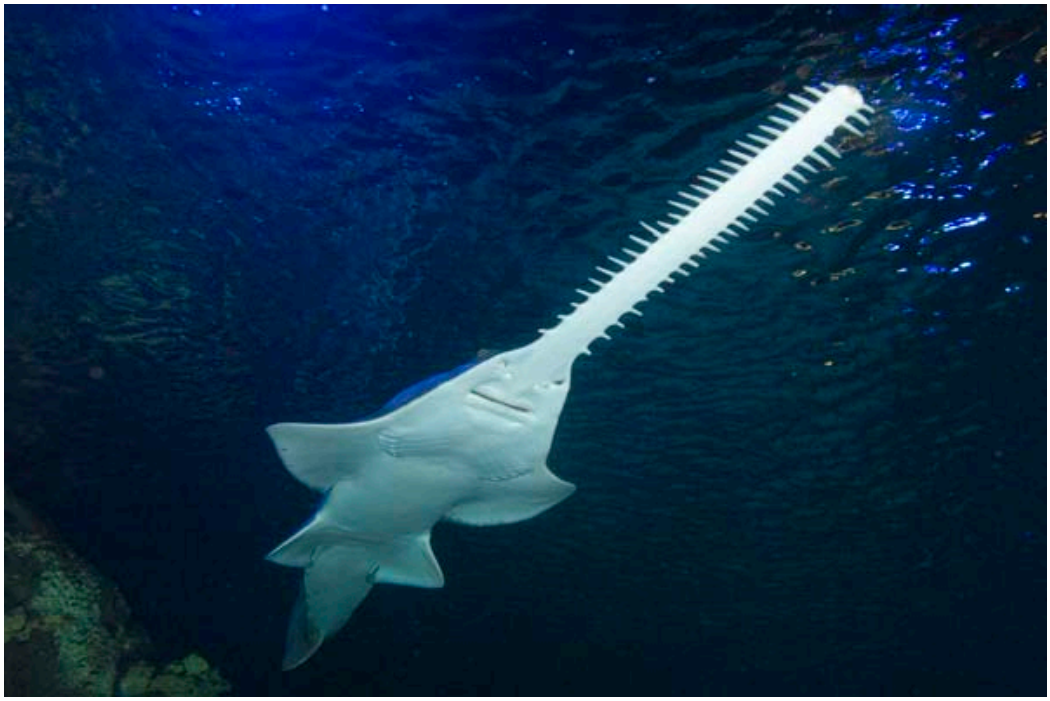
SUPPLEMENTARY ASSESSMENT OF IMPACTS AND RECOMMENDATIONS

Chevron Wheatstone Project: construct and operate a liquefied natural gas (LNG) and domestic gas (domgas) plant, Pilbara coast and offshore WA (EPBC 2008/4469)



Background

The recommendation report at **Appendix B** recommended that further information be sought from Chevron so that the potential impacts of the proposal can be adequately assessed. Further information was requested from Chevron on 20 April 2011 regarding:

- the impacts of dredging and spoil disposal and the adequacy of the modelling provided, including consideration of mitigation measures and dredging methodologies;
- the importance of the Project area for marine fauna, particularly dugong (*Dugong dugon*), to better understand how a temporary reduction in benthic primary producer habitat, which is a food source, could impact on listed species;
- discharges, particularly from the offshore accommodation vessel;
- the risk of an oil spill and proposed response mechanisms;
- proposed offsets;
- the potential for piling noise to impact on the Humpback whale (*Megaptera novaeangliae*) resting area at Exmouth Gulf, and;
- an analysis of the importance of the Project area for sawfish and an assessment of the likely impacts to sawfish,

The letter requesting this information is at **Appendix H**.

Chevron provided additional information in response to the letter on 13 May 2011, 17 May 2011, 18 May 2011, 15 June 2011, 8 July 2011, 19 July 2011, 20 July 2011, 29 July 2011, 5 August 2011, 8 August 2011, 15 August 2011 and 18 August 2011 (**Appendices F1-F12**).

