Review of Oil Spill Modelling for the Regia 3D MSS

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S2 ENVIRONMENTAL CONSULTING
S2 Services

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1. Introduction

This technical review of oil spill modelling has been prepared to support CGG Services (Australia) Pty Ltd (CGG) in its impact and risk assessment process for the for the Regia Marine Seismic Survey (Regia MSS).

The Regia MSS Preliminary Environmental Impact and Risk Assessment (PIERA) used an Environmental Planning Area set at 155 km around the Activity Planning Area. This distance was selected using professional judgement and a review of previous impact and risk assessments for similar activities in the region. Further justifying the distance, the NERA Reference Case: Consequences analysis of an accidental release of diesel (NERA 2018) found that diesel spills under 700m^3 were reliably predicted to disperse within 150 km. An additional 5 km was added to this range to ensure that coastal sensitivities were included in the search ranges for environmental values and sensitivities to inform the description of environment.

The PIERA recommended that following be undertaken: Review the NERA Reference Case 2018:1003 Consequence analysis of an accidental release of diesel and regionally relevant spill models from similar worst-case events to determine the applicability of the NERA Reference Case and, subsequently, the need for activity specific spill modelling. This report actions this recommendation to determine if the Environmental Planning Area is appropriate to approximate the spatial extent and variability of the receiving environment's contact with oil and subsequently inform risk evaluation and planning for oil spill response and monitoring, for the oil spill risk associated with the Regia MSS.

The initial spill modelling review was undertaken in April 2023 and updated in December 2023 prior to submission of the Regia MSS EP to NOPSEMA to consider any new oil spill modelling undertaken within the Otway Basin relevant to the review.

2. Review Recommendations

The following recommendations are made to CGG from this review:

- Basing the spill volume on the vessel's largest fuel tank is appropriate for the risk assessment.
- The NERA Reference Case distance of 150 km is appropriate for defining the furthest an oil spill could reach for spills up to 250 m^3 diesel spill that may occur within the Regia MSS Activity Planning Area.
- The Environmental Planning Area is appropriate for:
    - Estimating the spatial extent of oil exposure at the low thresholds (NOPSEMA 2019) for a 250 m^3 diesel spill within the Regia MSS Activity Planning Area.
    - Predicting oil exposure at King Island from a 250 m^3 diesel spill within the Regia MSS Activity Planning Area.
    - Predicting no oil exposure at the Tasmanian coast from a 250 m^3 diesel spill within the Regia MSS Activity Planning Area.
- CGG should keep the largest tank volume for vessels below 250 m^3.
- Once the seismic survey vessel and type of support vessels are contracted, undertake a review of the largest fuel tank volume. If the largest fuel tank volume is greater than 250 m^3 this oil spill modelling review should be redone to determine if the Environmental Planning Area is still

appropriate. If it is not a management of change should be undertaken as per CGG's Implementation Strategy for the Regia MSS.

- If the Regia MSS Activity Planning Area changes, this oil spill modelling review should be redone to determine if the Environmental Planning Area is still appropriate. If it is not a management of change should be undertaken as per CGG's Implementation Strategy for the Regia MSS.

3. Regia MSS Spill Risk

The Regia MSS PIERA identified that whilst undertaking the activity, unplanned events may occur which result in a discharge of marine diesel. The Regia MSS Description of the Activity details that the worse-case credible oil spill risk of a vessel collision could result in the loss of diesel fuel from the vessels largest fuel tank. This assumption aligns with AMSA's National Plan Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities (AMSA 2015) that recommend that the indicative maximum credible spill volume for a vessel collision is the volume of the largest fuel tank.

The Regia MSS Description of the Activity details that the survey will be conducted using a purpose-built seismic survey vessel supported by up to three support vessels. CGG provided information on the proposed seismic survey vessel and type of support vessels that are likely to be used for the Regia MSS and it was identified that the largest fuel tank was 257.4 m^3.

4. Review Process

The review process focussed on oil spill modelling that is publicly available that met the following requirements:

- Surface release of marine diesel oil.
- Modelling thresholds align with those in the NOPSEMA Oil Spill Modelling Environment Bulletin April 2019.
- Modelling was used in an environment plan available on the NOSPEMA website.
- Modelled location is within the Regia MSS Activity Planning Area or > 20 km of the Regia MSS Activity Planning Area where the metocean conditions would be similar.

5. Review

The oil spill modelling that met the criteria in Section B11-4 are detailed in Table B11-51-. Marine diesel oil spill volumes ranged from 200 m^3 to 375 m^3 with all models using a release rate over 6 hours.

Distances to the modelling thresholds ranged considerable with the furthest distances typically to the east of the spill release location. This aligns with the major ocean currents in South-eastern Australia where the Leeuwin current from Western Australia flows south-east across the Great Australian Bight and reaches the west coast of Tasmania as the Zeehan Current (CoA 2015a).

