

Please direct all responses/queries to:



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## **REQUEST FOR VARIATION TO THE PROPOSED BROWSE TO NWS PROJECT (EPA ASSESSMENT NUMBER 2191)**

Woodside Energy Ltd (Woodside), as Operator for and on behalf of the Browse Joint Venture (Woodside Browse Pty Ltd, BP Developments Australia Pty Ltd (BP), Japan Australia LNG Ltd (MIMI Browse Pty Ltd) and PetroChina International Investment (Australia) Pty Ltd (PetroChina)) referred the State Proposal component of the proposed Browse to NWS Development to the Environmental Protection Authority (EPA) in October 2018 (EPA Assessment Number 2191).

The State component of the Proposed Browse to NWS Development (the Proposal) is currently being assessed as a Public Environmental Review under the *Environmental Protection Act 1986* (EP Act). In light of engagements and guidance from the EPA, Woodside seeks to amend the Proposal, in accordance with section 43A of the EP Act, to reflect a number of refinements that have been made subsequent to the publication of Response to Submissions on the Environment Review Document in September 2022. Each of the five requested amendments are expected to result in lower risk or impact to the Western Australian environment.

The Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2016b) states that the proponent must seek the EPA's consent, and provide the EPA with the following:

- Details of the proposed change.
- Statement of the significance of the change.
- Rationale for the change.

Each of these requirements have been included within Attachment A - Request to amend a proposal during assessment under s 43A of the EP Act. A proposed revised Proposal Content Document has also been prepared (Attachment B).

The following is a description of the changes requested to the Proposal, via the attached amendment request and revised Proposal Content Document:

### **1. Revising (reducing) the size of the proposal's development envelope**

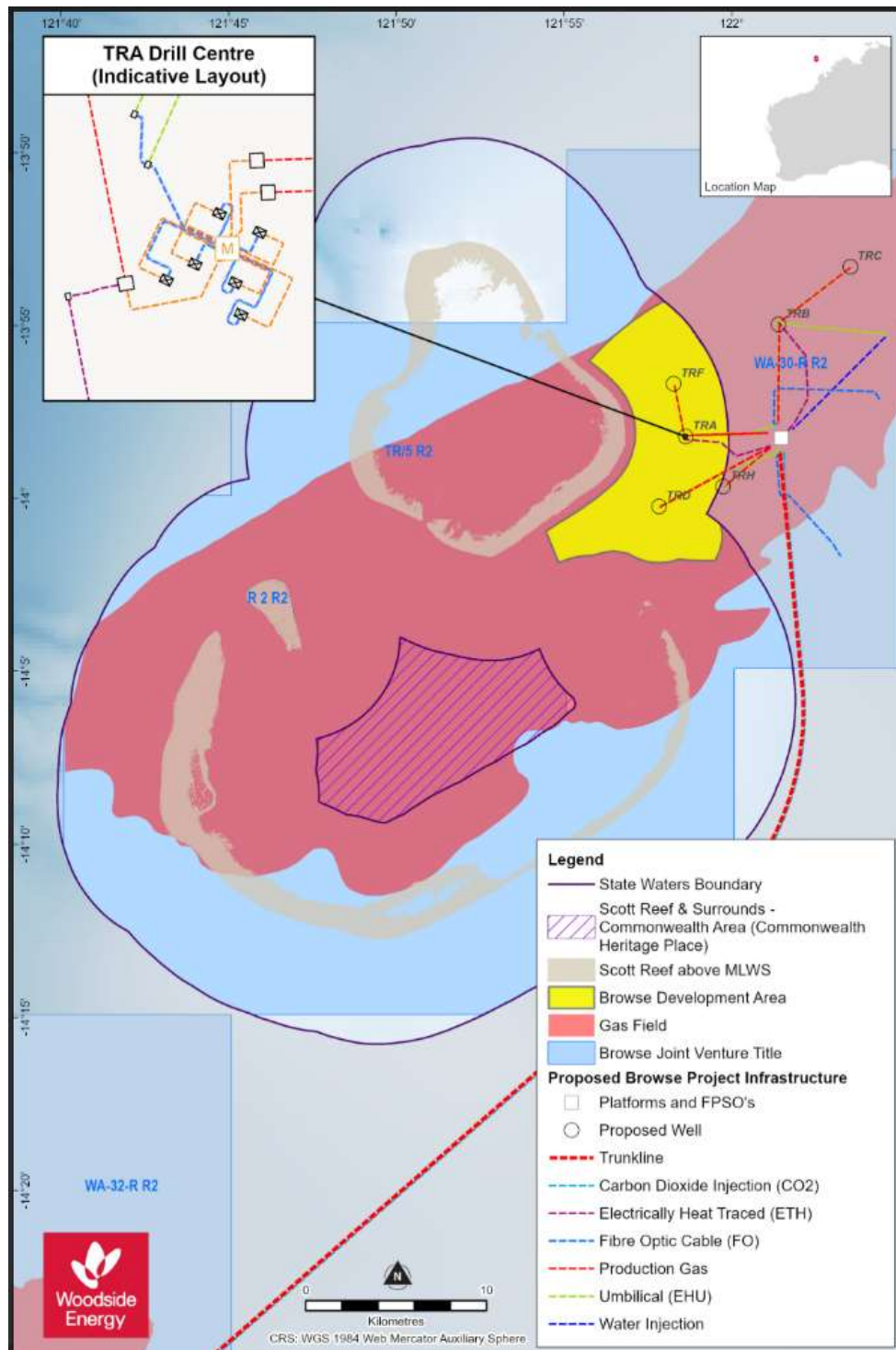
The development envelope (DE) is defined in EPA guidance as the maximum area within which the proposal footprint, including all physical elements, will be located. Upon referral, the DE for the Proposal within State waters was aligned with the marine boundaries of Petroleum Retention leases (WA-30-R R2 & TR5 R2) associated with the proposal. This covers an area around 1,220 km<sup>2</sup> and overlaps Scott Reef shallow water benthic habitats and Sandy Islet.

