West Flemish Pass Exploration Drilling Project Response to IRs

Response to Information Requirements

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Final Report

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1.0 INTRODUCTION

On April 28, 2020, Chevron Canada Limited (Chevron) received notification from the Impact Assessment Agency of Canada (Agency) that it completed its technical review of the Environmental Impact Statement (EIS) and associated EIS Summary for the proposed West Flemish Pass Exploration Drilling Project. Based on that technical review, the Agency requested additional information as outlined in the information requirements (IRs) found in Section 2.0 of this response document.

Chevron is pleased to provide a response to each of the IRs received. Capitalized terms used but not defined herein shall have the meanings provided to them in the West Flemish Pass Exploration Drilling Project EIS and EIS Summary documents. As always, Chevron is available to address Agency questions and concerns in a timely manner so as to adhere to the federal timeline within which the Minster of Environment and Climate Change’s decision must be made.

2.0 INFORMATION REQUIREMENT RESPONSES

2.1 IR-01

ID

IR-01 (DFO and C-NLOPB)

Reference to EIS

Appendix C and D

Context and Rationale

Part 1, Section 3.1 of the EIS Guidelines notes that drilling may occur in various water depths under consideration, using Mobile Offshore Drilling Unit(s), and with multiple drilling units operating simultaneously, if applicable.

Section 2.4.1 of the EIS does not indicate whether batch drilling or simultaneous drilling is being contemplated over the course of the project, and if so, whether the effects analysis in the EIS is applicable. This information is required to assess the potential environmental effects of the Project.

It is noted that the Chevron model (Appendix D of the EIS, Acoustic Model) was conducted in relation to operation of a single drilling unit, while two drilling units may be operating simultaneously for the Project. The effects of noise from two drilling units operating simultaneously is not addressed in Appendix D, nor carried through the effects assessment.

Specific Question / Information Requirement

Clarify if batch drilling or simultaneous drilling is being considered for the Project, and if so, provide information about its frequency and duration.

Should batch drilling or simultaneous drilling be contemplated, assess the environmental effects of batch drilling and simultaneous drilling on all valued components. This must include an assessment of the effects of noise from operating multiple drilling units simultaneously.

Update the modelling in Appendices C and D if applicable.

Chevron Response

Neither batch drilling nor simultaneous drilling is considered or intended for the Project.

2.2 IR-02

ID

IR-02

Reference to EIS

Fish and Fish Habitat - Section 8.3.1.3.4 and 8.3.2.1.

Context and Rationale

Section 8.3.1.3.4 of the EIS states that shaped charges, which may be used in well abandonment, will create localized effects. Section 8.3.2.1 states that if shaped charges are used in wellhead severance, there may be temporary disturbance to the area immediately surrounding the well. However, no description and analysis of the effects such as risk of mortality or physical injury to fish or of the potential effects to habitat quality for fish is provided.

Specific Question / Information Requirement

Confirm whether shaped charges will be used, or have the potential to be used, during abandonment procedures for the project.

If shaped charges will be used, provide an assessment of the environmental effects of the removal of a wellhead using shaped charges.

Describe any mitigation measures that would be put in place during wellhead removal if shaped charges are used.

Chevron Response

Explosives will not be used during wellhead removal.

2.3 IR-03

ID

IR-03 (DFO-18, C-NLOPB-14)

Reference to EIS

Fish and Fish Habitat - Section 8.3.1.3.3 Discharges

Section 15.5.1.3.3: SBM Spill from the MODU and the Marine Riser

Context and Rationale

Section 11.3 of the EIS uses a threshold level of approximately 6.5 millimetres of sediment deposition to cause mortality to benthic macrofauna. Similar exploration drilling projects in the Newfoundland offshore have noted that some species may be more susceptible to shallower burial depths and a more conservative PNET of 1.5 millimetres has been applied.

