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Canadian Environmental Assessment Agency
Suite 200, 1801 Hollis Street
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Attention: Shauna O'Brien, Project Manager Atlantic Regional Office

Date: November 7, 2018
File code: 43351.2

Dear Ms. O'Brien:

Reference: Submission of the ExxonMobil Canada Ltd. Eastern Newfoundland Offshore Drilling Program – Information Requirements – EL 1134 Addendum

Please find enclosed the Information Requirements (IRs) on the Environmental Impact Statement Addendum for the addition of EL 1134 to the ExxonMobil Canada Ltd. (ExxonMobil) Eastern Newfoundland Offshore Exploration Drilling Project.

Electronic copies in pdf and word format have been transmitted electronically.

If you have any questions regarding the transmittal please contact the undersigned.

Respectfully,
<Original Signed By>

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Responses to Information Requirements – EIS Addendum EL 1134

For

Eastern Newfoundland Offshore Exploration Drilling Project (CEAR 80132)

Pursuant to the *Canadian Environmental Assessment Act, 2012*

ExxonMobil Canada Ltd.

November 2018

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EXXONMOBIL

INFORMATION REQUIREMENT – IR-92

Project Effects Link to CEAA 2012: 5(1)(a)(i) Fish and Fish Habitat, 5(1)(a)(ii) Aquatic Species

Reference to EIS Guidelines: Part 2, Section 6.6.1. Effects of potential accidents or malfunctions

Reference to EIS: Section 7.1.1 Modelling Approach, Table 7.1, Section 7.1.2 Model results

Context and Rationale

The description of modelling approach in the EIS Addendum and related appendix did not address the following:

- Trajectory modelling was developed for an unmitigated spill using Ben Nevis crude oil as a surrogate; however, in the original EIS, Bay du Nord crude oil was used for spill trajectory modelling in adjacent EL 1135. There is no rationale / supporting information provided for use of Ben Nevis crude oil for spill trajectory modelling in EL 1134.

- The release rate used for modelled spill scenarios is 37,000 barrels per day for EL 1134. However, the release rate in the modelled scenario for EL 1135 in the original EIS is 156,000 barrels per day. There is no supporting information provided for use of a release rate of approximately four times less than that used in the original EIS. It is noted that this may relate to the different properties of the surrogate oil used, or the difference in water depth; however, no specific supporting information was provided.

- Section 7.1.2 indicates that the representative deterministic scenarios (30 and 113 days) were selected based only upon the length of shoreline contacted with oil above threshold. It is unclear why deterministic scenarios were also not selected for surface oiling and water column contamination, as was done for previous modelling at release sites in El 1135 and EL 1137. In that modelling, the deterministic worst case scenarios were selected based on the "…95th percentile runs for surface oil footprint, shoreline oil length, and water column contamination…" (page 1229 of EIS).

Specific Follow-Up Question/Information Requirement

Provide rationale and supporting information for:

- the use of Ben Nevis crude oil in spill trajectory modelling given that Bay du Nord was used in the original EIS in adjacent EL 1135;

- the selection of a significantly lower release rate for spill modelling for EL 1134, as compared to the release rate used for adjacent EL 1135. Include a discussion of water depth and its effect on blow-out rate and spill trajectory modelling assumptions, as required by the EIS Guidelines; and

- the selection of deterministic modelling scenarios based solely on shoreline oiling stochastic results.

Response

Part 1: Rationale for the use of Ben Nevis crude oil in spill trajectory modelling given that Bay du Nord was used in the original EIS in adjacent EL 1135

The selection of crude oil type is dependent on the expected reservoir and geological conditions. It is does not necessarily relate to present geographic proximity. Many fields such as Hibernia have oil of different properties within the field so prediction of anticipated properties is derived from prediction of possible source, reservoir and pressure/temperature conditions of the prospect. The geological prospect identified in EL 1135 is predicted to have oil properties similar to Bay du Nord and the prospect in EL 1134 is predicted to have Ben Nevis type oil properties.