Woodside is proposing to reduce the DE to only include the location of proposed physical infrastructure or permanent seabed disturbance, including relevant buffer zones for temporary disturbance during construction activities such as anchor and pipeline installation. This revised DE has a total area of 78 km<sup>2</sup> as shown in Figure 1. There is no change to the area of direct or indirect seabed disturbance estimates, as currently reflected in the Proposal Content Document.

This DE revision also takes into account the reduction in spatial extent of proposed activities and seeks to provide improved transparency and certainty as to the maximum authorised extent of the location of activities associated with the Proposal. The proposed reduction in the DE means that it no longer overlaps the Scott Reef shallow water benthic habitats or Sandy Islet. This revised DE aligns with EPA's contemporary guidelines and expectations.

The revised DE reflects a number of design considerations and modifications made during proposal design to date that seek to minimise risk to the environment. These include:

- There will be no planned activities, and no infrastructure will be installed, within the Scott Reef Channel (the narrow channel between North and South Scott Reef) or at any location shallower than 75 m water depth. The depth contour of 75m is set below the maximum depth to which coral in the region could occur, verifying that no direct impacts to coral habitat are planned to occur as a result of the proposal.
- No drill centre will be located within 20 km of Sandy Islet. The revised DE extends to around 3 km from the drill centre locations, where anchors/moorings to hold the mobile offshore drilling unit (MODU) in place will be temporarily installed (adhering to the commitment that no activities will occur above the 75m depth contour).
- Removal of the 'TRE' drill centre from the proposal concept, including the flowline that was proposed to be installed in the channel between North and South Scott Reef. This change was approved by the EPA Chair on 12 October 2022, however the DE boundary was not revised at that time.



**Figure 1 Proposed updated Browse development envelope (yellow) in WA State waters**

## **2. Relocate the TRD drill centre outside of habitat Critical to the Survival of Green Turtles**

The proposal involves drilling up to 20 wells, each of which will be located within around 500 m of three drill centres (TRA, TRD and TRF).