DFO recommends that a more conservative threshold of 1.5 mm be applied when assessing effects if drill wastes on corals and sponges, including an SBM spill

Specific Question / Information Requirement

Update the discussion of potential effects of drill wastes on corals and sponges to include a 1.5 mm threshold or provide a rationale as to why the burial threshold of 6.5 millimeters is sufficient.

Chevron Response

Drill discharge simulations were conducted for two scenarios: a deep water well (WF1, 1,500 m) and a shallow water well (WF2, 500 m). Each simulation was run for spring and summer drilling scenarios (RPS 2019a). Modelled thicknesses above 6.5 mm were not predicted to occur at either well site under either seasonal simulation, and had a maximum sediment deposition thickness of 5.3 mm on the seabed. Deposition of 1.5 mm was not specifically delineated in the above scenarios; however, information was provided for various ranges of sediment depositional thicknesses. Dispersion sediment thicknesses of 1 mm or more surrounding EL 1138 are predicted to reach up to approximately 350 m for the summer scenario (WF1 and WF2) and approximately 1,000 m for WF2 in the spring because of the predominant eastern direction for the dispersion pattern. Seabed deposition of discharged mud and cuttings greater than 1 mm was not predicted to occur during the spring scenario for WF1. Table 1 outlines the maximum distance of thickness contours predicted for operational discharge simulations. The cumulative areal extent of seabed deposition for operational discharge simulations greater than 1 mm ranged from 1.05 to 2.54 km^2 (summer and spring, respectively) at WF1 and 1.16 to 1.63 km^2 (summer and spring, respectively) at WF2. Discharge simulations greater than 2 mm ranged from 0.78 to 1.37 km^2 (summer and spring, respectively) at WF1 and 0.84 to 1.10 km^2 (summer and spring, respectively) at WF2. Further detail on modelling results are presented in Table 3-1 of the RPS modelling report (RPS 2019).

Variations in footprint shape and extent between seasonal simulations (spring and summer) can be attributed in part to the subsurface current regimes. Spring simulations had more elongated footprints due to stronger subsurface current regimes, while weaker subsurface currents in the summer simulations resulted in slightly more radial footprints. There is potential for the burial effects or disturbance to sponges and sea pens present in EL 1138 in the immediate area of the well sites, although the distribution of corals at the sites is currently unknown; only sponges and sea pens were collected during various research vessel surveys. Sensitive benthic organisms (e.g., sponges) within the localized area of sediment thicknesses above 1.5 mm may be affected by the deposition of drilling waste to a cumulative area not exceeding 0.30 km². As modelled thickness above 6.5 mm were not predicted to occur at either site, effects on other benthic organisms would likely be low. For further discussion on effects thresholds on benthic organisms from drill mud deposition, please refer to the Chevron response to IR-04.

Table 1 Maximum Distance of Thickness Contours (distance from release site) Predicted for Operational Discharge Simulations

Deposition Thickness (mm)	Maximum extent from release site (km)			
	West Flemish 1 (deep)		West Flemish 2 (shallow)	
	Cumulative Summer	Cumulative Spring	Cumulative Summer	Cumulative Spring
0.1 to 1	0.76	7.92	0.81	2.57
1 to 6.5	0.37	0	0.35	0.98
Source: RPS 2019				

Section 6.1.6.4 outlines the existing environment as it pertains to sponges and corals. While there is limited information available on the Project Area, information gathered from surveys suggest that there are low numbers of sponge and sea pen species found throughout the southern portion of the EL. As indicated in Section 8.3.2.3.3 of the EIS, Chevron will conduct an imagery-based seabed survey at the proposed well sites to confirm the absence of sensitive environmental features, such as habitat-forming corals and sponges. The survey will be carried out prior to drilling and will encompass an area within a 500-m radius from the well site. The pre-drill surveys will allow for better estimates of the area of habitat that may be affected by the deposition of drilling mud and cuttings as well as the specific threshold based on identification of species in the area. If additional mitigation is required, it will be provided to the C-NLOPB and DFO for their review and acceptance in advance of drilling.