1. Dredging and Spoil Placement

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not consider the potential scale of dredging should key assumptions be proven incorrect and that therefore the modelling provided may not be conservative and impacts may be larger than those modelled. It was also noted that the potential impacts to marine megafauna, particularly dugong, as a result of reduced food availability from dredging impacts had been inadequately considered. Further, the recommendation report noted that there was insufficient information provided regarding mitigation strategies and optimisation of dredging methodology to minimise the extent of impacts from capital dredging.

On 17 May 2011 (**Appendix F2**), 18 May 2011 (**Appendix F3**), 15 June 2011 (**Appendix F4**), 8 July 2011 (**Appendix F5**), 19 July 2011 (**Appendix F6**), 20 July 2011 (**Appendix F7**), 2 September 2011 (**Appendix F9**) and 18 August 2011 (**Appendix F12**) Chevron provided additional information to address some of the concerns noted in the recommendation report.

Impacts to dugong

Chevron provided some information regarding the predicted impacts to seagrass and therefore dugong on 15 June 2011 (**Appendix F4**). In this document, Chevron noted that while 2963 hectares of seagrass is predicted to experience temporary partial mortality (up to 50% loss of above ground biomass, recovered within 5 years), this is the extent of the impact predicted over the entire dredging program. Staging of the dredge program will be such that impacts to seagrass will also be staged and it is unlikely that this amount of seagrass will be impacted simultaneously. Further, Chevron identified that mitigation measures, such as utilisation of seasonal net currents to carry the turbid plume away from seagrass could reduce the scale of impacts to seagrass. However, Chevron did not provide any commitment to implement these mitigation measures or to monitor or protect seagrass.

Surveys by Chevron (**Appendix E**) indicate that dugong numbers in the Project area are relatively low when compared with other nearby locations, such as Exmouth Gulf, which indicates that the Project area is not of high importance to the species. Further, dugong sightings were not highly correlated with the mapped seagrass beds. This is indicative of a number of possibilities:

- These seagrass beds are known to be highly ephemeral. It is possible that these beds may have modified since they were mapped and are no longer in the mapped location. Dugong may therefore be feeding on other seagrass beds, which have not been mapped;

- Dugong could be feeding on other matter, such as rhizomes and the seed bank of seagrass, which have not been mapped due to the difficulty in visually observing such a resource, or;

- Dugong may not use the Project area for foraging activity.

Given the limited survey effort and data, the uncertainty regarding the exact location of seagrass beds, or other food sources and uncertainty regarding the habitat use and behaviour of dugong, it is still difficult to determine the importance of the Project area to dugong and likely consequences to the species from reduction in food availability.

Dredge methodology optimisation

Chevron advised that further optimisation of the dredging methodology would take place once a dredging contractor is appointed and so this information could not be provided at this time (**Appendix F2**). However, Chevron provided a number of examples of mitigation strategies which could be employed. These include: use of seasonal net currents to carry the turbid plume away from sensitive habitats; restrictions on the use of overflow mode while dredging near sensitive habitats; staging of the dredge program; and, the use of silt curtains. It is unclear to what extent these strategies will be used at this stage, or how effective these strategies will be. It is likely, however, that a range of measures can be employed to reduce the scale of impacts.

Dredging and spoil disposal modelling adequacy

The modelling relies heavily on data from similar dredge programs in Singapore, rather than the usual approach of using sediment sampled from the Project site. Much of the information provided by Chevron (**Appendices F1-F12**) was justifying this approach. The department's independent technical consultant, WorleyParsons, reviewed the adequacy of the dredge plume modelling in the context of the additional information and provided an assessment of its conservativeness (**Appendix G**).

WorleyParsons concluded that "*the modelling that has been undertaken, including consideration of some of the additional sensitivity simulations, can be used to assist in defining areas that may be impacted and in the selection of key areas that should be monitored for impacts. However, given the uncertainty in the numerous modelling assumptions that have been made, we can not definitively state that the modelling results would be conservative.*"

Therefore, the impacts to benthic primary producer habitat, such as coral and seagrass, and therefore on the species which feed on them, such as marine turtles and dugong, has the potential to be greater than that predicted in the assessment documentation (**Appendix E**). This is because:

- the modelling makes a number of assumptions, which may not be valid and could influence the results;

- the modelling relies heavily on a generic sediment settling curve, rather than a curve derived from real laboratory tests on the parent sediment material, and;

- it is possible that the Project site to contain limestone rock, as has been the case for other dredging projects in Western Australia and has also been identified by Chevron as potentially occurring in the area. Limestone rock, when dredged, breaks down into very fine particles that cause extensive

sediment plumes that remain in suspension for significant periods of time. This scenario and has not been accounted for in the modelling.