Part 2: Rationale for the selection of a significantly lower release rate for spill modelling for EL 1134, as compared to the release rate used for adjacent EL 1135. Include a discussion of water depth and its effect on blow-out rate and spill trajectory modelling assumptions, as required by the EIS Guidelines.

As with the oil type discussed above, the release rate at any location is predicted based on expected fluid type and reservoir pressure/temperature conditions. Lower initial reservoir pressure and/or smaller reservoir volume would be factors that contribute to lower release rate. The data falls within the expected bounds for release properties and were used in the modelling that was provided.

Part 3: Rationale for the selection of deterministic modelling scenarios based solely on shoreline oiling stochastic results.

The selection of a single representative "worst case" guided by the previous modelling that was conducted for EL 1135 and EL 1137, in conjunction to the most recent work at EL 1134, provides an understanding of the potential human and ecological effects associated with releases that may contact shorelines.

For the previous assessment conducted at EL 1135 and EL 1137, stochastic modelling of hypothetical releases (119 simulations) were run for short (30 d) and long (113 d) duration releases, totaling 476 simulations. Representative deterministic simulations were identified for surface oil, water column, and shoreline contact for both sites and each of the representative 95th percentile worst-case scenarios (12 simulations). These scenarios bound the range of potential effects to a large degree. However, an additional assessment at EL 1134 was also conducted with an additional 350 simulations in the short (30 d) and long (113 d) duration releases. The 95th & 98th percentile release were modeled to capture further detail related to potential effects to shorelines. It is the opinion of ExxonMobil and RPS that when considered together, these 826 simulations and the 14 representative scenarios for surface, water column, and shoreline effects do bound the range of potential "worst-cases" for releases from these three EL's.

Finally, in the event of a release in this region, releases that make contact with shorelines have the potential to affect the largest number of people (e.g., beach closures and fisheries closures), shoreline ecology, and avian species, and would result in the largest level of effort required to respond. For scenarios that result in oil contacting shorelines, containment, collection, and other shoreline cleanup activities would need to be undertaken. The credible worst case for length of shoreline affected would therefore bound the upper end of potential effects and should be suitable for use as a "worst case" for this assessment.

References

N/A

INFORMATION REQUIREMENT – IR-93

Project Effects Link to CEAA 2012: 5(1)(a)(i) Fish and Fish Habitat, 5(1)(a)(ii) Aquatic Species, 5(1)(a)(iii) Migratory Birds, 5(2)(b)(i) Health and Socio-economic Conditions

Reference to EIS Guidelines: Part 2, Section 6.6.1. Effects of potential accidents or malfunctions

Reference to EIS: Section 7.1.2.1 and subsequent effects analysis

Context and Rationale

The discussion of spill trajectory modelling results and associated effects analysis provided in the EIS Addendum does not fully address the following:

- *Shoreline contact at Sable Island, Eastern Nova Scotia, and associated implications for oil in critical habitat for species at risk:*

The EIS Addendum states that the probability of making contact with the shoreline above the stated threshold for the 113 day release was up to 25 percent on the Avalon Peninsula and primarily less than 10 percent on the northern and southern coasts of Newfoundland. Potential shoreline contact with Eastern Nova Scotia and Sable Island, as shown in Figure 7.3 of the EIS Addendum, is not discussed. The potential for shoreline oiling in these areas is not consistently discussed in the effects analysis on valued components; while it is mentioned in the analysis for marine and migratory birds and Indigenous communities and activities, it is absent from the analysis for remaining valued components.

It is noted that Section 4.2.3.5 of the EIS Addendum states that critical habitat has not been identified for marine mammals and sea turtles species at risk within or adjacent to EL 1134 or elsewhere in the project area. However, spill trajectory modelling results in Section 7.1.2 and Appendix B indicate a small possibility that oil could reach the Gully, Sable Island, Haldimand Canyon, and Shortland Canyon areas. Section 7 of the EIS Addendum does not mention marine mammals and their critical habitat in these areas that could be affected by accidents or malfunctions.