Larger volumes modelled typically resulted in greater distances with entrained hydrocarbons travelling the furthest.

The NERA Reference Case (NERA 2018) detailed that, except for one outlier, there was no surface impact above thresholds beyond 150 km from the source of the spill for spills up to 700 m^3. This does not align with the modelling reviewed for which surface oil travelled between 10 to 300 km for spill volumes up to 373 m^3. Though it is noted that the moderate threshold for surface oil (NOPSEMA 2019) was used in the NERA Reference Case which would result in a smaller distance.

The NERA Reference Case (NERA 2018) also used 500 ppb for water column consequences of hydrocarbon release which does not align with NOPSEMA (2019) for which the low thresholds of 10 ppb for dissolved and entrained hydrocarbons are recommended for determining the spatial extent that may be exposed to a measurable level of hydrocarbons.

Only one spill volume of 250 m^3 was modelled (RPS 2019a) at the Annie-1 well location in 70 m water depth and 15 km from the Victorian coastline. The outputs from this modelling are relevant to the Regia MSS Activity Planning Area nearshore component and would be valid to estimate the distance to surface, dissolved and entrained low thresholds and oil contact to the mainland coast. The distances to these thresholds are within the Environmental Planning Area except for:

- The surface oil distance to the east of the oil spill modelling location was 193 km which is greater than the 150 km used for the Environmental Planning Area. However, the modelling used a threshold value of 0.1 g/m^2 which is lower than the current modelling threshold of 1 g/m^2 (NOSPEMA 2019) Based on a lower threshold was used and that the modelling at Minerva for Woodside (~ 10 km east of the Annie location) in a similar water depth (60 m) and distance to the Victorian coast (9 km) had a furthest distance of 75 km to the east for the low threshold surface oil, the 150 km used for the Environmental Planning Area in the nearshore Regia MSS Activity Planning Area would be appropriate.
- The moderate threshold for entrained oil was used for the modelling. This threshold is appropriate for informing the risk evaluation, but NOPSEMA (2019) recommend that the low threshold be used to define the area that may be exposed to oil above background levels. The moderate threshold was reached at a maximum distance of 60 km so even if this distance was double it would still be within the 150 km used for the Environmental Planning Area.

However, as the Regia MSS Activity Planning Area extends out ~ 120 km from the Victorian mainland and ~100 km from King Island the Annie-1 location may not accurately predict oil exposure to King Island or Tasmania.

Based on the following modelling that was undertaken closer to King Island and the Tasmanian mainland than the Regia MSS Activity Planning Area, the Regia MSS Activity Planning Area is appropriate for predicting low shoreline exposure to King Island and no shoreline exposure to the Tasmanian mainland from a 250 m^3 diesel spill over 6 hours:

- The ConocoPhillips Australia SH1 Pty Ltd modelling at Permit T/49P, 70 km west of King Island and 50 km south of Cape Otway, for a 350 m^3 diesel spill over 6 hours predicted no shoreline oil exposure for the Tasmanian mainland and a maximum probability of shoreline accumulation at the low threshold of 3%.

- The Beach Energy (Operations) Limited modelling at the Thylacine field located 70 km south of Port Campbell and 90 km northwest of King Island, for a 200 m^3 diesel spill over 6 hours predicted no shoreline oil exposure for the Tasmanian mainland and a maximum probability of shoreline accumulation at the low threshold of 2%.
- The Beach Energy (Operations) Limited modelling at the Thylacine field located 70 km south of Port Campbell and 90 km northwest of King Island, for a 300 m^3 diesel spill over 6 hours predicted no shoreline oil exposure for the Tasmanian mainland and a maximum probability of shoreline accumulation at the low threshold of 4%.