WorleyParsons recommends that monitoring of dredge plume behaviour and effects on sensitive receptors be undertaken as the Project proceeds. An independent scientific review by Dr Des Mills (**Appendix E**), commissioned by Chevron, also concluded that the modelling should be rerun and the impact predictions revised once the dredging program is fully determined. This will provide a better basis for designing the monitoring program for turbidity and dredging impacts. Similarly, WorleyParsons have recommended that dredge plume measurements should be undertaken during dredging to validate the modelling under local conditions.

Mitigation

As stated above, there is still considerable uncertainty regarding the likely extent of impacts from dredging and spoil disposal, and impacts may be larger than that predicted by the modelling. Therefore, condition 10 of the proposed approval (**Appendix C**) is that Chevron develop and submit for approval a Dredge and Spoil Disposal Management Plan. The conditions require that Chevron rerun modelling once the dredge program is better known, consistent with Dr Des Mills' recommendations, so that appropriate monitoring sites required as part of the Dredge and Spoil Disposal Management Plan, can be selected based on more relevant and accurate modelling. Similarly, the plan must consider a range of mitigation measures, monitoring programs, trigger levels and management actions to minimise impacts to benthic primary producer habitat and dugong, and must have procedures in place to enable adaptive management. This is also consistent with WorleyParsons' recommendations.

Further, due to the scale of impacts and uncertainty regarding proposed mitigation measures, condition 17 of the proposed approval is that Chevron must establish, fund and manage a Dredge Technical Panel to provide advice and oversee the development, implementation and review of the Dredge and Spoil Disposal Management Plan. The Panel must have independent, relevant scientific expertise and must advise on the Dredge and Spoil Disposal Management Plan during its development, including endorsement of the Plan prior to submission. The Panel must provide recommendations during the dredge program and advise on appropriate management measures should triggers be exceeded.

As there is also still uncertainty regarding the use of the Project area by dugong, condition 29 of the proposed approval is a Dugong Research Plan to better understand the importance of the Project area for dugong. The findings of this research must be considered as part of the Dredge and Spoil Disposal Management Plan. Should dugong be found to be utilising habitat other than the mapped seagrass beds, it is a requirement of the conditions that these areas be adaptively managed and mitigation measures developed and implemented via the Dredge and Spoil Disposal Management Plan.

While there is uncertainty regarding the extent of impacts from dredging, with the above measures in place, the department considers that impacts to threatened and migratory species can be managed to an acceptable level. The use of a Dredge Technical Panel will facilitate adaptive management to allow for continuous improvement within the Dredge and Spoil Disposal Management Plan.

Offsets

While impacts are likely to be acceptable, there will still be considerable residual impacts, particularly to dugong and marine turtles, which will need to be offset. Chevron did not provide any offsets specific for matters of national environmental significance, but a Biodiversity Offset Strategy is required as part of the proposed approval at condition 53 (**Appendix C**) including funding of an Indigenous Sea Ranger program to address threats to listed fauna.

2. Discharges

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not provide sufficient information with regard to the likely impacts of waste discharge from the floating accommodation vessel and likely impacts from nutrient enrichment as a result of Produced Water discharge. On 13 May 2011, Chevron provided further information in relation to this issue (**Appendix F1**).

Offshore Accommodation Vessel

Solid wastes generated on the floating accommodation vessel will be transported to shore for onshore disposal. Liquid wastes to be discharged from the vessel include reverse osmosis brine, domestic grey water, treated sewage and cooling water. However, Chevron have advised that the accommodation vessel will be anchored away from sensitive receptors such as turtle nesting rookeries and coral reef assemblages (**Figure 7, Appendix F1**), which will minimise the risk of impacts to matters of national environmental significance

Produced Water

The composition of Produced Water varies with the source and location of gas, and nutrients in Produced Water in Australia are not usually considered a high risk. Given worst case composition and metocean scenarios, concentrations of nitrogen and phosphorus are expected to be below ANZECC and ARMCANZ (2000) Water Quality Guidelines within 200m of the outfall, to be located in 20m water depth, approximately 20km from shore and not in proximity to sensitive receptors. There are no physical features that are likely to provide points of accumulation, and water movement and mixing is expected. Impacts to matters of national environmental significance are considered acceptable.