References

RPS. 2019. Chevron Canada Limited West Flemish Pass Exploration Drilling Project 2021-2030: Drill Release Risk Assessment.

2.4 IR-04

ID

IR-04 (DFO-19, C-NLOPB-15 and WNNB-4a)

Reference to EIS

Fish and Fish Habitat - Section 8.3.2.8.3: Discharges

Emissions, Discharges and Waste Management - Section 2.8.2.1

Appendix C: Drill Cuttings Dispersion Modelling

Fish and Fish Habitat - Section 8.3.1.3.3: Discharges

Context and Rationale

Section 7.3.1 of the EIS Guidelines requires the proponent to assess the effects of changes to the aquatic environment on fish and their habitat resulting from project activities including drilling waste disposal.

The description in the EIS of effects of discharges on change in habitat quality and use is insufficient. For example, there is no description of potential effects from deposition of drill muds, nor is there mention of discharges other than drilling muds and cuttings.

The proponent describes and provides figures illustrating the predicted thickness of seabed deposition of total discharged mud and cuttings resulting from all drilling sections for both spring and summer. However, there is no discussion, or figures presented on seabed deposition for each drill section (WBM only and SBM only)

Specific Question / Information Requirement

Update the environmental effects of all discharges on fish and fish habitat including WBM, SBM other wastes and toxic substances to more thoroughly discuss effects of discharges.

Provide information on seabed deposition for each drill section.

Chevron Response

Additional information is provided below for the relevant sections of the EIS. Recent EA reports prepared for other exploration drilling projects in the Eastern Newfoundland offshore area (e.g., BHP 2019) are the key information sources used in the following discussion.

Section 8.3.1.3.3

Initial drilling will be conducted with WBM and then once the riser is installed, SBM will be used. SBM cuttings will be returned to the MODU for treatment and released into the ocean according to Offshore Waste Treatment Guidelines (OWTG). Discharges to the seafloor will be primarily WBM cuttings associated with the initial riserless drilling and drilling of top-hole sections. This will result in increased turbidity and suspended solids in the water column near the seafloor, as well as a deposition area on the seafloor. Large particles and flocculated material typically settle quickly, forming a deposition area surrounding the well head (Ragnarsson et al. 2017). Sessile species or those with low mobility have higher potential for effects from drill mud and cuttings in comparison to mobile fish and invertebrates that can avoid suspended sediments and areas with deposits. As discussed in Section 8.3.1.3.3, the potential effects from toxicity and bioaccumulation effects from WBM and SBM cuttings are low. Physical and indirect effects from drill cuttings may have effects on fish mortality, injury, and health.

The potential effects on the water column are generally non-persistent and temporary with the rapid dilution and dispersal of drill mud and cuttings (Koh and Teh 2011; IOGP 2016). In a modelling study conducted on drill cuttings in the south China Sea, suspended solid levels returned to background levels within hours after the discharge ceased (Koh and Teh 2011). Discharges of near-surface drill cuttings are unlikely to have effects on the pelagic zone or the transfer of organic particulate matter from the pelagic zone to benthic areas. Suspension feeding benthic invertebrates (e.g., bivalves, corals, sponges) are considered more sensitive to direct exposure to suspended drill cuttings due to their low capacity for avoidance. Benthic organisms associated with fine sediment environments generally have some ability for tolerance of suspended and settled sediment (Smit et al. 2006, 2008; Bell et al. 2015; Kutti et al. 2015). Prolonged use of mechanisms for tolerating suspended sediments (e.g., reduced respiration, reduced feeding, sediment clearing) may lead to sublethal effects or reduced growth (Smit et al. 2008; Larsson and Purser 2011; Bell et al. 2015; Ragnarsson et al. 2017). These effects would be species-specific and depend on the local oceanography, exposure levels, and recovery times.