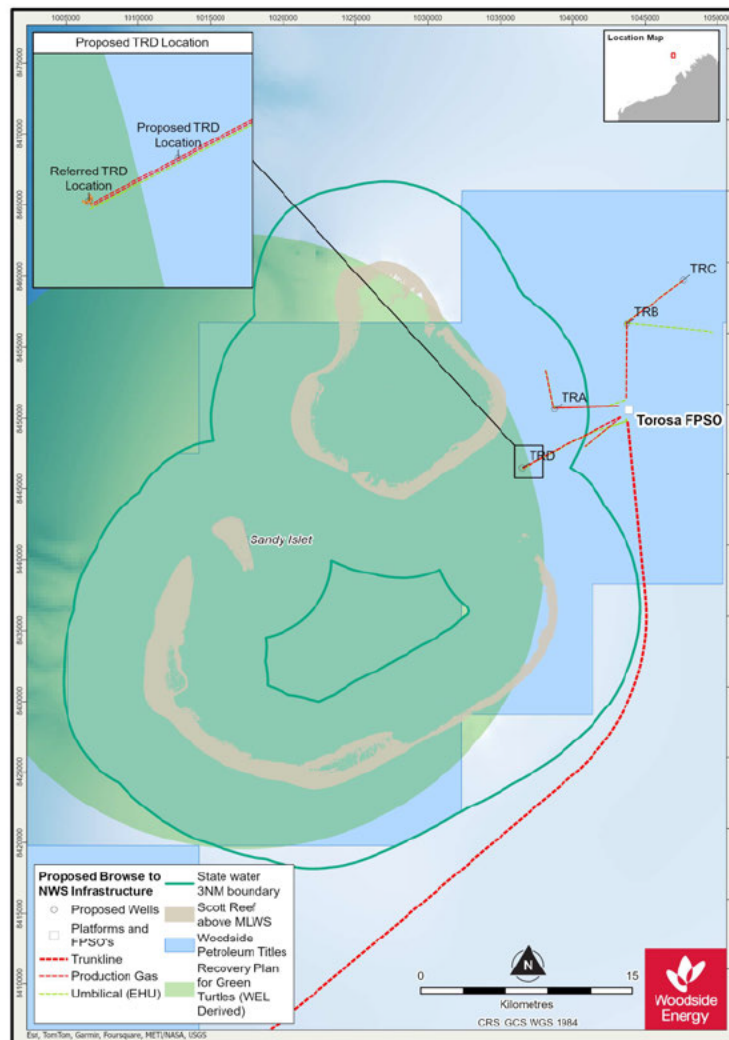
To minimise risk and impacts to Green Turtles, the 'TRD' drill centre is being re-located east, further away from Sandy Islet which is a known nesting location for Green Turtles. The updated coordinates for drill centres in

State Waters are presented in Table 1. If approved, no drilling activities as part of the Proposal will occur within 20 km from Sandy Islet. This area is classified as an interesting area 'habitat critical to the survival of green turtles' as defined in the Recovery Plan for Marine Turtles in Australia (Figure 2).

This change will also have the effect of moving drilling activities further away from Scott Reef, further reducing the potential that cuttings or other discharges at this location could impact the reef. Note, the current Environment Quality Management Plan (EQMP) published as part of the Response to Submissions requires that there is no change from natural condition to the water column or benthic environment at Scott Reef above the 75 m depth contour. This change provides increased certainty that this outcome will be achieved.

**Table 1 Proposed new coordinates of drill centers in State Waters**

Field	Drill centre in State Waters	Coordinates as of Oct 2022	Proposed new coordinates
Torosa	TRA	389 521 E, 8 455 338 N	No change
Torosa	TRD	387 315 E, 8 451 207 N	388 108 E, 8 451 598 N
Torosa	TRF	388 865 E, 8 458 144 N	No change



**Figure 2 Proposed TRD drill center relocation relative to the Habitat Critical to the Survival of Green Turtles interesting buffer**

### **3. Incorporating best practice technology, dual pyrotechnic shear rams, to minimise the risk of a loss of well control event occurring during drilling**

Woodside has committed to adopt industry best practice risk reduction measures for all drilling as part of the proposal. As part of Woodside's ongoing commitment to review emerging technology, it has finalised an evaluation of pyrotechnically actuated shear ram technology and determined it will be utilised at Browse to achieve significant reduction in the risk an unplanned release event during drilling.

