Department of Fisheries
Government of Western Australia

Fish for the future

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SUBMISSION ON THE YANNARIE SOLAR PROJECT ERMP

The Department of Fisheries (the Department) wish to provide a submission on the Environment Review and Management Programme (ERMP) developed by Straits Salt Pty Ltd for the Yannarie Solar Project on the eastern shore of Exmouth Gulf.

Significance of the Eastern Shore and Waters of Exmouth Gulf

In order to give context to the Department of Fisheries comments it is necessary to discuss the importance of Exmouth Gulf, and in particular the eastern waters of the Gulf, in relation to commercial fishing activities in the region and, more broadly, as a critical marine fauna habitat.

Ecological Importance of the Eastern Waters of Exmouth Gulf

The eastern waters of Exmouth Gulf have been recommended as a Fish Habitat Protection Area in the draft Department of Fisheries report *Fisheries Environmental Management Plan for the Gascoyne Region – 2002*. This report discusses the importance of the habitats on the eastern waters and coast of the Gulf, specifically the transverse tidal creeks, the wide supra-tidal salt flats and the intertidal mudflats. These areas are the source of much of the nutrients that support the valuable prawn fishery in the Gulf and function as a nursery area for prawns, commercial and recreational fish species as well as other marine fauna. It is considered an area of substantial importance for nature conservation and for sustaining local fisheries.

The specific waters recommended as a Fish Habitat Protection Area are those waters on the eastern side of the Gulf that are closed to trawling. This permanent nursery area closure has been in operation since 1983. The creation of a Fish Habitat Protection Area was recommended to provide the area and its conservation values with a much higher public profile and afford it greater protection and management.

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Specific values of the eastern waters of Exmouth Gulf include:

- Habitat for juvenile prawn species that are captured in adjacent high value commercial trawl fishery;
- Important nursery area for commercial and recreational fish species;
- Recreational fishing area;
- Valuable pearl oyster habitat;
- Important to aquaculture and pearling leaseholders;
- Minimal impact and disturbance from human activity;
- High value mangal habitat, sand habitat and coastal marine flora and fauna generally; and
- Important habitat for species other than fish, including turtles, dugongs, whales and migratory wading birds.

Major Fisheries in Exmouth Gulf

The Exmouth Gulf Prawn Fishery is a significant fishery being one of Western Australia's six major fisheries that produce approximately 90% of the States commercial fishing gross value of production. There are 17 managed fishery licenses held in the fishery in 2007 with 10 vessels operating under these licenses. Around 50 crew are employed on these vessels with additional processing and support staff based in Exmouth and Fremantle. Fishery scientists calculate the fishery can sustainably produce between 771 and 1,276 tonnes of prawns per year, worth $15 – 20 million. Consequently the fishery is an asset of considerable economic significance.

The prawn fishery is concentrated in the centre and northern areas of Exmouth Gulf. This is also the breeding area for adult prawns and after larval prawns are released they undergo a short series of planktonic stages where they live in the water column and are carried about by currents in the Gulf. While there may be some movement of larval prawns into and out of the Gulf, it is largely a self-sustaining system. The life cycle is completed in about a year, with each annual crop coming from the previous years' residual population and includes recruits of the same year. It has been known for over 40 years that the planktonic larvae settle to the bottom and congregate in the extensive shallows along the eastern and southern margins on the Gulf, including the mangrove creeks. As they approach maturity, juvenile prawns migrate into the deeper central waters of the Gulf where they become adults and spawn.

In recognition of the annual cycle of movement, trawling in the eastern waters of the Gulf was prohibited to protect the substantial concentrations of juvenile prawns and as knowledge increased over the decades the protected areas were extended. The present permanent closure to prawn trawling includes extensive areas along the eastern and southern portions of the Gulf. This is a major reason for the area to be proposed as a Fish Habitat Protection Area.

The other major fishery in the Gulf is the pearl fishery, which produces world class South Sea pearls. There are a number of leases along the eastern side of the Gulf and in other areas of the Gulf. Traditionally there has been substantial collection of pearl oysters for seeding in Gales Bay and Giralia Bay at the southern end of the Gulf. This still occurs, but pearl producers are increasingly using juvenile pearl oysters grown in

laboratories from spat produced by artificially spawning mature animals. However, there is a substantial value of pearl on the lease sites, where animals must remain in the water for two years for the pearls to develop after the animal is seeded. High water quality is critical to the health of the pearl oyster and the development of the pearl.