Table B11-5-1: Oil Spill Modelling Outcomes

Company	EP	EP Status	Modelling Site	Approximate Modelling Location	Diesel Spill Volume	Water depth	Approximate Distance to Low Threshold			
							Surface Low - 1 g/m2	Shoreline Low - 10 g/m2	Dissolved Low- 10 ppb	Entrained Low - 10 ppb
ConocoPhillips Australia SH1 Pty Ltd	Otway Exploration Drilling Program Oil Spill Report – RPS 2023a	Public comment period recently closed	VIC/P79	50 km south of Port Campbell	350 m^3 over 6 hours	93 m	52.8 km east 27.9 km west	390 km east 170 km west	125 km east 50 km northwest	700 km east 260 km west
ConocoPhillips Australia SH1 Pty Ltd	Otway Exploration Drilling Program Oil Spill Report – RPS 2023a	Public comment period recently closed	VIC/P79	30 km south of Warrnambool	350 m^3 over 6 hours	74 m	59.9 km east 60 km west	430 km east 100 km west	159 km east 120 km west	446 km east 310 km east
ConocoPhillips Australia SH1 Pty Ltd	Otway Exploration Drilling Program Oil Spill Report – RPS 2023a	Public comment period recently closed	VIC/P79	25 km south of Yambuk	350 m^3 over 6 hours	66 m	51.8 km east 30 km west	500 km east 160 km west	121 km east 120 km west	489 km east 430 km west
ConocoPhillips Australia SH1 Pty Ltd	Otway Exploration Drilling Program Oil Spill Report – RPS 2023a	Public comment period recently closed	VIC/P79	10 km south of Yambuk	350 m^3 over 6 hours	45 m	62.3 km east 50 km west	470 km east 100 km west	119 km east 80 km west	598 km east 540 km west
ConocoPhillips Australia SH1 Pty Ltd	Otway Exploration Drilling Program Oil Spill Report – RPS 2023	Public comment period recently closed	Permit T/49P	70 km west of King Island 50 km south of Cape Otway	350 m^3 over 6 hours	93 m	49.8 km east 10 km west	160 km west 250 km east	92 km east 50 km west	648 km east 250 km west
Woodside Energy (Victoria) Pty Ltd	Minerva P&A Oil spill report not provided with EP	Under Assessment	Minerva	9 km southwest of Port Campbell	330 m^3 over 6 hours	60 m	75 km east 40 km west	200 km west 500 km east	150 km east 90 km west	450 km east 225 km west
Cooper Energy (CH) Pty. Ltd	Otway Offshore Operations - Casino, Netherby & Henry Revision Oil Spill Report – RPS 2019a	Under Assessment	Annie	15 km southeast of Port Campbell	250 m^3 over 6 hours	70 m	145 km west 193 km east	75 km west 75 km east	42 km west Low - 62 km east	Used 100 ppb 51 km northwest 60 km southeast
Beach Energy (Operations) Limited	Thylacine Installation and Commissioning Oil Spill Report – RPS 2022	Accepted	Thylacine	70 km south of Port Campbell 65 km southwest of Cape Otway 90 km northwest of King Island	300 m^3 over 6 hours	100 m	20 km west 39.3 km east	Discrete locations King Island Cape Otway	40 km west 90 km east	50 km west 230 km east
Beach Energy (Operations) Limited	Offshore Gas Victoria Geophysical and Geotechnical Seabed Survey Thylacine Installation and Commissioning Oil Spill Report – RPS 2022	Accepted	Thylacine	70 km south of Port Campbell 65 km southwest of Cape Otway 90 km northwest of King Island	200 m^3 over 6 hours	100 m	15 km west 36.5 km east	Discrete locations King Island	20 km west 60 km east	50 km west 180 km east
Beach Energy (Operations) Limited	Otway Offshore Operations Oil Spill Report – RPS 2019b	Accepted	Artisan	32 km south of Port Campbell	300 m^3 over 6 hours	60 m	93 km east 40 km west	No shoreline contact	Used 6 ppb 80 km west 160 km east	400 km east 400 km west
Beach Energy (Operations) Limited	Otway Phase 5 Early Dive Installation Campaign Oil Spill Report – RPS 2019a	Accepted	Thylacine	70 km south of Port Campbell 65 km southwest of Cape Otway 90 km northwest of King Island	300 m^3 over 6 hours	100 m	Applied the Artisan modelling from the Otway Offshore Operations EP			
ConocoPhillips Australia SH1 Pty Ltd	Sequoia 3D Marine Seismic Survey Oil Spill Report – RPS 2020	Accepted	Seismic Survey Operational Area	23.5 km west of King Island 26 km south of Victorian coast	373 m^3 over 6 hours	70 to 1,000 m	300 km east 20 km west	300 km east	251 km ENE	742 km ENE

6. References

AMSA. 2015. Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities. Australian Maritime Safety Authority

CoA. 2015a. South-East Marine Region Profile. As description of the ecosystems, conservation values and use of the South-east Marine Region. Commonwealth of Australia.

RPS. 2019a. Annie-1 Oil Spill Modelling. Report MAQ0748J.

RPS. 2019b Beach Energy Artisan-1 Exploration Well Oil Spill Modelling. Report MAQ0828J.

RPS. 2020. Sequoia 3D Marine Seismic Survey Oil Spill Modelling. Report MAQ0953J.

RPS. 2022. Thylacine Installation and Commissioning – Phase 5 Oil Spill Modelling. Report MAQ1217J.

RPS. 2023. ConocoPhillips Exploration Permit T/49P Marine Diesel Spill Modelling. Report MAQ1155J.