The description of development drilling activities is being updated to specify that drilling of Torosa wells will incorporate the use of dual pyrotechnic shear rams. This change is being proposed as an additional mitigation to further reduce the likelihood and environmental consequence of a loss of well control event during drilling.

#### ***Description of pyrotechnic shear ram technology***

Pyrotechnic shear ram technology provides additional layers of independent redundancy to further reduce the likelihood of a loss of well control event occurring during drilling and provides enhanced capability to immediately respond to a loss of control event and stop any flow of hydrocarbons into the environment, in the unlikely event this should occur. It has several advantages over existing industry practice, including that:

- It is capable of shearing tubulars that could be positioned across the blow out preventer (BOP) at the time of a loss of well containment, that are considered 'non-shearable' for a typical blind shear ram.
- It allows for rapid closure of the shear ram across the wellbore, minimising exposure of sealing mechanisms to fluid flow at velocities that may erode or otherwise compromise sealing effectiveness.
- It has enhanced reliability due to the reduced number of components required to activate the system compared to the number of hydraulic system components for a traditional BOP. There are far fewer opportunities for failure.
- It is pre-positioned on the well prior to drilling the target reservoir, eliminating the additional time involved in mobilising or deploying a capping stack i.e. it is available to cap the well immediately.
- It is installed in addition to traditional blind shear ram and does not hinder existing BOP functionality.
- It can be configured with multiple redundant modes of activation. The shear rams can be activated by an acoustic signal sent from the MODU or support vessel or can also be activated via a support vessel equipped with a remotely operated vehicle (ROV).
- Woodside successfully trialled the deployment and use of this equipment during the drilling of subsea wells in the Gulf of Mexico, noting that this application was a technical trial only and was not used as part of an emergency due to a loss of well control.

Woodside considers this technology to represent contemporary world's best practice for drilling in proximity to sensitive marine environments. In 2024 Woodside commissioned *Stuart Wright Well Integrity Management Solutions* to conduct an independent review of Woodside's drilling risk management against industry best practice and this technology was identified as representing part of a best practice approach, when combined with traditional source control and spill response measures, including both capping stack deployment and relief well drilling. The report is included as Attachment C to this letter.

The loss of well containment risk scenarios considered in the referred proposal submitted in 2019 were assessed as having significant, long-term consequences. With the application of this contemporary world's best practice technology, these scenarios are now considered to have a probability of lower than remote and should be considered as only a mere theoretical possibility.

#### ***Environmental consequence reduction benefits of this change***

In addition to reducing the likelihood of an already extremely unlikely subsea well loss of containment event, pyrotechnic shear ram technology also provides enhanced capability to immediately stop the flow of hydrocarbons to the environment. For this reason, the equipment can be considered as a blowout 'stopper', as compared with existing equipment that is most effectively used as a blowout preventer.

Within the ERD, it was noted that the worst 'worst case credible' scenario arising from Torosa drilling activities could result in a 77 day loss of containment event, releasing up to 142,154 m<sup>3</sup> of condensate. Evaluation of pyrotechnic shear ram technology determined that the longest credible duration of a blowout would be 12 hours, resulting in release of up to 887 m<sup>3</sup> of condensate. This 12-hour release scenario conservatively