Potentially Significant Impacts on Exmouth Gulf

The Department of Fisheries has a number of concerns, which are detailed below, in relation to the possible impacts the proposal may have on Exmouth Gulf. While the Department is unable to provide definitive evidence to suggest the proposal should not go ahead, there is uncertainty about a number of potentially significant impacts that could pose a high risk to the integrity of the system should they materialise. Research has also demonstrated that the prawn fishery is sensitive to the level of spawning stock, therefore any significant impacts on the spawning stock is of concern. Chief amongst these concerns are the impacts the proposal may have on productivity and nutrient cycling in the Gulf, both of which are likely to be long term, cumulative impacts that may be difficult to quantify. For instance, decreased productivity of the Gulf may result in a gradual decrease in prawn catches, however it is difficult to assess the risk of this occurring given the information supplied in the ERMP.

The Department does not believe that the ERMP gives a sufficient level of comfort that these, and other, issues have been adequately addressed, particularly given the long timeframe of the proposal that may exacerbate cumulative impacts on the Gulf. For example the ERMP does not provide a risk assessment matrix that identifies all possible issues, the likelihood they will occur and the possible impact they will have on the system. The ERMP also does not put forward any long term monitoring mechanisms that could quantify what long term impact, if any, the proposal may have on the Gulf. Additionally the Department would also like to see the ERMP consider possible mechanisms to deal with potential lower catch rates over time as a result of the proposal, such as compensation packages for affected fishing operators.

The Department acknowledges that issues associated with productivity of the Gulf are complex and requires a significant research effort to address. However, without further research the Department believes that there is a high level of uncertainty related to the possible impacts of the proposal, particularly given the scale and lifespan of the proposal and its close proximity to valuable marine habitat and commercial fishing grounds.

Possible impact on productivity through altered hydrological processes

Despite the information presented in the ERMP claiming a minimal risk to the productivity of the Exmouth Gulf from altered overland and subsurface hydrological processes, there still remains some uncertainty over the information on which this claim is made. It is unclear how significant overland flows are to the productivity of the Gulf and the impact the proposal will have on these flows to Exmouth Gulf. The proponent cites Brunskill *et al* (2001) to show that this contribution is minimal, however it is unclear over what timeframe this study was undertaken and how soon after a cyclonic event samples were taken. While not disputing that nutrient contribution to the Gulf may be low, Kangas *et al.* (2007) suggests that there may be a

link between cyclonic events and increases in productivity of both seagrass and algal communities, particularly a few years after a cyclonic event (productivity may initially decrease due to physical disturbance). There is also evidence of an increased prawn catch following some cyclonic event due to good environmental conditions for prawns, including increased turbidity and subsequent larval/juvenile survival (Kangas *et al.*, 2007). This would seem to indicate some kind of relationship between overland flows and increased productivity in the Gulf, although in some years cyclonic activity has resulted in lower prawn productivity and may be related to the timing and/or intensity of cyclonic events. It is acknowledged that some of the productivity of the area is undoubtedly due to the algal mats as discussed in the ERMP, however there would seem to still be some uncertainty over the role that overland flows play in the productivity of the Gulf and the possible impact the proposal will have on the nutrient cycling of the Gulf system.

It is also unclear what effects the levee banks, which will direct flows to the north and south of the salt farm, will have on the productivity of the eastern waters of the Gulf. Currently, the natural overland flows, particularly from large rainfall events, drain into the eastern waters of the Gulf though the numerous creeks along the coast. However, the proposal will alter the flow regime of water draining to the Gulf and will concentrate these flows to the north and south of the salt farm. What impact this altered flow regime will have on near shore waters of the Gulf is uncertain and does not appear to be adequately explained in the ERMP.

Uncertainty over hydrological model used in ERMP

There also seems to be some uncertainty over the hydrological linkage between the salt ponds and the Gulf. Work undertaken by V & C Semeniuk and summarised in Semeniuk (2007) would seem to raise some level of uncertainty over the claim made in the ERMP that there is no hydrological link between the salt ponds and the Gulf. Considering the possible impact that long term subsurface discharge of highly saline groundwater could have on the near shore Gulf environment, it would seem that any uncertainty related to this issue should be thoroughly investigated and be subject to independent review by hydrological experts.

