

Annex D6

Peer Review of ERM Oil Spill Report

07 September 2018

Our Reference: S2001-94-LT-ERM001

ERM Southern Africa (Pty) Ltd
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ATTENTION: MS V STEVENS

Dear Vicky

EIA FOR OFFSHORE DRILLING IN BLOCK ER 236: PEER REVIEW OF OIL SPILL MODELLING REPORT**1. INTRODUCTION**

ERM has been appointed by Eni to conduct an Environmental Impact Assessment (EIA) for an offshore exploration drilling programme in Block ER 236, off the east coast of South Africa. The EIA includes an oil spill modelling study undertaken by ERM. ERM have appointed PRDW to undertake an independent peer review of the oil spill modelling study. The peer review included the following tasks:

- Initial discussion with team to discuss and confirm approach to the modelling studies;
- Review of the modelling results and provision of comments to the team;
- Review of the modelling report; and
- Drafting a peer review report (this document).

This peer review is based on the following report received from ERM on 4 September 2018: Environmental Impact Assessment: Oil Spill Modelling Report, Exploration of the Block ER236 Block, South Africa, September 4, 2018, Final Report, File: "Final Eni-SA_Oil Spill Modelling_Report_Rev2.pdf".

2. GENERAL COMMENTS

The oil spill modelling study has been undertaken by well qualified and experienced modellers and utilises the well-established GEMSS (Generalized Environmental Modelling System for Surfacewaters) model, specifically the following sub-models:

- GEMSS-COSIM for three-dimensional oil spill dispersion; and
- GEMSS-GIFT for three-dimensional particle dispersion and deposition.

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These models have been applied using best practise methodology, including a probabilistic approach to account for the variability in the forcing metocean conditions. The thresholds applied to the model results in order to assess impacts of the oil and drilling mud are well motivated, i.e.:

- 1 µm for surface oil thickness;
- 100 g/m² for oil on the shoreline;
- 5 cm for mud thickness on the seabed; and
- 35 mg/L for total suspended solids (although it should be noted that this is based on discharge/end of pipe concentrations rather than receiving water concentrations).

The review has identified a number of major and a couple of minor comments, which are described below.

3. MAJOR COMMENTS

3.1 Oil spill scenarios modelled

The volume of oil for each spill scenario (Table 5-1) needs to be justified as these have a significant influence on the magnitude of the impacts, i.e.:

- Scenario 1: Provide a justification for the 5000 bbl of diesel, e.g. is this the size of one fuel tank on the vessel?
- Scenario 2: The crude oil release rates of 4,717 bpd and 6,604 bpd for the two blowout scenarios require a thorough justification. These seem low compared to previous studies off the west coast of South Africa and Namibia undertaken for international oil companies where the modelled oil release rates for blowouts ranged between 10,000 and 80,000 bpd. For reference, the Macondo/Deepwater Horizon blowout in the Gulf of Mexico released 4.9 million bbl over for 87 days giving an average of 56,300 bpd.
- Scenario 3: Provide a confirmation that that these are the NADF volumes in the riser and justify why additional volumes will not be lost, e.g. is there an automatic shutoff valve?

In response to this review comment, Eni provided the following reasons for the flow rates for Scenario 2:

The input data provided for the model run are based on lithology and preliminary reservoir assessment and interpretation starting from seismic data. During the 2Q of 2018, new data interpretation were available from 2D/3D seismic data acquired by some multi client providers in 2016 and 2018. Based on the analysis already finalized, the reservoir and production profiles are expected to be very similar to the same available in other subsea fields developed by Eni in Africa. For this reason the PI (productivity index), porosity, hydrocarbon properties and expected flow rate have been re-calculated and optimized using real data from those similar fields. The confirmation of those assumption will be provided after the drilling of first explorative well.

Further to this response from Eni, the following comments stand:

- Please include this justification for Scenario 2 in the main report. Since these oil release rates still need to be confirmed after drilling the first well, it seems that these may not be the worst-case flow rates in the case of a blowout. Why were conservatively high rates not used for the oil spill modelling?
- Please add justifications for Scenarios 1 and 3 to the report.