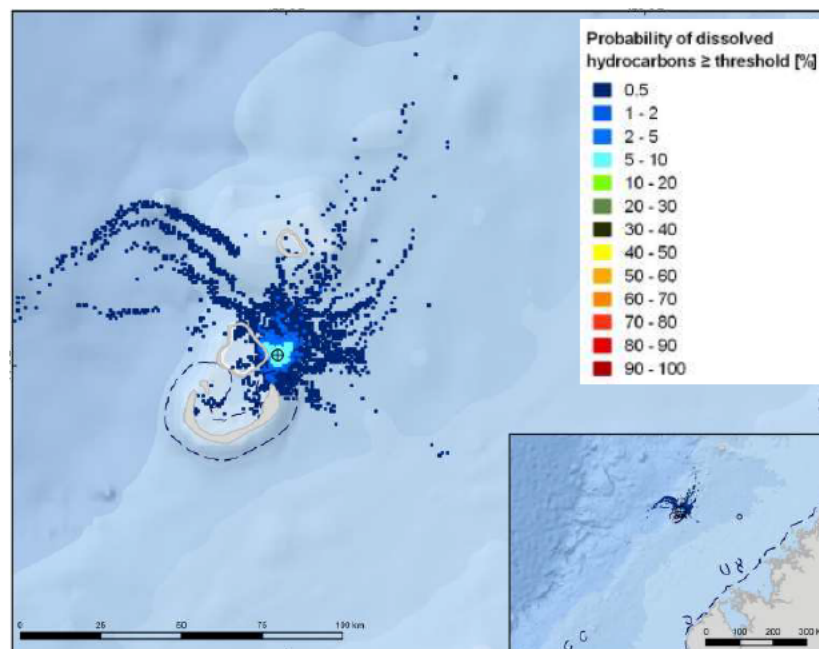
assumes that a loss of containment has occurred, both manual and automatic activation modes on the MODU have failed and an independent response is required to manually activate the pyrotechnic ram and shut in the well.

Stochastic modelling of this scenario was conducted to industry standards. 100 replicate modelling simulations were run and the results were compared with ecological impact thresholds. This uses valid and reasonable assumptions to ensure that a conservative approach is taken with any modelling uncertainties. The outputs of the modelling are included in Attachment A and summarised below.

Under this revised loss of well control scenario, the receptor locations that may be contacted by entrained oil at concentrations above the environmental risk assessment threshold (100 ppb<sup>1</sup>) are Scott Reef and Seringapatam Reef. Of these receptor locations, the probability of entrained hydrocarbons contacting receptors above ecological thresholds was likely at North Scott Reef (37% probability), while the probability of contact at South Scott Reef, Sandy Islet or Seringapatam was unlikely (<10%).

Dissolved hydrocarbons are also relevant for assessing potential impacts to the shallower water benthic habitats of Scott Reef. The modelling indicated that there is a low likelihood (10.5% probability) that dissolved oil will contact Scott Reef above ecological thresholds of 50 ppb<sup>2</sup>. For the small areas of Scott Reef that may be contacted, the likelihood of dissolved oil contacting above the ecological threshold ranges from <0.5% to 5%. Figure 3 has been extracted from the attached spill modelling report as an example.

The maximum concentration of dissolved hydrocarbons in the worst-case simulation was 247 ppb at Scott Reef North and 124 ppb at Scott Reef South. This is slightly higher than the ecological impact threshold of 50 ppb<sup>2</sup>. The modelling results suggest that in the highly unlikely event of this scenario, impacts are likely to be restricted to the most sensitive species or life stages of these habitat and communities.



**Figure 3 Hydrocarbon spill modelling outputs for a successful activation of a pyrotechnic shear ram within 12 hours: predicted annualised probability of dissolved aromatic hydrocarbon concentrations at or above 50 ppb<sup>2</sup>. This figure represents the merged area of 100 simulations with different weather and ocean conditions.**

The extent to which an unrestricted flow of hydrocarbons for up to 12 hours would impact the marine environment is significantly less than the extent from a 77 day unrestricted loss of subsea well control scenario that is presented in the Browse to NWS EIS/ERD.

<sup>1</sup> Entrained hydrocarbon threshold of 100ppb is appropriate given oil characteristics for informing risk evaluation, as recommended in the National Offshore Petroleum Safety and Environmental Management Authority Environment bulletin on Oil spill modelling (April 2019).

<sup>2</sup> Dissolved hydrocarbon threshold of 50ppb approximates potential toxic effects, particularly sublethal effects to sensitive species, as recommended in the National Offshore Petroleum Safety and Environmental Management Authority Environment bulletin on Oil spill modelling (April 2019).