Modern WBM and SBM have a low toxicity to marine organisms based on laboratory toxicity studies (IOGP 2016). SBMs were developed specifically to have low toxicity and fast degradation (Neff et al. 2000; Jagwani et al. 2011; Paine et al. 2014; Tait et al. 2016) in order to reduce potential effects on marine fish (IOGP 2016). Laboratory exposure studies with SBM drilling fluids and juvenile pink snapper resulted in health effects that suggested potential for chronic toxicity (Gagnon and Bakhtyar 2013). However, exposure levels were not a direct comparison of field conditions and chronic effects are unlikely with transient exposure to drilling fluids in the water column.

Drill mud components (e.g., barite, bentonite) and associated metals are typically not readily bioaccumulated. The trace metals in the barite are in the form of insoluble sulfides and hydroxides, which renders the metals largely unavailable to exposed marine organisms (IOGP 2016). Some invertebrate species with low mobility have been shown to accumulate metals (Ruus et al. 2005; Neff 2010; Edge et al. 2016; IOGP 2016) and *Lophelia pertusa* corals have been shown to incorporate barite particles as far away as 600 m from the drill site (Ragnarsson et al. 2017). Conversely, several bioaccumulation bioassays using WBM cuttings found that metal concentration in the tissues of exposed animals were similar to those in the tissues of unexposed animals (IOGP 2016).

Although drill muds and cuttings have low toxicity and bioaccumulation effects, there remains the potential for injury, mortality, and health effects on benthic communities from burial, sediment grain size alteration, and degradation of organic components that lead to oxygen depletion (Kjeilen-Eilertsen et al. 2004; Smit et al. 2008; Neff 2010; Ellis et al. 2012; DeBlois et al. 2014; Tait et al. 2016; DFO 2019). The effects of smothering can include mortality from the mass of discharges crushing them or inability to penetrate through the deposited layer from underneath. Species living on the drill cuttings may have lower growth rates as discharged particles have lower nutrient levels relative to native sediments. Sediment grain size alterations may reduce suitability for larval settlement due to change in stability, and chemical and physical cues (Kjeilen-Eilertsen et al. 2004). The combination of these effects may result in a change in fauna community composition (Kjeilen-Eilertsen et al. 2004, Cordes et al. 2016, IOGP 2016). It has been calculated that an average burial depth of 6.5 mm or less is unlikely to cause net adverse effects to benthic organisms based on tolerances to burial, oxygen depletion, and change in sediment grain size (predicted no effect threshold (PNET)) (Kjeilen-Eilertsen et al. 2004; Smit et al. 2006; 2008; AMEC Foster Wheeler 2017). Injury and polyp mortality was observed on the cold-water reef coral *Lophelia pertusa* in laboratory experiments with deposition of WBM drill cuttings of 6.5 mm (Larsson and Purser 2011). This is an average value and some species may experience adverse effects at shallower or deeper burial depths. For example, sediment reworking by a brittle star and bivalve was reduced in a microcosm aquaria experiment with deposition of WBM drill cuttings of 2.5 mm (Trannum 2017). As the PNET threshold is based on average tolerances, the conservative approach as suggested by Kjeilen-Eilertsen et al. (2004) has been to set a lower threshold limit by subtracting 0.5 cm from the derived PNET value. Therefore, 1.5 mm is suggested as a more conservative predicted no-effect threshold (Kjeilen-Eilertsen et al. 2004; AMEC Foster Wheeler 2017).

Section 8.3.2.3.3

Discharges of drilling mud and cuttings that settle on the seafloor may change habitat quality and availability due to sediment alteration and degradation of organic components that lead to oxygen depletion (Kjeilen-Eilertsen et al. 2004; Smit et al. 2008; Neff 2010; Ellis et al. 2012; DeBlois et al. 2014; Tait et al. 2016; DFO 2019). While macrofauna may be initially affected by physical and indirect effects, recovery to the area may occur quickly after degradation of drill cuttings components (Tait et al. 2016). Exposure to drill waste can persist for months or years; however, effects may subside between one to five years with recovery beginning at the edges (Neff et al. 2000; Kjeilen-Eilertsen et al. 2004; Tait et al. 2016; Gates et al. 2017).