Mitigation

Chevron has not been able to provide offshore accommodation vessel specifications so the exact volume of wastes from the offshore accommodation vessel is not known, nor is the exact composition of the Produced Water. The department therefore proposes that the impacts from discharges be managed via implementation of a Liquid Discharge Management Plan as per condition 36 of the proposed approval (**Appendix C**).

3. Hydrocarbon Leaks and Spills

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not provide sufficient information with regard to justification of the parameters used in the oil spill modelling, preventative measures that will be used to minimise the likelihood of a spill and Chevron's capacity to implement a first-strike spill response. On 13 May 2011 and 15 June 2011 Chevron provided this information (**Appendix F1 and F4**).

Chevron provided justification of the parameters used in the modelling (**Appendix F1 and F4**), including the hydrocarbon-type modelled for each spill scenario, spill duration and spill volume. The department is now comfortable that the modelling provided in the assessment documentation (**Appendix E**) and assessed in the recommendation report (**Appendix B**) is sufficient to understand and assess the impacts.

Chevron described preventative measures that will be in place (**Appendix F1**) including blowout preventers and production shut down valves at the wells, alarms and regular inspections of the trunkline and dry break hoses and spill response equipment at the Production Loading Facility and Material Offloading Facility. These preventative measures will reduce the likelihood of a major spill. Chevron is also required to comply with the environment and safety requirements under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

Historical data from previous industry incidents in similar regulatory environments shows that the frequency of a blowout during production is less than one in 250, 000, per well, per year of production. The Project involves up to 35 wells and up to 50 years of production.

Further, each well will also have to undergo development drilling which has a blowout frequency of less than one in 2000 per well drilled for a surface blowout and a frequency of less than one in 1000 for a subsea blowout per well drilled. Each well will also undergo completion activities, which have a frequency of a blowout of less than one in 7000 per well completed. A blowout is therefore considered unlikely, but it should be noted that the risk of an incident increases with the number of wells and the number of years of production.

Should a spill occur, Chevron has provided information on possible resources available for a first strike response (**Appendix F4**). These include aerial surveillance capability, tracking buoys, a range of recovery and containment equipment and shoreline protection booms and equipment. Chevron advised that the location of their first strike response would depend on the location of the spill. Resources and personnel will be able to be deployed from Barrow Island, where Chevron has existing assets for their Gorgon Development, and from Ashburton North or Onslow. While a blowout would have devastating effects on threatened and migratory species, and the Commonwealth Marine Area as discussed in the recommendation report, it is considered possible but unlikely and Chevron has demonstrated their capacity to implement a first strike response.

Mitigation

The recommendation report (**Appendix B**) stated that a future condition of approval should be submission of an Oil Spill Contingency Plan for approval. Given the further information provided, the department considers that this requirement can be more targeted. Instead, it is recommended that Chevron provide an Oil Spill Environmental Response Plan for approval prior to drilling. The Oil Spill Environmental Response Plan is required to provide a clear description of response measures and must demonstrate consideration of identified sensitive habitats and potential response mechanisms to protect matters of national environmental significance. This is condition 39 of the proposed approval notice at **Appendix C**.

4. Recreational fishing, boating and camping

As noted in the recommendation report (**Appendix B**), the construction workforce of up to 5000 people will have impacts on listed threatened and migratory species and the Commonwealth marine environment.

Chevron has negotiated offsets with the WA state government (**Appendix F1**) some of which will directly reduce the impacts to matters of national environmental significance. These are, funding for WA Department of Environment and Conservation (DEC) officers to manage recreational visitation of offshore island nature reserves and funding for WA Department of Fisheries (DoF) officers to manage recreational fishing.

Mitigation

The department considers that further conditions on the activities of the workforce are required to ensure impacts are not unacceptable. It is a condition of the proposed approval that Chevron:

- implement a staff induction program for all employees and contractors, and;
- develop a Wheatstone Environment Protection Code of Conduct (WEPCC), and;

These are conditions 49 to 52 of the proposed approval (**Appendix C**).