Recommendation

Further investigations should be conducted regarding the impact of overland flows on the productivity of the Gulf, including what affect directing these flows around the proposed levee banks will have on the system. Consideration should be given to what role cyclonic events play in the productivity of the Gulf and what impact the proposal may have on altering the contribution of these events to nutrient cycling in the Gulf. Further work should also be conducted to reduce uncertainty surrounding the hydrological characteristics of the area. In order for the proposal to proceed the ERMP should demonstrate, to a reasonable level of certainty, that there will not be any long-term impacts to the productivity and nutrient cycles of the Gulf.

Other Potential Impacts of the Proposal

There are a number of issues the Department of Fisheries considers to be less significant than the above, although they may still have serious localised impacts requiring consideration and/or management should the proposal proceed. The Department acknowledges that the risk posed by the issues discussed below should, with appropriate management arrangements and conditions, be of a level that would not preclude the proposal from proceeding.

Bitterns disposal

A significant risk to Exmouth Gulf is the possibility of bitterns discharge into coastal creeks and waters. The chemical composition of bitterns is particularly toxic to invertebrate species such as prawns and pearl oysters that are the mainstay of the commercial fisheries in the region. Bitterns discharge can result in acute short term localised damage and the Department of Fisheries would not support the release of any bitterns to the Gulf.

It is acknowledged that the ERMP claims that bitterns disposal will not occur and the Department supports this approach. However, there is still some uncertainty over the approach outlined for the management of bitterns. If bitterns storage is to occur there is still some risk of accidental release to the marine environment should levee banks fail. The proposed method of dealing with bitterns also represents some risk if there is seepage of these compounds into the groundwater system or cyclonic tide surge and associated flooding rainfall.

Recommendation

A more thorough consideration of bitterns disposal or management arrangements should be detailed by the proponent, including a risk assessment of accidental bitterns discharges to coastal waters and alternatives for bitterns disposal if markets for bitterns related compounds cannot be found. Should the proposal proceed there should be appropriate engineering solutions to ensure appropriate security of the bitterns and that there is no risk of bitterns release to the Gulf.

Introduction of non-indigenous marine species (NIMS) and diseases

The ERMP should include a more rigorous assessment process and management framework with regard to NIMS and diseases that may be introduced by shipping and dredging activities related to the proposal. NIMS and introduced diseases pose a serious threat to the marine flora and fauna of the region and the below comments are made on this aspect of the ERMP;

- Both the ERMP and the Management Programme, provide little detail in relation to the risk of NIMS introduction associated with dredge activity. It is briefly mentioned in the "Marine Water and Sediment Quality" section of Chapter 6 in the ERMP, however NIMS is not a water quality issue. Section 3.4.9 of the Management Programme identifies bulk carriers as the primary risk of introduction, whereas dredges would usually be considered a higher

risk. The proponent should include a risk assessment matrix that identifies the vessels and activities that represent the highest risk for the introduction of NIMS.

- The Management Programme section on "Anti-foulants" requires the contractor to use best practice anti-fouling systems (page 2-20). What are these? Do these systems detail the application of anti-foulants to accessible internal system areas such as sea chest and the removal of anodes prior to application, or does "best practice requirements" address issues other than the prevention of NIMS introduction?
- The section of the Environment Programme that deals with NIMS is not clear (page 2-20). Do the provisions mentioned minimise the risk of introduction to the area? What is the distance outside the Gulf that these provisions are implemented? What is the depth at this location? Are there more suitable areas?
- The Management Programme does not mention dredges in relation to NIMS. Appropriate steps need to be taken to ensure dredges and other high risk vessels are clean and free of fouling. Dredges should require inspection on arrival unless appropriate management measures have been taken directly prior to arrival. Vessels such as dredges that have been in operation for extended periods in one location should also be inspected prior to departure to identify any NIMS that may have further spread or established on the vessel.
- Within the Management Programme it is noted that the Department of Fisheries and the Consultative Committee for Introduced Marine Pest Emergencies (CCIMPE) will be notified if NIMS are detected in baselines surveys undertaken by the proponent. Should NIMS be detected the WA representative on the CCIMPE would then trigger the State NIMS response plan. However no indication is made on the response requirements should a NIMS be found on a vessel or associated equipment (i.e. not found in baseline survey activities). In this case it would be the proponents responsibility to implement an appropriate NIMS Management Strategy. These have been previously established in consultation with the Department of Fisheries and have been a requirement of similar previous Ministerial environmental conditions. An example of such a requirement is *"In the event that any non-endemic marine species are detected, the proponent shall put in place a management strategy to ensure that any non-endemic species are not introduced or transferred to any other locations within Western Australia's territorial waters, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority"*
- The ERMP does not consider introduced diseases to be a risk to the marine environment of the Gulf, and in particular pearling and aquaculture activities (page 7-6). The ERMP should detail a risk assessment framework for this issue, including the range of diseases that may be introduced, the possible impact these diseases may have on the marine environment and pearling and aquaculture activities, the management arrangements to deal with any introduced diseases that should include the consideration of compensation if industries are adversely affected.