- *Anticipated hydrocarbon exposure for fish*

The effects analysis does not contain a discussion of the predicted hydrocarbon concentrations that marine fish may be exposed to in the area affected by a spill.

- *Time for spills to reach shoreline and associated degree of weathering*

The EIS Addendum states that the minimum time predicted for the oil to reach shore could be 8 - 27 days and that the oil is expected to be highly weathered. Based on figure 7.6 on page 191, which shows the mass balance plots of representative worst case scenarios for 30 and 113 days subsurface blowouts, the percentage of oil degraded after 8 days appears to be less than five percent. It is not clear from the EIS Addendum what percentage of oil will reach shore in eight days and what percentage of that oil will be heavily weathered.

The effects analysis for most valued components throughout Section 7.2 repeats the above statements regarding minimum of eight days to shoreline contact and the highly weathered state of oil by the time it potentially reaches the shoreline.

Specific Follow-Up Question/Information Requirement

Part A: Provide an updated discussion of spill trajectory modelling results, with additional information on:

- potential for shoreline oiling to reach Sable Island and Eastern Nova Scotia;
- anticipated hydrocarbon concentrations in the area affected by a spill; and
- percentage of oil predicted to reach shore 8 - 27 days following blowout, and how much of that oil will be highly weathered; and
- the implications of shorter time to reach shorelines (as compared to previous modelling results for EL 1135 and El 1137) for the applicability of previous effect analysis and predictions presented in the EIS.

Part B: Update the effects analysis, mitigation and follow-up, as applicable, for effects of accidental events on all valued components, incorporating the above-noted considerations. In addition:

- with respect to the marine mammal and sea turtles, a description of marine mammal species at risk and their critical habitat in the Gully Marine Protected Area, Sable Island, Haldimand Canyon and Shortland Canyon that could be impacted by an accidental event, and assess associated effects, as applicable.
- with respect to fish and fish habitat, include analysis of effects of the predicted hydrocarbon concentrations to which marine fish may be exposed in the area affected by a spill.

Response

Part A

Part 1: Potential for shoreline oiling to reach Sable Island and Eastern Nova Scotia

Within the RPS trajectory and fate report, there are numerous figures (Appendix B: EL 1134 Oil Spill Modelling Report, Figures 4-13 to 4-18) that provide information related to the predicted probability and minimum time for oil to contact shorelines above the highly conservative socio-economic threshold of 1 g/m^2. Results have been further processed to tabulate the minimum, average, and maximum probabilities of shoreline oil contamination and minimum time to shore by region including: Nova Scotia, Labrador, and Sable Island.

Nova Scotia								
Scenario	Release Site	Scenario Timeframe	Probability of Shoreline Oil Contamination (%)			Time to Shore (days)		
			Minimum	Average	Maximum	Minimum	Average	Maximum
30-day release	EL 1134 (37,800 bbl/d)	Annual*	N/A	N/A	N/A	N/A	N/A	N/A
		Winter*	N/A	N/A	N/A	N/A	N/A	N/A
		Summer*	N/A	N/A	N/A	N/A	N/A	N/A
113-day release		Annual*	N/A	N/A	N/A	N/A	N/A	N/A
		Winter	1	1	1	132	133	134
		Summer	1	1	1	85	89	105

*no oil was predicted to strand on shorelines of Nova Scotia in this scenario

Labrador								
Scenario	Release Site	Scenario Timeframe	Probability of Shoreline Oil Contamination (%)			Time to Shore (days)		
			Minimum	Average	Maximum	Minimum	Average	Maximum
30-day release*	EL 1134 (37,800 bbl/d)	Annual*	N/A	N/A	N/A	N/A	N/A	N/A
		Winter*	N/A	N/A	N/A	N/A	N/A	N/A
		Summer*	N/A	N/A	N/A	N/A	N/A	N/A
113-day release		Annual	1	1.3	2	86	95	132
		Winter	1	1.52	4	86	110	153
		Summer*	N/A	N/A	N/A	N/A	N/A	N/A