Drilling mud and cuttings discharges may also result in changes to habitat quality and use due to mortality and potential injury and other health effects on coral and sponge communities (Allers et al. 2013; Cordes et al. 2016; DFO 2019). As described in Section 6.1.6.4, structure-forming benthic invertebrate species occur in the Project Area; there are small numbers of sea pens and sponges, but no corals were observed in research vessel trawls. Drill cuttings dispersion modelling was performed for the Project to assess the footprint, spatial extent, and thickness of discharged drill cuttings as described in Section 2.8.2. Dispersion sediment thicknesses of 1 mm or more surrounding EL 1138 are predicted to reach up to approximately 350 m for the summer scenario (WF1 and WF2) and approximately 1,000 m for WF2 in the spring. No deposition of greater than 1 mm was predicted to occur during the spring scenario for WF1. Recovery rates for sponge and sea pen communities within the deposition area are expected to be longer (e.g., decades) than other benthic invertebrates (Henry and Hart 2005; Cordes et al. 2016; Henry et al. 2017; Ragnarsson et al. 2017; Liefmann et al. 2018). Benthic mortality rates as a result of these discharges are not predicted to result in irreversible changes to local populations due to the low magnitude and spatial extent of potential effects.

Potential liquid discharges from an offshore exploration drilling program may have potential effects on water column habitat quality. These discharges will be managed in accordance with the OWTG and associated standards and guidelines. Discharges are expected to be temporary, non-bioaccumulating, nontoxic, and highly-diluted. If residual hydrocarbons are present in discharges, such as deck drainage and bilge water, they will be in low volumes and concentrations and not exceed limits stated in the OWTG and MARPOL.

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2.5 IR-05

ID

IR-05 (C-NLOPB-9 and WNNB-4c)

Reference to EIS

Emissions, Discharges and Waste Management - Section 2.8.2.1: Drill Cuttings Deposition Modelled for the Project

Appendix C: Drill Cuttings Dispersion Modelling

Context and Rationale

Section 2.7 of the EIS identifies that the initial well is scheduled for 2021 (pending regulatory approval) and that Chevron’s preference is to conduct drilling between May and September, although the EIS assumes year-round drilling. The drill cutting modelling in Appendix C only examines two scenario (summer and spring), without providing a clear indication on why these are chosen for modelling purposes.

