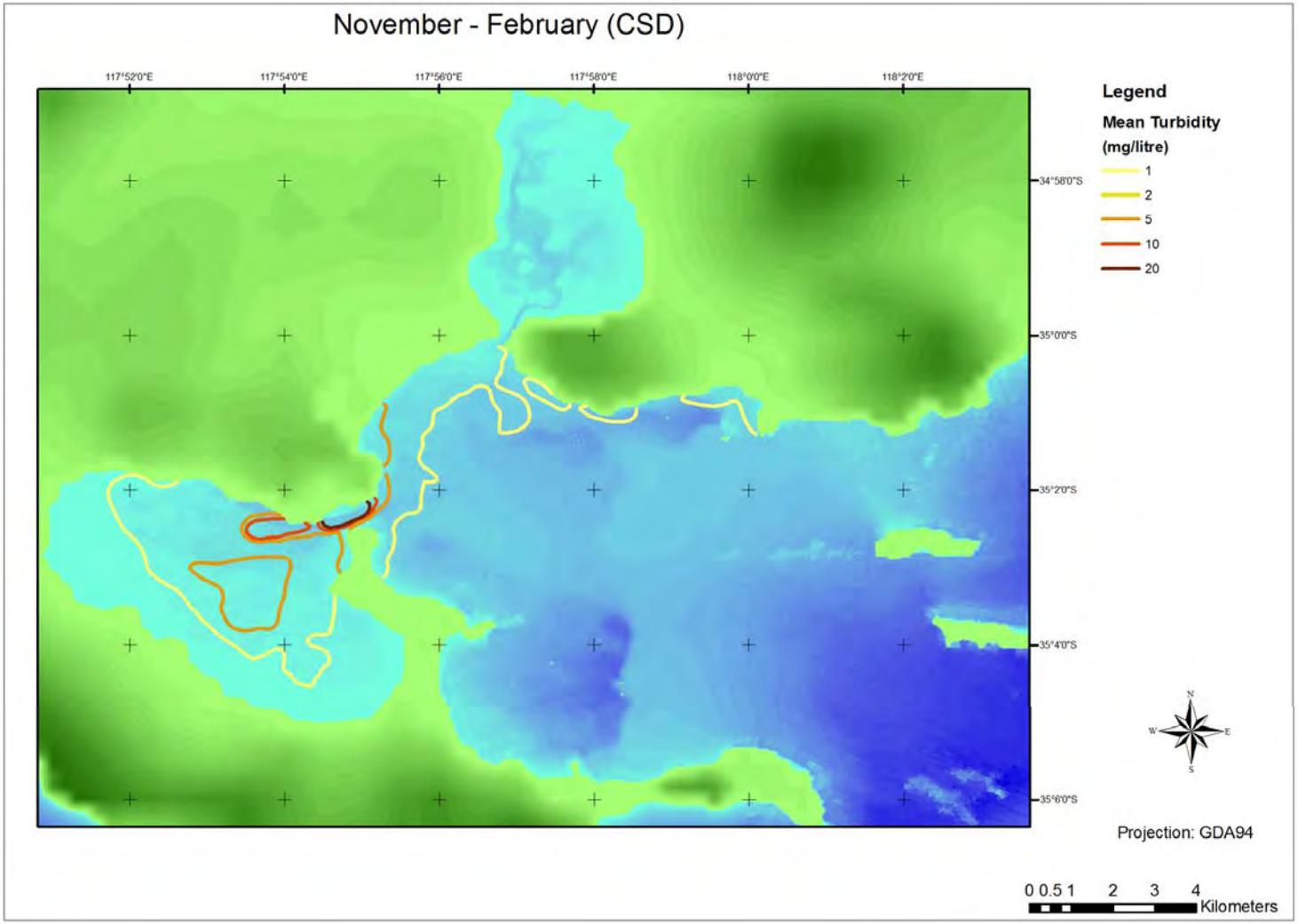


Figure 9-7: CSD Berth Pocket only Turbidity Generation (November to February)