*no oil was predicted to strand on shorelines of Labrador in this scenario

Sable Island								
Scenario	Release Site	Scenario Timeframe	Probability of Shoreline Oil Contamination (%)			Time to Shore (days)		
			Minimum	Average	Maximum	Minimum	Average	Maximum
30-day release*	EL 1134 (37,800 bbl/d)	Annual*	N/A	N/A	N/A	N/A	N/A	N/A
		Winter*	N/A	N/A	N/A	N/A	N/A	N/A
		Summer*	N/A	N/A	N/A	N/A	N/A	N/A
113-day release		Annual	1	1.25	2	51	78	100
		Winter	1	1.92	4	51	78	100
		Summer	1	1	1	64	103	142

*no oil was predicted to strand on shorelines of Sable Island in this scenario

In summary there was no predicated shoreline oil contact to Nova Scotia, Labrador and Sable Island from the 30-day release at EL 1134. The highest predicted potential for oil exceeding 1 g/m2 to make contact with shorelines occurred within the 113-day release during the winter scenarios, with summer conditions resulting in less probable contact with shorelines. Oil that was predicted to make contact with shorelines would be patchy, discontinuous, and highly weathered, as it would take a minimum of 85, 86, and 51 days to reach the shores of Nova Scotia, Labrador and Sable Island, respectively.

Part 2: Anticipated hydrocarbon concentrations in the area affected by a spill

Anticipated hydrocarbon concentrations in the area of the spill may be considered in two different ways: 1) presence/absence and 2) absolute concentration. The presence or absence of any contamination above a concentration that could potentially result in effects would necessitate an understanding of the highly conservative threshold (i.e., socio-economic value of 1 µg/L dissolved hydrocarbon concentration). Maps have been provided (Appendix B: EL 1134 Oil Spill Modelling Report, Figures 4-7 to 4-12) that outline the probability and associated minimum time of contamination in the water column above the identified threshold. In essence, the areas highlighted have a potential for hydrocarbon contamination at some point from at least one of the 350 modelled simulations included in the stochastic assessment. The absolute concentration of hydrocarbon contamination is better described with the deterministic results. For the representative "worst case" shoreline scenario, maximum dissolved hydrocarbon concentrations predicted within the water column (vertical maximum) at any location within the model extent are estimated and used to provide an understanding of the highest concentration that may be anticipated at every location in space over the entire simulation (Appendix B: EL 1134 Oil Spill Modelling Report, Figures 4-23 and 4-24). Highest concentrations rarely exceed 100 µg/L outside the immediate proximity (several km) of the hypothetical release location. Note that concentrations are spatially and temporally variable within single simulations as well as across each modelled simulation. Also note that these maps depict the cumulative maximum (maximum value at any point in time) and therefore the overall footprint of values provided would never exist at any single point in time (e.g., response perspective, effects perspective, etc.).

Part 3: Percentage of oil predicted to reach shore 8 - 27 days following blowout, and how much of that oil will be highly weathered

Following a modelled release from EL 1134, the stochastic analysis predicted that oil could reach shorelines in as little as 8-27 days (out of 350 simulations), depending on the exact release scenario (Appendix B: EL 1134 Oil Spill Modelling Report, Table 4-2). The timing of potential shoreline contact is not dependent on the release duration (e.g., 30 vs. 113 d release), but rather is influenced by the speed and direction of currents and winds. The oil used in the modelled simulations (Ben Nevis) is a light to medium crude oil with approximately 40% being volatile/soluble. Therefore, weathering will proceed rapidly. Evaporation, dissolution, and photodegradation takes place on the scale of hours, while biological degradation takes place on the scale of days to weeks. Most crude oils that are over a week old within the environment would be considered weathered. While the crude oil predicted to strand on shores in as little as 8 days would be "fresher" than 27-day old crude, both oils would be considered highly weathered. Note that from a deterministic perspective, the oil within the "worst-case" shoreline scenarios were as predicted to reach shorelines for the first time between days 28-58 (i.e., highly weathered) and would have totaled less than 0.2% of the total release volume.