**4. Update to reflect that drilling within State Waters will occur from a moored 'drill rig' (MODU), to eliminate underwater noise from dynamic positioning**

The Browse to NWS ERD identified that the Mobile Offshore Drilling Unit (MODU) used to drill the wells may use either dynamic positioning or moorings to hold itself in a constant position (station keeping) while drilling – a function that is critical to the safety of drilling operations. This change seeks to remove from the proposal the activity of drilling using a dynamically-positioned MODU at Torosa and specify that drilling will only occur once the MODU has been safely moored. This means that MODU in State Waters will not use dynamic positioning other than when arriving at or departing the drilling location.

Underwater noise modelling conducted in support of the Browse EIS/ERD and summarised within the Pygmy Blue Whale Management Plan published as part of the Response to Submissions estimated that the underwater sound source level from a dynamically positioned MODU operating at Torosa would be up to 182.8 dB re 1µPa. The noise from drilling activities from a moored MODU when drilling is estimated to be lower, at 170.1 dB re 1µPa as a significant amount of underwater noise from the activity comes from operating the DP thrusters.

Woodside has conducted underwater noise modelling that compares the distance at which relevant noise thresholds will be received in the environment (Appendix B). Modelling results show that the most sensitive threshold, which is 120 db, associated with the behavioural response threshold for cetaceans, reduces from ~4.1 km from a MODU using DP to less than 500 m for a MODU that is moored. See Table 3 of Attachment D for the modelling results and further supporting information.

The area of ocean surrounding the MODU expected to be exposed to noise above 120 db from a moored MODU is approximately 0.8 km<sup>2</sup>. For context, the possible foraging area around Scott Reef is >12,000 km<sup>2</sup>. Baseline data for Pygmy Blue Whales transiting this region showed they were migrating at average speeds of 2.8±0.9 km hr<sup>-1</sup> in this region (Thums *et al* 2022). This would mean any PBW would only be exposed to noise capable of eliciting a behavioural response for less than one hour while passing this region. Woodside notes underwater noise can occur from other vessels supporting drilling operations, but unlike a MODU they are not directly connected to the seabed and have the ability to manoeuvre away from or avoid cetaceans if observed.

Monitoring in 2023 identified that the maximum number of whales confidentiality observed to be present within ~30 km of the proposal area during any given 24-hour period was four.

**5. Remove the activity to conduct planned MODU flaring operations at Torosa locations at night.**

The referred proposal described intermittent flaring from the MODU during well unloading as a construction element. Flaring from the MODU at Torosa locations would produce artificial light that may be visible at Sandy Islet, depending on vessel height and flaring magnitude.

This application seeks to modify the temporal extent of any planned flaring such that it cannot occur outside of daylight hours, removing the impact pathway of artificial light generated from flaring on turtles at Sandy Islet.

An updated Proposal Content Document that incorporates these changes has been included. The changes are within the scope of the proposal referred and do not result in a significant increase to any impact that the proposal may have on the environment, having regard to the nature and extent of the impacts in their environmental context.

The EPA's consent to these changes pursuant to section 43A of the EP Act is requested.

Yours sincerely,



**Kimberly Walpot**

Vice President Browse

**Attachments**

Attachment A - Request to amend a proposal during assessment under s 43A of the EP Act.

Attachment B – Proposed Revised Proposal Content Document.

Attachment C. Independent Review of Well Blowout Risk Management at Torosa. Prepared by Colin Stuart and John Wright. September 2024.

Attachment D. Acoustic Modelling – Woodside Browse to NWS Vessel Noise. Prepared by Jasco Applied Sciences, July 2022.

**Citations**

Thums, M., L., Cerqueira-Ferreira, C., Jenner, M., Jenner, D., Harris, A., Davenport, V., Andrews-Goff, M., Double, Möller, L.M., C.R.M., Attard, K., Bilgman, P., Thomson and R.D. McCauley (2022). Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. *Global Ecology and Conservation* 35:e02054.