9.3.3 For the Period March to June

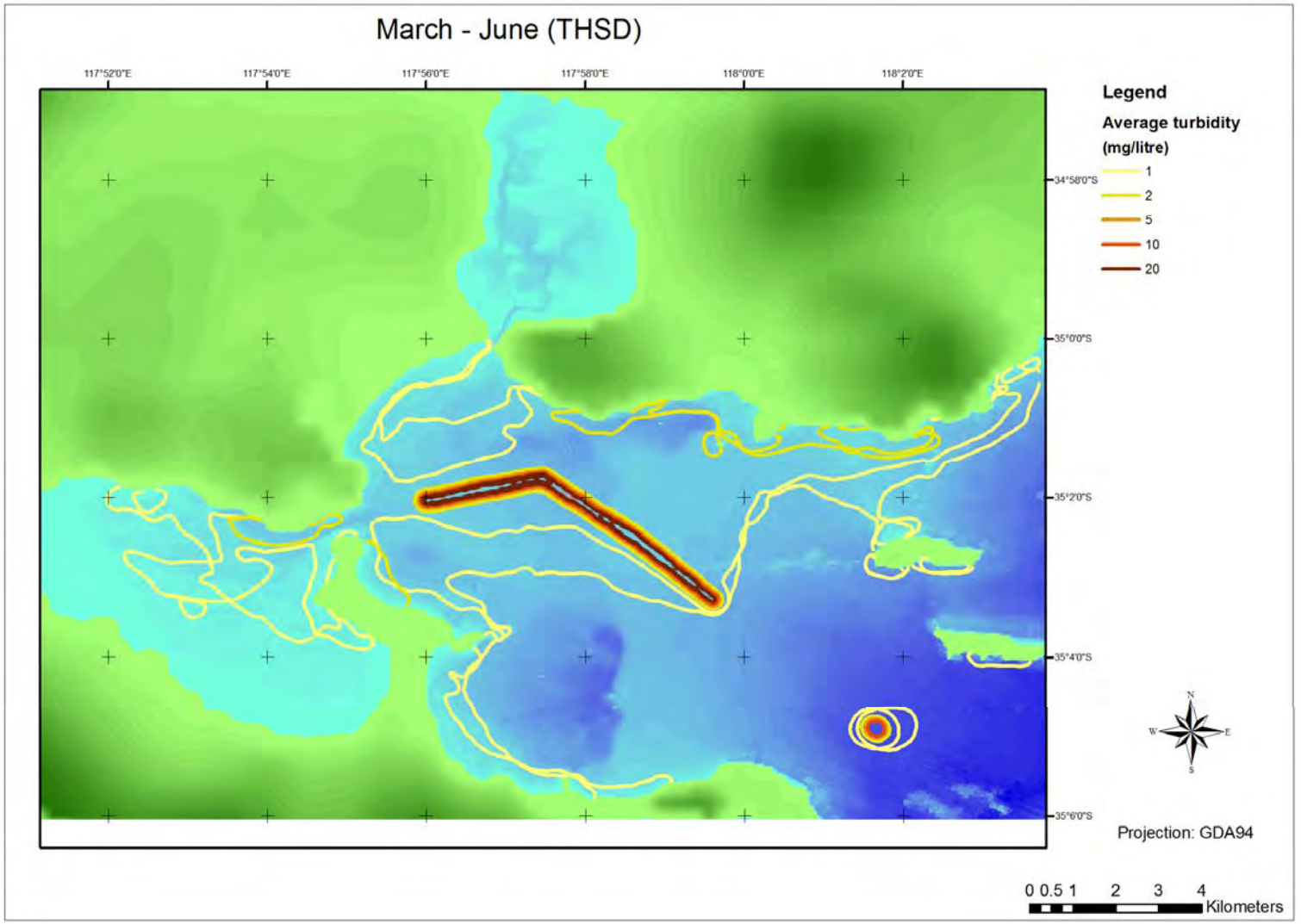


Figure 9-8: CSD and TSHD Combined Campaign Turbidity Generation (March to June)