Specific Question / Information Requirement

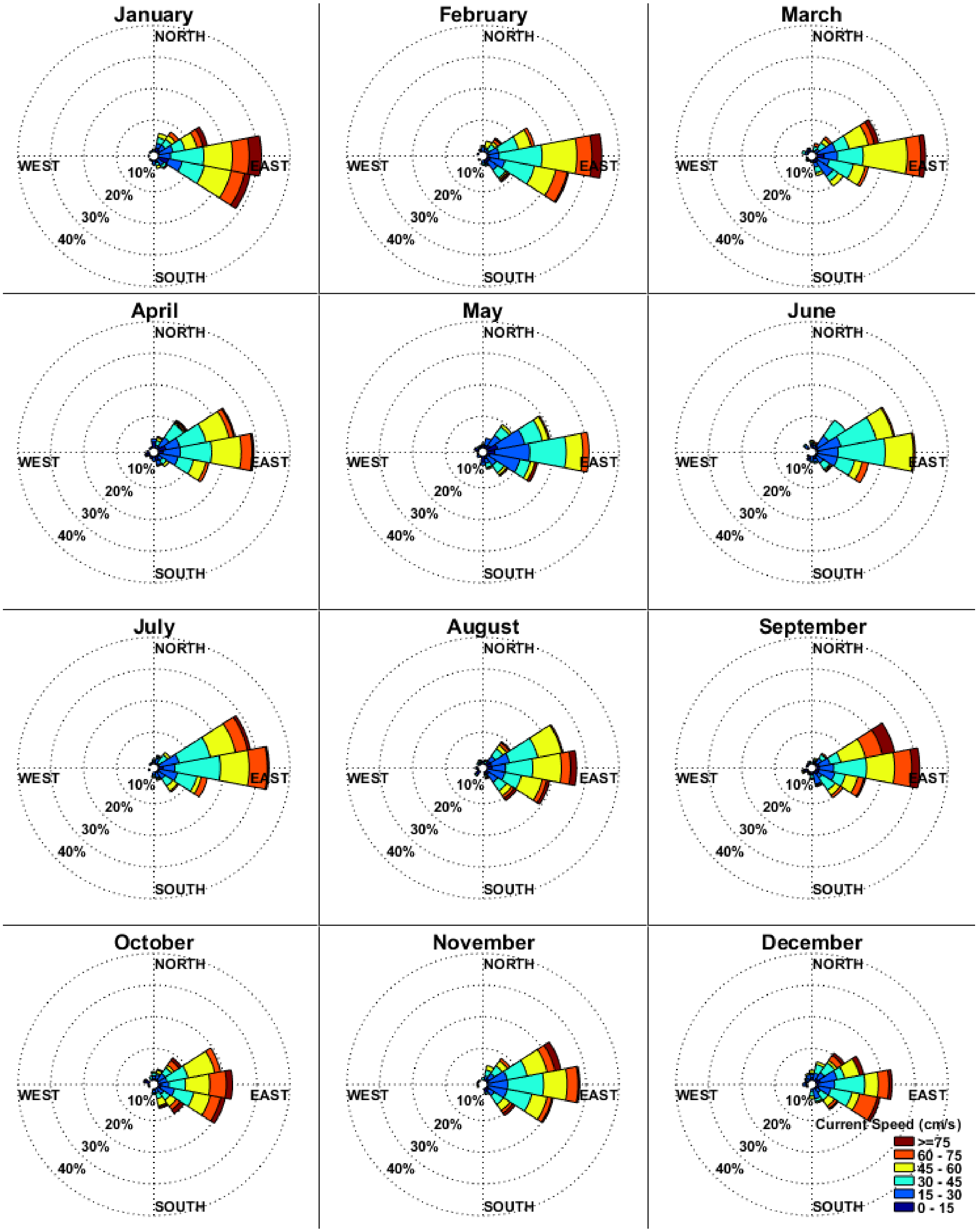
Provide a rationale for modelling only spring and summer timeframes and/or why winter and fall dispersion scenarios would be similar to spring and summer dispersion.

Chevron Response

As described in Section 1.2 for the RPS technical report, strong eastward-directed currents persist near the drilling site throughout the year (Figures 1 and 2, from RPS [2019]). RPS performed a qualitative review of the HYCOM time series between 2006-2012, comparing current statistics (speeds and directions) from each year at multiple depths for each modelled timeframe (Figures 3 and 4, from RPS [2019]). Current trends for the two model periods during 2012 were congruent with the overall seven-year trend and were thus deemed suitable as a representative modelling period (RPS 2019a).