Recommendation

The proponent should develop a more thorough NIMS and disease management strategy, including a risk assessment of all vessels to be used in the proposed operations and appropriate mitigation and management commitments.

Cyclone activity and tidal surges

The proposed site is located in one of the highest risk locations from cyclone impact on the WA coastline. Exmouth Gulf is a known hot spot for cyclones crossing the coast, and the topography of the area magnifies the normal cyclone tidal surge. The area proposed has a history of extreme inundation, as graphically demonstrated by trawlers being stranded well inland of the normal spring tide high-water mark (note the vessels concerned have a draft of 3m). The ERMP briefly mentions the risk posed to the salt fields by cyclones and tidal surges, however a much more thorough risk analysis is needed that includes hydrographic modelling of cyclonic tidal surges and a demonstration that all infrastructure is engineered to withstand these events.

Recommendation

A thorough risk analysis should be undertaken of the possible impacts of cyclone activity and tidal surges on the salt fields and associated infrastructure. This should be based on hydrographic modelling of cyclonic tidal surges that should guide the design of levee banks and location of other infrastructure.

Entrainment of prawn larvae at pump stations

The known migration behaviour of larval prawns will interact with the proposed two intake pumps on natural tidal creeks, such that a portion of the annual larval prawn recruitment will be permanently jeopardised. Experience with other WA salt farm seawater intakes demonstrates this larval entrainment impact problem for both prawns and coastal finfish stocks. With the pumps taking up to 60% of the creek flow it is expected that there will be entrainment issues with this proposal also. The ERMP discusses this issue on page 6-123 but it is not clear how the figures of total entrainment are calculated. There is also a discrepancy in the information provided under "Local Significance" and "Regional Significance", with no justification given as to why entrainment figures cannot be provided at the local scale but can be quantified at the regional scale. It is also unclear if the figures provided in Table 6-19 take into account increased prawn larvae levels in tidal creeks during October – February. Furthermore, on page 7-6 it is stated that the proportion of organisms entrained by the pump stations cannot be estimated. This is not acceptable to the Department of Fisheries, considering the importance of this area for prawn stocks in Exmouth Gulf, and the fact that the pumps will take up to 60% of the creek flow.

Recommendation

Further work to be conducted by the proponent to more accurately predict the entrainment levels of prawn larvae at pump stations and give justification to those figures presented in the ERMP. If the proposal proceeds a condition should be

imposed that requires the proponent to monitor entrainment levels at the pump stations that, if found to be significant, would lead to the modification of pumping activities to decrease levels of entrainment. This may be of particular relevant during prawn spawning periods.

Impact of pump stations on near shore salinity

The impact that pumping significant volumes of seawater will have on salinity levels of the near shore marine environment of the gulf is not adequately assessed in the ERMP. It is likely that the high salinity levels of the near shore waters in the gulf are significant for the marine flora and fauna of this area, particularly with regards to the prawn nursery found in these waters. Any change to the salinity levels caused by the pumping of seawater to crystalliser ponds may have flow on impacts for the marine environment and the proponent should investigate this issue further.

Recommendation

Possible impacts of the pump stations on near shore salinity levels should be investigated further by the proponent, including a consideration of the importance of nearshore salinity levels for marine flora and fauna in the area.

Start up pumping

In discussions between the Department of Fisheries and Straits representatives it was mentioned there would be a sustained six-week pumping period at the start of the project. This does not appear to be mentioned in the ERMP. Considering the volume of water that is likely to be pumped during this start up phase, and the impact this may have on entrainment of prawn larvae and near shore salinity levels, this issue should be more thoroughly considered in the ERMP.

Recommendation

Details of the proposed start up pumping requirements and an analysis of possible impacts from this pumping should be considered further. Start up pumping should avoid prawn spawning periods.