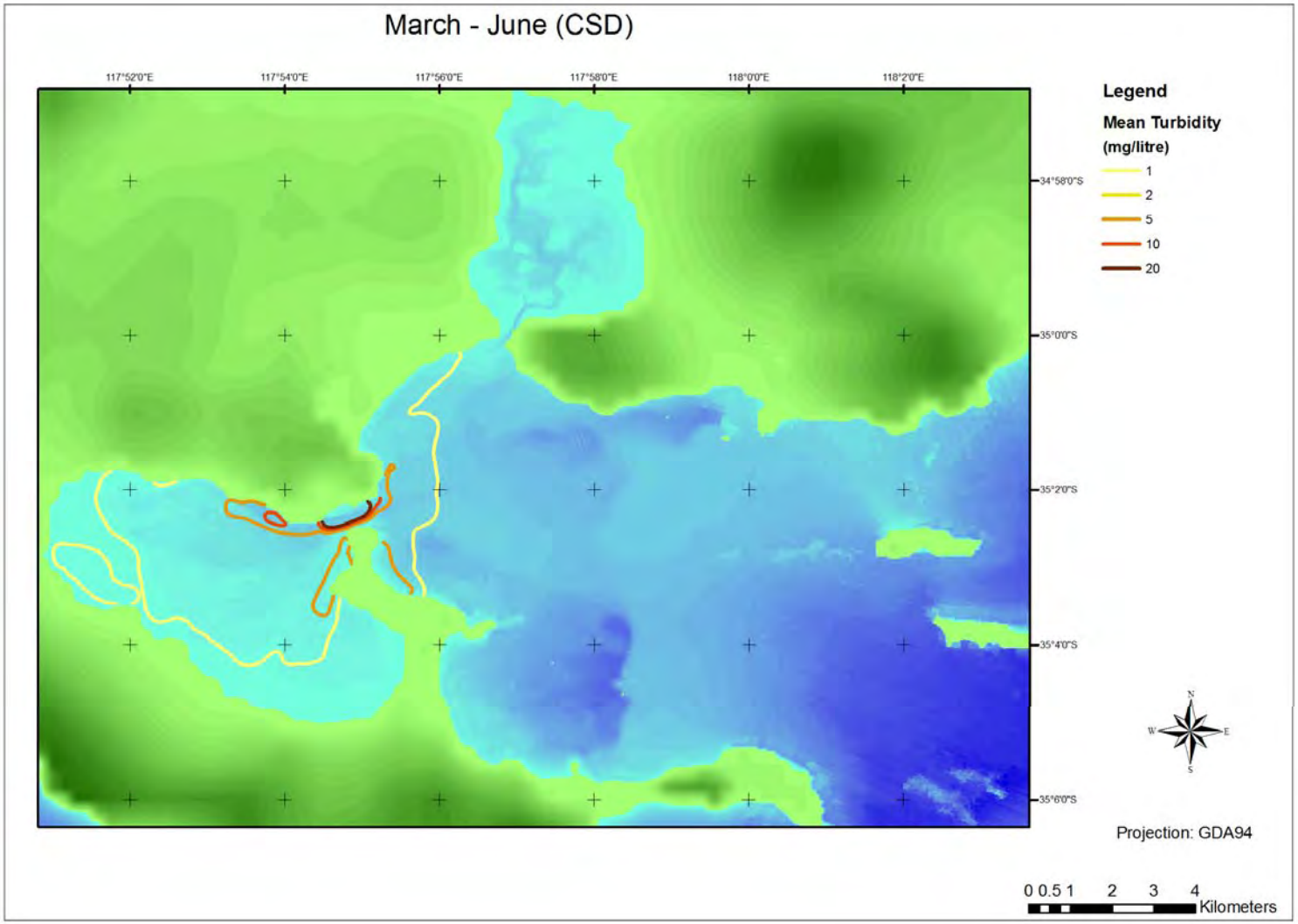


Figure 9-9: CSD Berth Pocket only Turbidity Generation (March to June)

9.4 Impacts to BPPH

9.4.1 Berth Pocket Dredging

Based on the revised information on turbidity generation, the impacts to BPPH were reassessed. This was based on a Minimum Light Requirement (MLR) of 8.5% which is appropriate due to the species of seagrass and lack of epiphyte growth in the area.

The loss scenarios for the CSD berth pocket dredging is quantified and presented in Table 9-1, and illustrated in Figure 9.10.

Table 9-1: BPPH Impacts for CSD only

Loss scenarios		**Management Units**		
		1	**2**	**3**
July to October	Best case	0.01%	0.00%	0.00%
Figure 9.10	Most probable case	0.01%	0.00%	0.00%
	Worst case	0.02%	0.00%	0.00%
November to February	Best case	0.01%	0.00%	0.00%
Figure 9.11	Most probable case	0.01%	0.00%	0.00%
	Worst case	0.02%	0.00%	0.00%
March to June	Best case	0.01%	0.00%	0.00%
Figure 9.12	Most probable case	0.01%	0.00%	0.00%
	Worst case	0.02%	0.00%	0.00%

Definitions

Best case: This is the direct loss in the footprint of dredging and reclamation.
Most probable case: This is that predicted for the zones for Permanent Loss.
Worst case: This is a combination of that predicted for the zones for Permanent Loss and Temporary Loss/Damage.