3.2 Dissolved aromatics

The terms of reference for the oil spill study contained in the Final Scoping Report of 8 March 2018 (file: "eni_final_scoping_report_08march2018.pdf") includes the following: "Impacts will be assessed in terms of the probability of the presence of a visible hydrocarbon slick on the surface, probability of oil contacting shorelines, and **dissolved aromatic concentrations in the water column.**"

The model results for the blowout scenarios, e.g. Figure 5.15, show that approximately 40% of the crude oil mass is dissolved into the water column, however the dissolved aromatic concentrations have not been quantified. The model results need to be analysed to determine the dissolved aromatic concentrations in the water column and these should then be compared to the relevant threshold concentrations to enable the potential impacts on the marine ecology in the water column to be assessed.

3.3 Blowout results

For the blowout scenarios, the model predicts that only approximately 1% of the oil is on the sea surface, less than 1% comes ashore, 40% is dissolved into the water and 40% dispersed as droplets. Although there is a high probability of some shoreline contact, the threshold for shoreline oiling (100 g/m^2) is predicted not to be exceeded. Thus the impact at the water surface and on the shoreline is predicted to be lower than for the other scenarios modelled.

The lower impact on the surface and shoreline is rather unexpected as the blowouts involve much larger volumes of more persistent oil. This is presumably due to the large depths and strong currents at the blowout sites. It is recommended that the authors increase the confidence in these predictions by including a high-level comparison of these model results to available observations from blowouts under similar conditions.

3.4 Additions to conclusions section

The following additions are suggested to the Conclusions section, with corresponding additions to the Summary section:

- Scenarios 1: For clarity, it is suggested that the last sentence on page 91 and the first sentence on page 92 be amended by inserting the text indicated in bold below: "The total length of this stretch at risk of oiling above the **significant shoreline oiling flux threshold for wildlife injury ($>100 \text{ g/m}^2$)** is up to 366 km and the probability of shoreline oiling at any location due to a spill from any of the three spill locations is between 3.3% from a release from location N2 and 15.0% for a release from location S. Although any diesel reaching shoreline is predicted to be below the **oil thickness threshold of $1 \mu\text{m}$** for risk to birds and wildlife, some oil mass may reach shorelines over time."
- Scenario 2: On page 92 provide an indication of the travel distance and surface area where the surface oil exceeds the thickness threshold. Also include a statement that for Scenario 2a there is a 55 to 80% probability of some shoreline contact with oil and for Scenario 2b between 90 and 97%, although these are not predicted to exceed the shoreline oiling flux threshold for wildlife injury ($>100 \text{ g/m}^2$).
- The conclusion will also need to be updated to include information on the dissolved aromatic concentrations and the impact relative to the relevant concentration thresholds.

4. MINOR COMMENTS

4.1 Validation of ocean currents, water temperature and salinity

The ocean currents, water temperature and salinity used in the oil spill modelling were obtained from the HYCOM (HYbrid Coordinate Ocean Model) global circulation model. Although this is a well-established model, no validation of the results in the study area was presented, e.g. a comparison to local current meter measurements would be expected.

Further, only a single snapshot in time of the current field was provided. Current roses or time-series would have provided evidence that the temporal characteristics of the currents applied in the model were realistic.

4.2 Validation of wind data

The wind used in the oil spill modelling was obtained from NOAA's National Climatic Data Center (NCDC). Although this is a well-established dataset, no validation of the results in the study area was presented, e.g. a comparison to local wind measurements would be expected. Further, no wind roses in the study area were presented which would have provided evidence that the statistical characteristics of the winds applied in the model were realistic.

5. CONCLUSION

This review has identified a number of major comments which, in the opinion of this reviewer, need to be addressed by ERM before the study results can be used to inform the EIA. A couple of minor comments are also provided the record, but do not require any actions.

Yours sincerely
PRDW



STEPHEN LUGER
Technical Director

18 September 2018

Our Reference: S2001-94-LT-ERM002

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In a letter dated 7 September 2018, PRDW identified four major comments regarding the study report received from ERM on 4 September 2018. In response to these comments, ERM issued the following revised study report to PRDW on 18 September 2018: Environmental Impact Assessment: Oil Spill Modelling Report, Exploration of the Block ER236 Block, South Africa, September 4, 2018, Draft Report, File: "Eni-SA_Oil Spill Modelling_Report_Rev-2018-9-17-Appendix.docx".

This letter confirms that all four major comments raised by PRDW have been adequately addressed.

Yours sincerely
PRDW



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