The shortest times that were predicted for oil to reach shorelines from the EL 1134 simulations were less than those predicted for EL 1135 and EL 1137. This difference is explained by two factors.

First, the previous modeling for EL 1135 and EL 1137 included met ocean data from 2005-2010 in the stochastic analysis. For the work at EL 1134, two additional years of wind and current data were acquired to extend the met ocean coverage to 2005-2012. The sole intent of this was to capture a longer time-history of environmental variability in the region to increase any potential for rare conditions that may minimize the time it took for oil to reach shorelines. In this additional two years of data, there were events that not only increased the potential for oil to contact shorelines but also within a shorter timeframe.

Second, there were two different SIMAP model versions used between the two assessments. For the previous modeling study at EL 1135 and EL 1137, oil was predicted to make contact with shorelines in as little as 29-31 days, while predicted shoreline contact values for the simulations at EL 1134 were 8-27 days. While a portion of this is likely attributed to additional wind/current conditions that may transport oil towards shorelines more rapidly, there are also differences in the fate (i.e., behavior) of the oil, which influences the trajectory (i.e., movement). The SIMAP model recently underwent updates to algorithms that describe entrainment, viscosity, surface spreading, droplet diameter, and fractional water content based upon recent learnings from the Deepwater Horizon oil spill (see references below). Each of these updates resulted in changes (increases) in the predicted persistence of oil. These updates increased the conservative nature of the SIMAP model and are validated against this real-world release. With higher viscosity and more persistent behavior of oil, a higher percentage of the modelled release was predicted to remain on the surface. Oil on the surface is exposed to winds for a larger portion of time, which therefore results in a higher potential for more rapid contact with shorelines. Therefore, even if two additional years of met ocean data had not been used (as they were for runs at EL 1134), it is likely that oil contacting shorelines would happen more rapidly due to the persistence of surface oil and the resulting increased transport by surface winds. The predicted behavior of oil stresses the importance of coupled trajectory and fate models like SIMAP, as changing chemical and physical parameters of oil need to be factored into each time step of the simulation, as opposed to post-processed, as the end results are likely to be different.

Part 4: The implications of shorter time to reach shorelines (as compared to previous modelling results for EL 1135 and El 1137) for the applicability of previous effect analysis and predictions presented in the EIS

The implications of this shorter time to reach shorelines are not as striking as may be expected at first glance. Oil is not predicted to strand on any shorelines in 75% of the modelled scenarios at EL 1134 (using the updated model) and 70% of the modelled scenarios at EL 1137 (using the older model). In the 25-30% of scenarios that have some quantity of oil predicted to reach the shoreline, the shortest time for contact was reduced from 29-31 days (regardless of oil type - Bay du Nord and Ben Nevis were used) in the previous modelling study to 8-27 days based upon a more conservative model and more environmental data at EL 1134. The oil that would be predicted to strand on shorelines would be highly weathered (> week-month old) in each case. Additionally, these minimum time values are only for the first quantity of oil to contact shorelines in each scenario. In all scenarios, the operator has at a minimum between a week and a month to mobilize responders to begin containment and collection prior to any oil reaching shorelines.

Part B

Part 1: Update the effects analysis, mitigation and follow-up, as applicable, for effects of accidental events on all valued components, incorporating the above-noted considerations. In addition, with *respect to the marine mammal and sea turtles, a description of marine mammal species at risk and their critical habitat in the Gully Marine Protected Area, Sable Island, Haldimand Canyon and Shortland Canyon that could be impacted by an accidental event, and assess associated effects, as applicable.*

The valued components of marine mammals and sea turtles, and special areas off the Scotian Shelf have been reviewed and considered with respect to the accidental events scenarios for EL 1134. Based on the project spill modelling and implementation of mitigation measures, the predicted adverse residual effects on these VCs are of low to medium magnitude, occurring within the RSA, of short to long term duration, not likely to occur or occurring sporadically, and reversible with a moderate level of confidence in the effects prediction.