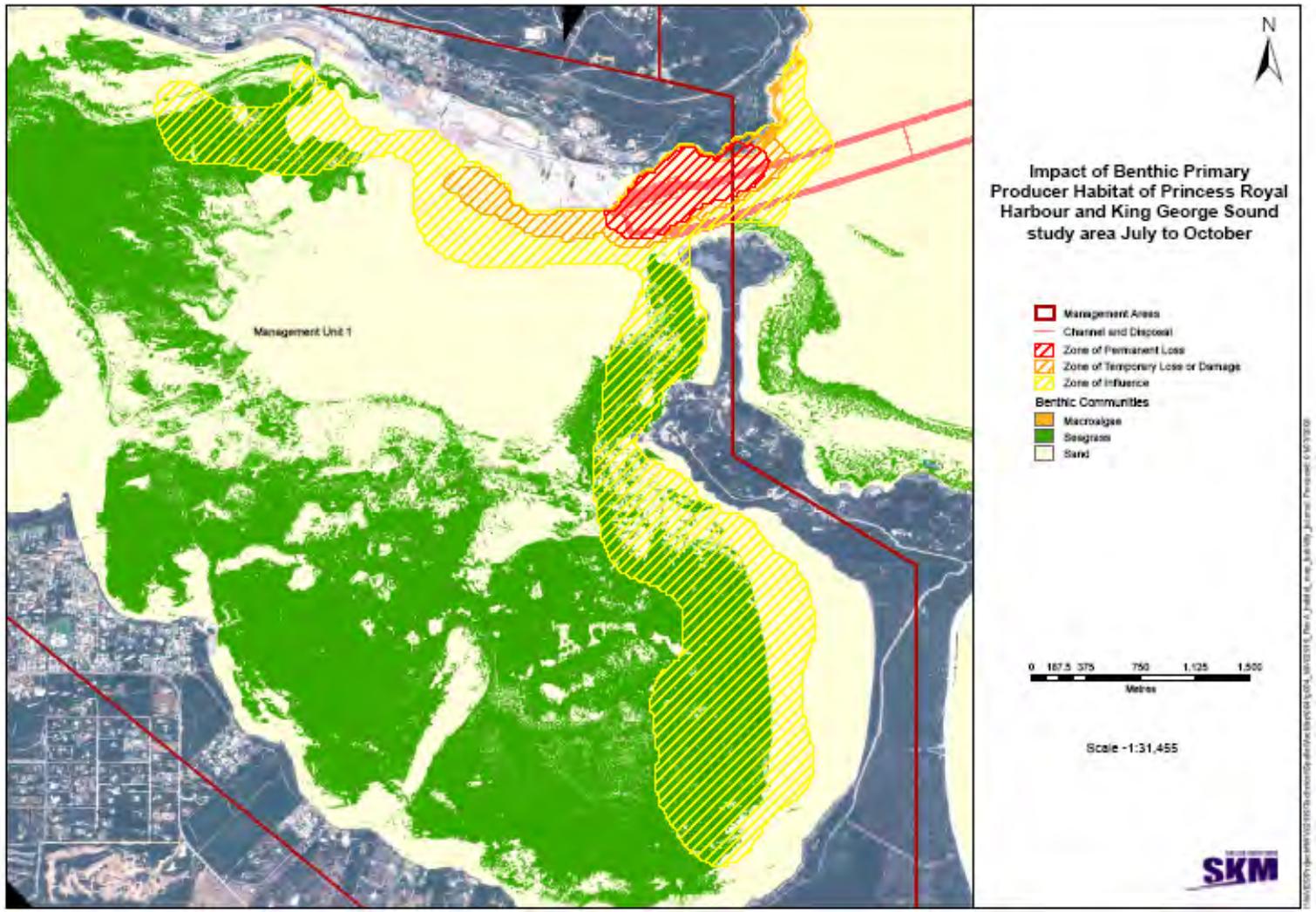


Figure 9-10: CSD Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area July to October