Offsets

Further, the department considers that the workforce is likely to result in residual impacts to matters of national environmental significance, which will need to be offset. Chevron did not provide any offsets specific for matters of national environmental significance, but a Biodiversity Offset Strategy is required as part of the proposed approval at condition 53 (**Appendix C**), which includes funding for an Indigenous Sea Ranger Program to manage threats to listed fauna and to assist Chevron to implement and enforce the Code of Conduct.

5. Noise and Vibration

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not provide sufficient information regarding the

audibility of piling at the Humpback whale resting area at Exmouth Gulf. On 13 May 2011, Chevron provided this information (**Appendix F1**).

Noise at levels below that known to cause physical impacts may have significant behavioural impacts to whales engaging in biologically important behaviours, such as mother and calf resting behaviour. Chevron referred to the modelling in the assessment documentation (**Appendix E**) and showed that the noise level at which behavioural disturbance is considered possible in Humpback whales (120 dB re 1µ Pa^2·s), is likely to be reached at 6km from the piling source (**Figure 6, Appendix F1**). Therefore noise in the resting area will be less than this threshold. Impacts to Humpback whales are considered acceptable.

Chevron did not provide further information on the use of the offshore islands by listed bird species, however, piling does not take place in close proximity to any of the offshore islands. Some noise disturbance and vibration may result from dredging near some of the islands, but any impacts to bird species are likely to be minimal.

Mitigation

As noted in the recommendation report (**Appendix B**), a Marine Fauna Management Plan, which will include piling management measures to minimise physical impacts, is condition 26 of the proposed approval (**Appendix C**)

6. Lighting

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not provide sufficient information with regard to the impacts of lighting from the offshore accommodation vessel on marine fauna, in particular marine turtle species. On 15 June 2011, Chevron provided this information (**Appendix F4**).

The information stated that a range of mitigation measures will be employed to reduce light spill including locating the offshore accommodation vessel a minimum distance of 4.5km from the nearest turtle nesting beach (Figure 1, Appendix F4), downward facing lights, shielded lights, lighting only on work areas and use of blanks on portholes to manage cabin lighting. Impacts to listed marine fauna are considered likely to be acceptable.

Mitigation

It is possible that impacts to adult and hatchling marine turtles as a result of light spill may be greater than that predicted in the assessment documentation (**Appendix E**). To manage this uncertainty, the Marine Fauna Management Plan, which is condition 26 of the proposed approval (**Appendix C**) will address monitoring and management measures should impacts be greater than that predicted.

7. Coastal Processes

The recommendation report (**Appendix B**) noted that the assessment documentation (**Appendix E**) did not provide sufficient information regarding the importance of the Project area for sawfish. On 13 May 2011, Chevron provided further information (**Appendix F1**) in relation to this issue.

Chevron provided preliminary results from sawfish surveys (**Appendix F1**), which showed that sawfish utilise the Project area. These results indicate that the Project area is very important habitat for sawfish species. The key impact on sawfish species as a result of the Project will be changing coastal processes, which could affect the entrance of lagoons and creeks, which are sawfish habitat.

Mitigation

The recommendation report (**Appendix B**) recommended that coastal processes be addressed as part of the Marine Fauna Management Plan, which is at condition 26 of the proposed approval (**Appendix C**). The Marine Fauna Management Plan includes a Coastal Processes Management Program to be developed and implemented. The Program is required to specify key sites to be monitored (eg. creek entrances) and a sand management system implemented should changes be detected. Given the complexity of coastal processes, the conditions require that this strategy be reviewed and endorsed by an independent coastal engineering expert.

Offsets

There is some uncertainty regarding the predicted changes in coastal processes and the efficacy of implementing a sand management system in real-time. It is possible that there may be residual impacts to sawfish as a result of temporary changes to sawfish habitat. Therefore a Biodiversity Offsets Strategy, which must consider direct offsets for sawfish is included as condition 53 of the proposed approval (**Appendix C**), including research into the development of sawfish fishways and implementation of fishways where there are barriers within sawfish riverine habitat.