The detailed environmental effects assessment for accidental events on marine mammals and sea turtles are detailed in Section 15.5.3 – Marine Mammals and Sea Turtles of the Environmental Impact Statement (EIS). As detailed in the EIS (Section 15.5.3 – Marine Mammals and Sea Turtles) and the EL1134 EIS addendum (Section 4.2.3.5 – Species at Risk), there are areas of importance to marine mammals and sea turtles off the Scotian Shelf. The Gully Marine Protected Area, Halidmand Canyon and Shortland Canyon have been designated as critical habitat for the Northern Bottlenose Dolphin. On the western side of the Scotian Shelf lies critical habitat in the Roseway Basin for the North Atlantic Right Whale. Although critical habitat has not been established for the Atlantic leatherback turtle, the Scotian Shelf represents an important foraging area from the summer to fall (James et al. 2006). The Sable Island is also an important area for marine mammals as it hosts the northwest Atlantic's largest grey seal breeding colony (Bowen et al. 2007).

Surface oil modelled for the 30-day subsurface blowout at the EL 1134 site is not predicted to reach the areas of concern on the Scotian Shelf. For the 113-day subsurface blowout, the probability of surface oil in excess of 0.04 µm on the Scotian Shelf is between one and ten percent and includes the waters around Sable Island, the Gully Marine Protected Area, Haldimand Canyon and Shortland Canyon. The minimum time for surface oil to reach these areas would be between 50-160 days where the oil is expected to be highly weathered, patchy and discontinuous. Therefore, the overall risk to marine mammals and sea turtles remains low as described in the EL 1134 EIS addendum. As a result, the conclusion within the EL 1134 EIS addendum based on existing data remains valid; with applied mitigations, Project accidental events are not predicted to result in significant adverse environmental effects on marine mammals and sea turtles including species at risk.

Part 2: With respect to fish and fish habitat, include analysis of effects of the predicted hydrocarbon concentrations to which marine fish may be exposed in the area affected by a spill.

Modelling of batch diesel spills (100 L or 1,000 L) predicts that areas exceeding the ecological threshold (100 µg/L THC) would be highly localized to the release site. Only fish in the immediate vicinity near the surface at the time of the spill may be exposed, and at the concentrations predicted. Deterministic models indicate a spill would be limited to within 12 km from the release site and is generally less than 5 µg/L. For the 1,000 L batch spill scenario, total maximum hydrocarbon concentration was above 5 µg/L within 25 km of the release site and less than 5 µg/L beyond 25 km from the site. The modelled spill scenario largely travelled to the south of the Project Area along the Flemish Pass, based upon the environmental conditions that were modelled for that specific time period. Since batch diesel spills are very localized, the potential for exposure and the likelihood of adverse effects on Marine Fish and Fish Habitat are low. A change in habitat availability and quality will likewise be of low magnitude. While batch diesel spills would affect water quality around the spill site, this would be short-term until the slick naturally disperses through surface wave action in the offshore environment.