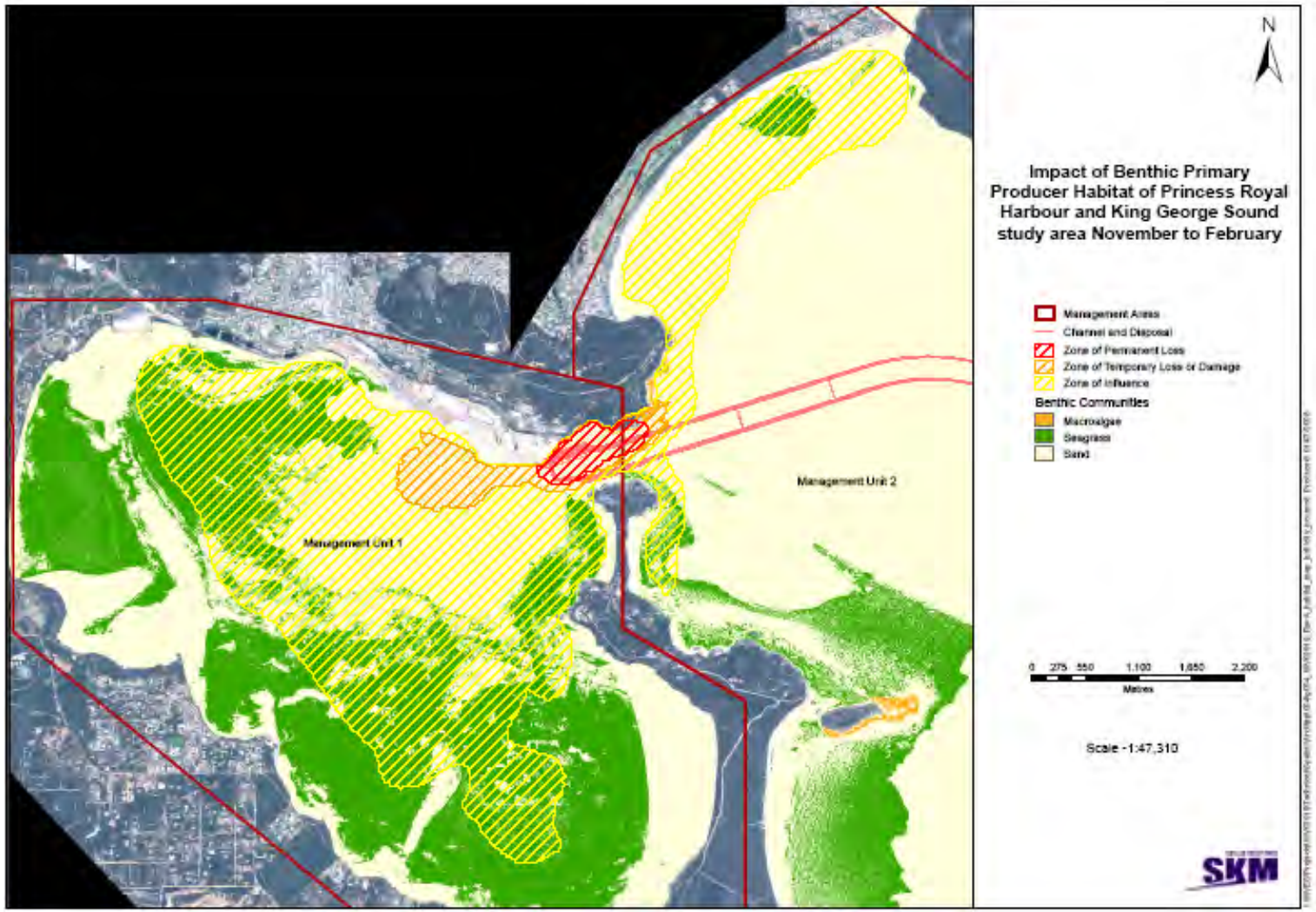


Figure 9-11: CSD Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area November to February

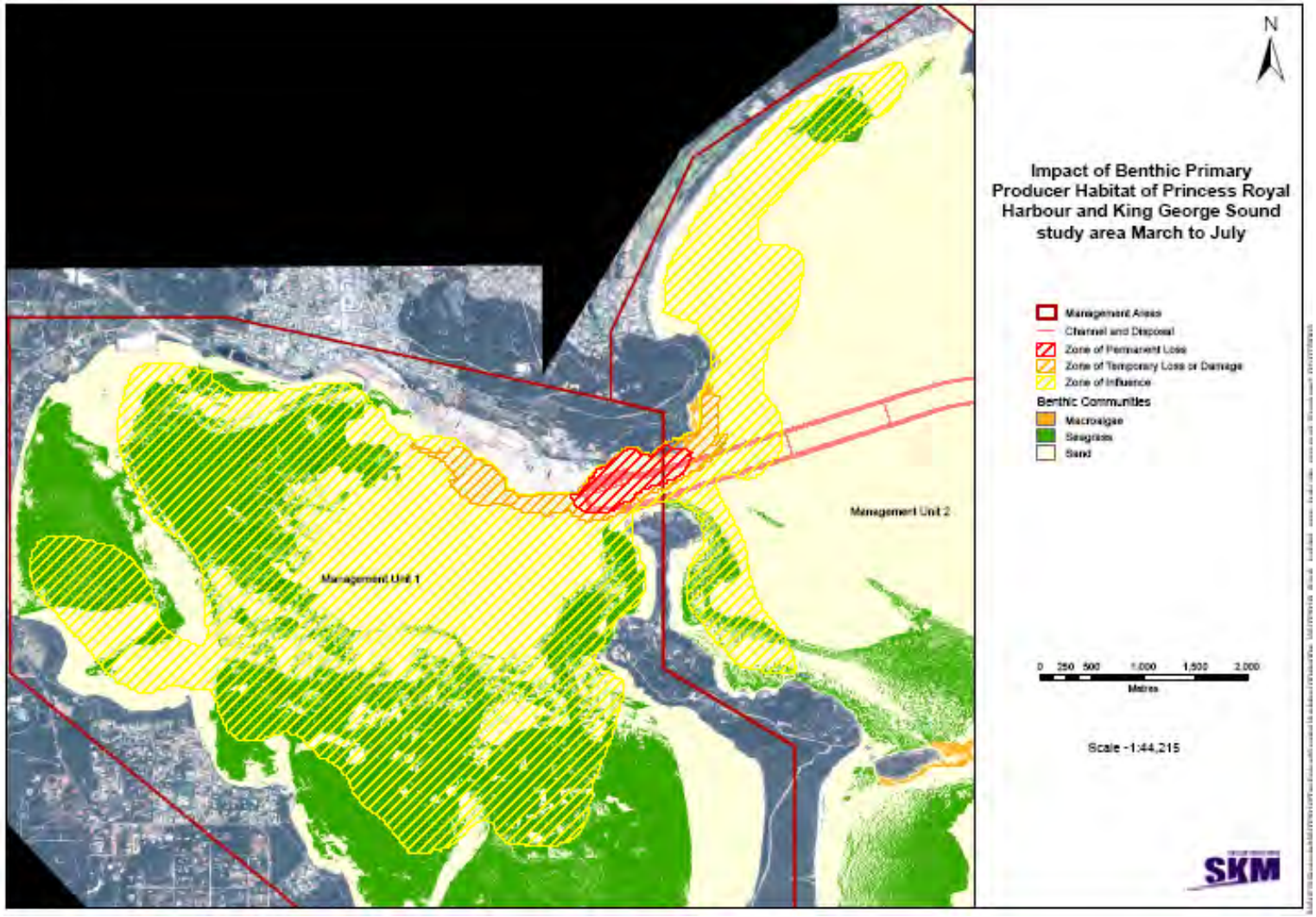


Figure 9-12: CSD Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area March to June

9.4.2 Combined Berth Pocket and Channel Dredging

On 19th June 2008, the APA and its consultants attended a meeting requested by DEC Marine Branch to discuss (among other issues) queries regarding the nominated minimum light requirement (MLR) values used as part of BPPH impact predictions. As a result, additional MLRs (10% and 14%) have been incorporated into the impact assessment calculations for Management Unit 2 as discussed, agreed and requested by Marine Branch / EPASU.