Dredging Operations

The proposed salt shipping system will involve dredging/permanent disruption to sub-tidal habitats at Hope Point, in the centre of the known prawn nursery areas. There is limited benthic habitat mapping in the ERMP and this should be developed further prior to any dredging taking place. There also does not appear to be any mention of maintenance dredging in the future that will most likely be necessary to keep the channel at a suitable depth for barge and other shipping traffic. What will the frequency of maintenance dredging be? Where will the dredge spoil from this dredging be located? These and other issues related to dredging maintenance operations should be considered further.

Recommendation

The proponent should conduct more comprehensive benthic habitat mapping, particularly in the locations that are likely to be affected by dredging operations and dredge spoil disposal. Future maintenance dredging operations should also be detailed in the ERMP.

Shipping movements and salt loading

The offshore ship mooring and barge loading point is located directly on the main prawn trawl grounds and centred on the area of tiger prawn spawning aggregation. This will permanently reduce the fishing area for prawn trawling and presents a salt spillage risk to tiger prawn spawning stocks. Trawlers generally operate in long, straight sweeps and it does not appear that the ERMP has considered this with regard to the mooring locations. Will the area excluded from trawling operations be larger than what is put forward in the ERMP because trawlers are not very manoeuvrable with their gear deployed? It is noted that VMS data has been presented in the ERMP, however this data is presented in points rather than continuous sweeps that are a more accurate way of portraying trawling activities. How many sweeps pass through he proposed mooring sites? How will shipping traffic to and from the mooring locations impact on trawling operations? What consultation has been undertaken with the local fishermen to investigate this issue further? The ERMP does not appear to consider any alternative mooring locations for salt loading operations that may be in less sensitive areas or away from intense prawn trawling operations. It is also unclear if there is a possibility of increased shipping and salt loading operations in the future.

Recommendation

Local trawl fishermen should be consulted with regard to mooring locations and the possible impact this may have on trawling activities. The proponent should demonstrate that alternative sites for ship mooring and salt loading have been examined. Management arrangements for salt spillage, including an assessment of the possible impacts on marine fauna and flora, should be examined.

Impacts on pearl farm leases and pearl oyster fishing grounds

The proposed site borders the main pearling farm leases in Exmouth Gulf and is adjacent to the pearl oyster fishing grounds. The long production times for pearls and the value of pearl oysters held on farms magnify the risks to this important industry. Additionally there is uncertainty about the possible impact the levee banks will have by channelling overland runoff to the south of the salt farm and into Giralia Bay. Turbidity and water quality issues associated with this proposed channelling of overland flow, and the possible impact on pearl farming operations, have not been addressed in the ERMP. There is also no discussion about possible impacts on pearl farm leases and pearl oyster fishing grounds from the possible changes in salinity levels of near shore waters from saline groundwater seepage. The possible impact of NIMS and introduced diseases should also be considered (see point specifically on NIMS and diseases).

Recommendation

Further information should be provided with regard to the possible impacts of altered overland flows and possible saline groundwater seepage on pearl farm leases and pearl oyster fishing grounds.

Recreational Fishing

The eastern waters of Exmouth Gulf are an important area for recreational fishing. The proponent should ensure that access to fishing locations is not impeded by the proposal. It is unclear in the ERMP if recreational fishing groups and individuals have been consulted to ensure access to fishing grounds in this area is not affected.

Recommendation

The proponent should consult with recreational fishing groups to ensure access to fishing location in the eastern waters of the Gulf is not affected by the proposal. This should include an explanation of the impacts that the pump stations will have on recreational fishing (i.e. will there be exclusion zones in the creeks where pumping occurs and, if so, how will this be communicated to recreational fishers?).

Should you wish to discuss any of the above issues further please contact Ben English on 9482 7251.

Yours sincerely

Dr R Fletcher
CHIEF EXECUTIVE OFFICER

16th March 2007

Appendix 1

References

Brunskill, G.J; Orpin, A.P; Zagorskis, K.J; and Ellison, J; 2001; *Geochemistry and particle size of surface sediments of Exmouth Gulf, Northwest Shelf Australia*; Continental Shelf Research 21 p 157-201.

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Shaw, J.; 2002; *Fisheries Environmental Management Plan for the Gascoyne Region – Draft Report*; Fisheries Management Paper No. 142.