The stochastic subsurface blowout scenario at the EL 1134 site featured modelling the 30-day and 113-day release of 37,800 bbl. /day of crude oil from the release point. The results of a hypothetical, unmitigated subsurface blowout modelled in the Project Area may result in reaching or exceeding the ecological threshold for in-water concentration (1 µg/L PAH or 100 µg/L THC) on Flemish Cap, Flemish Pass, Grand Bank and mid-Atlantic. For the 30-day release scenario, areas with a 90% probability of dissolved hydrocarbon concentration were predicted to reach the ecological threshold in a localized area mainly in the southern Flemish Pass. For the 113-day release scenario, areas with a 90% probability of dissolved hydrocarbon concentration reaching the ecological threshold included the Flemish Pass, Flemish Cap, southern and eastern slope of the Grand Bank, and mid-Atlantic areas. Deterministic 95th percentile shoreline contact scenarios provide an indication of hydrocarbon levels in the environment (e.g. water column, shoreline, surface, etc.). The 30-day scenario had maximum predicted concentrations of dissolved hydrocarbons of 50-100 µg/L along the southern Flemish Pass to the eastern slopes of the Grand Banks. The 113-day scenario had maximum predicted concentrations of dissolved hydrocarbons of 50-150 µg/L along the Flemish Pass, the eastern slopes of the Grand Banks, and the western slope of the Flemish Cap. Predicted hydrocarbon levels on the shelf of the Grand Banks and Flemish Cap are largely less than 50 µg/L. It is important to note that while the modelled extent of oiled surface areas is predicted to be large, the probability of an event occurring is extremely unlikely.

Therefore, the conclusions within the EL 1134 EIS addendum based on the modelling remain valid. In the unlikely event of an offshore oil release, some degree of residual adverse effects to individual marine fish and to fish habitat in the area at the time of the incident are expected. The degree of exposure and type of effects would depend on the type and size of spill, time of year, and location and species of fish within the affected area. However, effects are not expected to alter the long-term viability of local or regional fish populations in the RSA. Spill prevention techniques and response strategies (e.g., capping stack, spill clean-up processes, shoreline protection measures as detailed in Section 15.1 of the EIS) will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low to medium magnitude, occurring within the RSA, of short to long-term duration, not likely to occur or occurring sporadically, and reversible with a moderate level of confidence in the effects prediction.

References

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Horizon Oil Spill Model Results – Subsurface Oil Concentrations; Annex F: Deepwater Horizon Oil Spill: Comparison of Modeled Subsurface Concentrations to Chemistry Data. Prepared by RPS ASA for the US Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 20xx-xxx. 305 pp.

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INFORMATION REQUIREMENT – IR-94

Project Effects Link to CEAA 2012: All valued components

Reference to EIS Guidelines: Part 2, Section 6.6.1. Effects of potential accidents or malfunctions

Reference to EIS: Table 7.5

Context and Rationale

In Table 7.5 summarizing mass balance information for the EL 1134 scenarios, it was noted that after the 45 day model run (release duration of 30 days, volume 1.134 million bbl.), nearly 47% of oil remains on the surface. This is considerably higher than any other surface oil mass balance encountered in recent model results. For example:

- A somewhat comparable volume release (release duration 30 days, volume 786,000 bbl.) modelled for Exxon's EL 1137 had only 8.97% oil at surface at the end of the 45 day model run for the shoreline contact scenario.

Comparison of 113 day release (160 day run) results for EL 1134 with other modelling results shows a similar pattern.

- Exxon's EL 1135 has a lower percentage at surface (4.68%) than EL 1134 (10.43%) at the end of the 160 day run for the shoreline contact scenario, despite the volume of the EL 1135 spill being four times larger than the EL 1134 spill.

- A twice-larger volume 113 day release at Equinor's EL 1142 predicted 0.55% of oil remaining at surface at the end of the 160 day run for the shoreline contact scenario, compared to 10.43% for EL 1134's smaller volume spill.

Similarly, EL 1134 shows much larger areas of exceedance of several thresholds than for the EL1135, EL 1137, and EL 1142 releases of comparable duration but larger volumes.

Specific Follow-Up Question/Information Requirement

Provide an expanded discussion of the EL 1134 spill trajectory model results, with consideration of how the model results differ from previous model runs in the vicinity of EL 1134 and what factors might contribute to the higher degree of surface oiling predicted for the EL 1134 release site.