Due to the absence of epiphyte growth, 8.5% MLR is considered as the most appropriate measure for the King George Sound area.

The changes in loss scenarios for the combined CSD berth pocket and TSHD channel dredging based on different MLRs (and corrected sediment settling velocities) is quantified and presented in Table 9-2 (seagrass around the channel) and Table 9-3 (whole of Management unit 2). The data represent temporary loss/damage as the permanent loss data has not changed. This is due to the 'black out' effect upon which further reduction in light would not have any additional impacts. The overall loss scenarios for CSD berth pocket and TSHD channel dredging is presented in Table 9-4, and illustrated in Figure 9.13, Figure 9.14 and Figure 9.15.

Table 9-2: Management Unit 2 seagrass area around the outer channel

	Temporary Loss/Damaage (ha)			% Increase from base case MLR 8.5%		
	MLR 8.5%	MLR 10%	MLR 14%	MLR 8.5%	MLR 10%	MLR 14%
July to October	11.72	11.77	11.97	0.00%	0.43%	2.15%
November to February	9.12	9.13	13.32	0.00%	0.10%	46.05%
March to June	10.56	10.59	13.36	0.00%	0.27%	26.49%

Table 9-3: Total Management Unit 2 seagrass area

	Temporary Loss/Damage (ha)			% Increase from base case MLR 8.5%		
	MLR 8.5%	MLR 10%	MLR 14%	MLR 8.5%	MLR 10%	MLR 14%
July to October	11.77	11.81	23.47	0.00%	0.34%	99.38%
November to February	65.10	65.10	66.78	0.00%	0.01%	2.58%
March to June	10.58	10.68	54.25	0.00%	0.97%	412.83%

Table 9-4: BPPH Impacts for combined CSD and TSHD Dredging

Loss scenarios		Management Unit 2		
		MLR (%)		
		8.5	10	14
July to October	Best case	1.44%	1.44%	1.44%
Figure 9.13	Most probable case	2.62%	2.62%	2.62%
	Worst case	4.06%	4.07%	5.49%
November to February	Best case	1.44%	1.44%	1.44%
Figure 9.14	Most probable case	3.07%	3.07%	3.07%
	Worst case	11.03%	11.03%	11.24%
March to June	Best case	1.44%	1.44%	1.44%
Figure 9.15	Most probable case	3.15%	3.15%	3.15%
	Worst case	4.45%	4.46%	9.79%

Definitions

Best case:	This is the direct loss in the footprint of dredging and reclamation.
Most probable case:	This is that predicted for the zones for Permanent Loss.
Worst case:	This is a combination of that predicted for the zones for Permanent Loss and Temporary Loss/Damage.

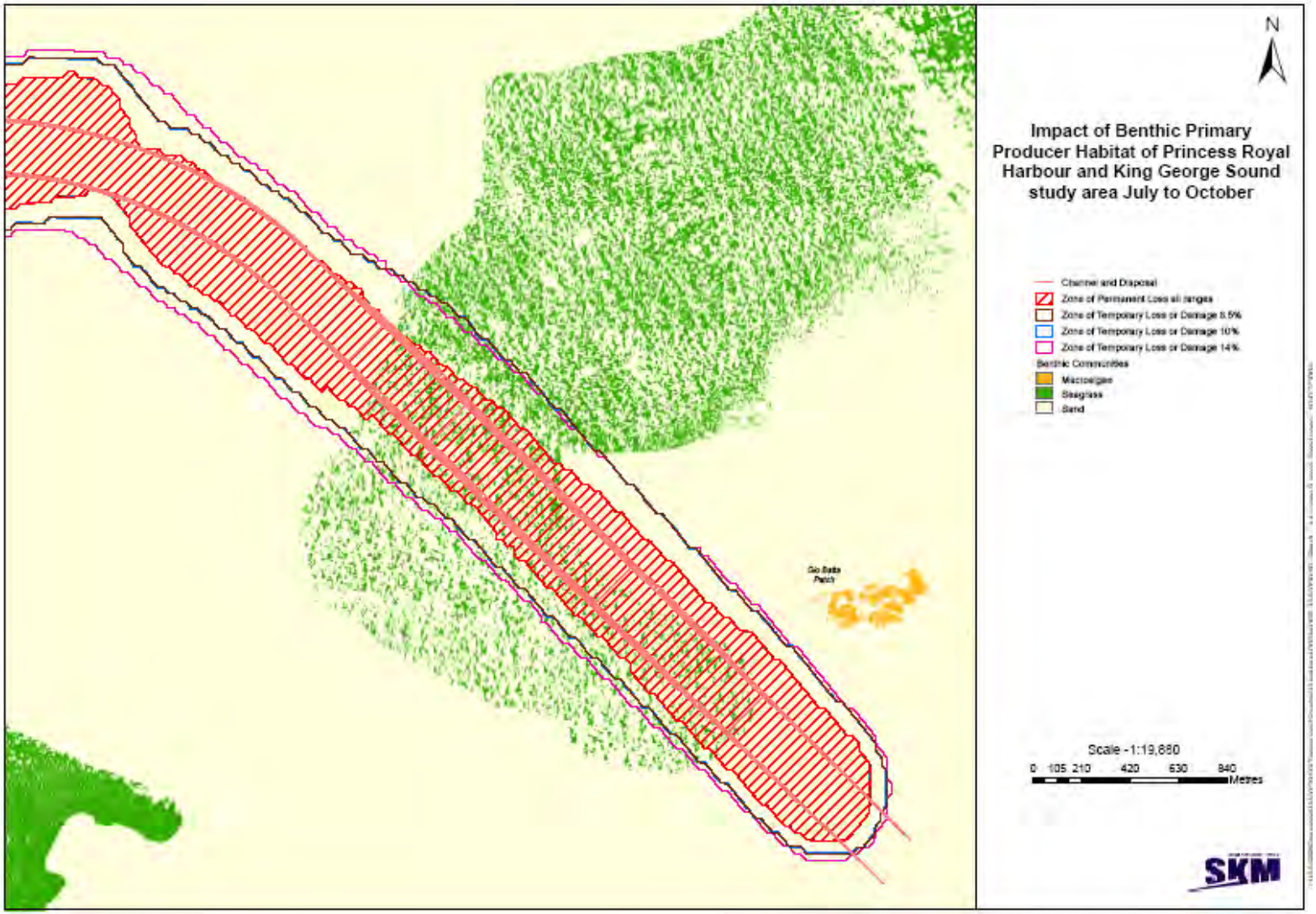


Figure 9-13: Combined Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area July to October