Response

A spill modelling workshop was completed on 05-Sep-2018 and included representatives from exploration drilling operators, including ExxonMobil Canada Ltd. (ExxonMobil), spill modelling consultant (i.e. RPS) and regulatory departments and agencies (i.e. Canadian Environmental Assessment Agency [CEA Agency], Canada-Newfoundland and Labrador Offshore Petroleum Board [C-NLOPB], Environment and Climate Change Canada [ECCC], Fisheries and Oceans Canada [DFO], Health Canada, Natural Resources Canada [NRCan] and Transport Canada. One of the purposes of this workshop was for the exploration drilling operators and spill modelling consultant to explain the subtle differences between SIMAP model iterations (versions), which included updates/improvements to model algorithms to ensure model predictions more closely align with the latest research and work associated with the real-world Deepwater Horizon oil spill. The concept of model versions is applicable to the modelling completed as the original Environmental Impact Statement (EIS) (i.e. exploration licenses [ELs] 1135 and 1137) used a different version of the SIMAP than the modelling for the EIS Addendum (i.e. EL 1134). Each modelling analysis was the most up to date and state-of-the-art result based upon the current level of knowledge and published works at time that each set was run. However, there were improvements/updates made over the course of these two separate assessments that result in subtle differences. The end result is an increase in the persistence of oil and a more conservative assessment that increases the potential likelihood of shoreline oiling.

In addition to changes in model versioning, there were also changes in the SIMAP model inputs used. As indicated in the spill modelling workshop, metocean data (i.e., currents, winds, temperature/ salinity, and ice data) in the original EIS (i.e. ELs 1135 and 1137) included the 2006 to 2010 time frame, however, the EIS Addendum (i.e. EL 1134) used a longer period including 2006 to 2012. The two additional years of data were not available when the first round of modelling was completed for the original EIS, which was submitted in December 2017.

The mass balance table provided in Table 4-4 (Appendix B: EL 1134 Oil Spill Modelling Report, page 69) provides summary information on the quantity of oil predicted to be contained within each environmental compartment at the last time step of the modelled representative deterministic "worst case" shoreline scenarios for EL 1134. This value is higher than values for modeling work at EL 1135 and EL 1137. For certain environmental compartments (e.g., evaporation, degradation, sediment, shore), the amount of oil will tend to increase at each successive time step within the model. However, for oil on the surface of the ocean or near the surface (in the wave mixed layer), changes in wind/wave conditions can rapidly result in different amounts of oil in each environmental compartment. Increases in wind speed result in larger and more surface breaking waves, which entrains surface oil into the water column. The turbulence associated with these waves will tend to mix entrained oil throughout the mixed layer depth. When wind speed and wave height/frequency are reduced, turbulence levels drop and entrained oil can resurface. Therefore, large fluctuations (in a see-sawing pattern with variability occurring on time scales of hours) may be predicted to occur between surface and water column based upon wind and wave conditions at each specific period in time. Therefore, caution must be used when comparing surface oil versus entrained oil at the end of any representative scenario, as small and short changes in windspeed can result in large differences in these two environmental compartments.

As explained in the response to IR-93, recent updates to algorithms that describe entrainment, viscosity, surface spreading, droplet diameter, and fractional water content increased the conservative nature of the SIMAP model and are validated against a real-world release (Deepwater Horizon oil spill). As these updates lead to increased oil persistence, oil is both predicted to remain on the surface for a larger proportion of time and a larger percentage of the modelled release is predicted to remain on the surface.

It is of importance, and also mentioned in the spill modelling workshop, that spill modelling is a prediction tool and not intended to predict a specific future event or effect. The model used for EL 1134 does not alter the determination of significance in the EIS as the application of mitigation measures are taken into consideration. These spill scenarios are considered representative of credible worst-case with no mitigation measures. It is very unlikely that a subsea blowout would occur due to the preventative measures accounted for in the well design and noted in the EIS. However, if a subsea blowout were to occur, applicable mitigation measures would be implemented, thereby further reducing the potential for highly weathered surface and shoreline oiling to occur.

References

N/A