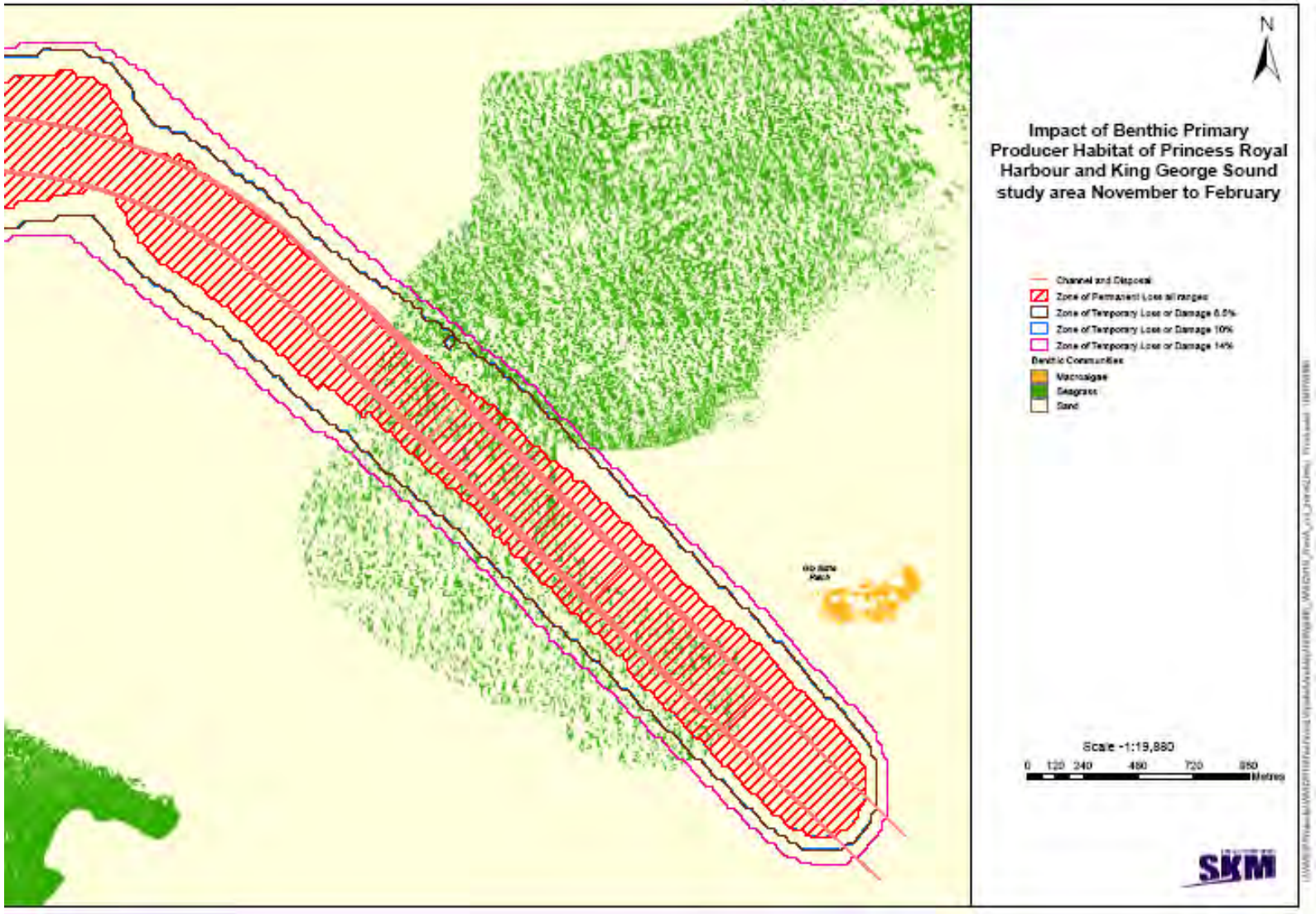


Figure 9-14: Combined Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area November to February

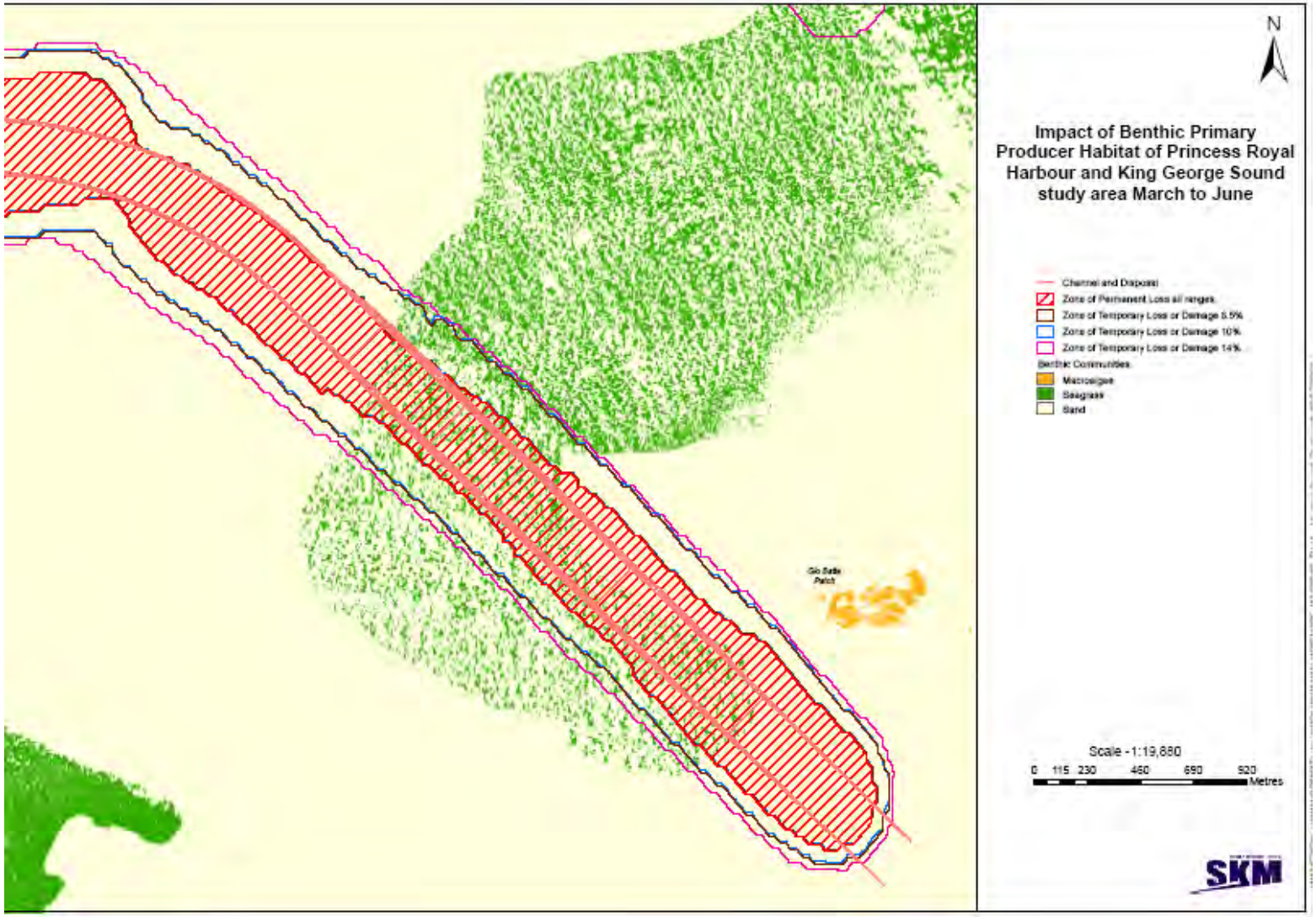


Figure 9-15: Combined Impact on Benthic Primary Producer Habitat of Princess Royal Harbour and King George Sound study area March to June

10.0 References

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