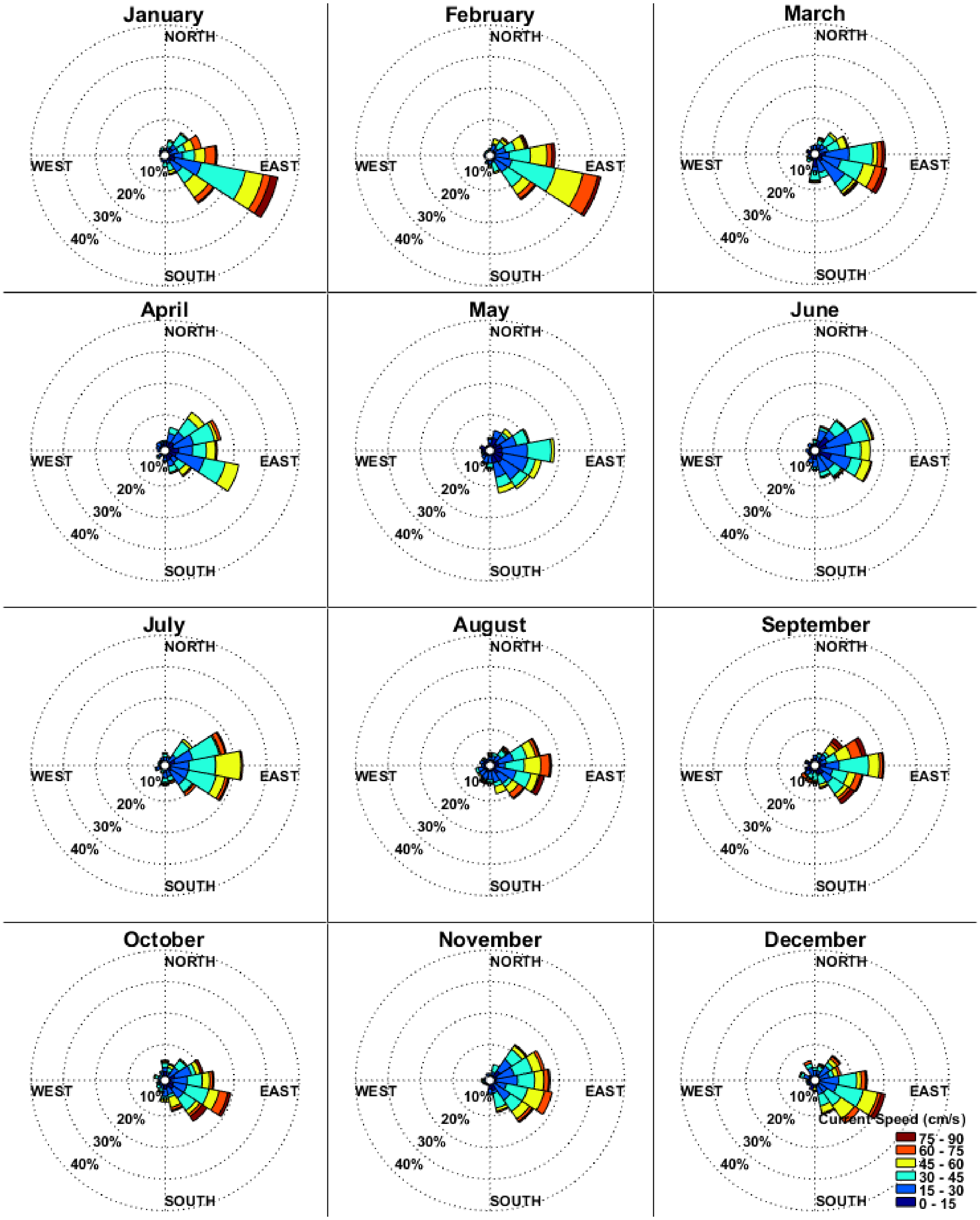
Regardless of month and depth, currents were predominantly to the east at both release locations with seasonal variations in speed, rather than direction. The variations within predicted results between simulations were due to three main factors including: 1) settling velocity associated with different releases, 2) current patterns (i.e. velocity – predominantly speed) and 3) release height relative to the seabed. The discharges modelled in this study may be considered representative of other potential discharges in the Project Area, as the depth of the sites (500 to 1500 m) are similar in depth to other potential sites within the Project Area. While this dispersion modelling targeted the most likely drilling windows for the Project (April to May and July to August), the predicted results are applicable outside of this temporal window (RP 2019).

As drill cuttings dispersion are driven primarily by currents (i.e., speed and direction) and currents are consistent throughout the year, no changes are anticipated for winter and fall dispersion scenarios as compared to the spring and summer dispersion that was simulated.



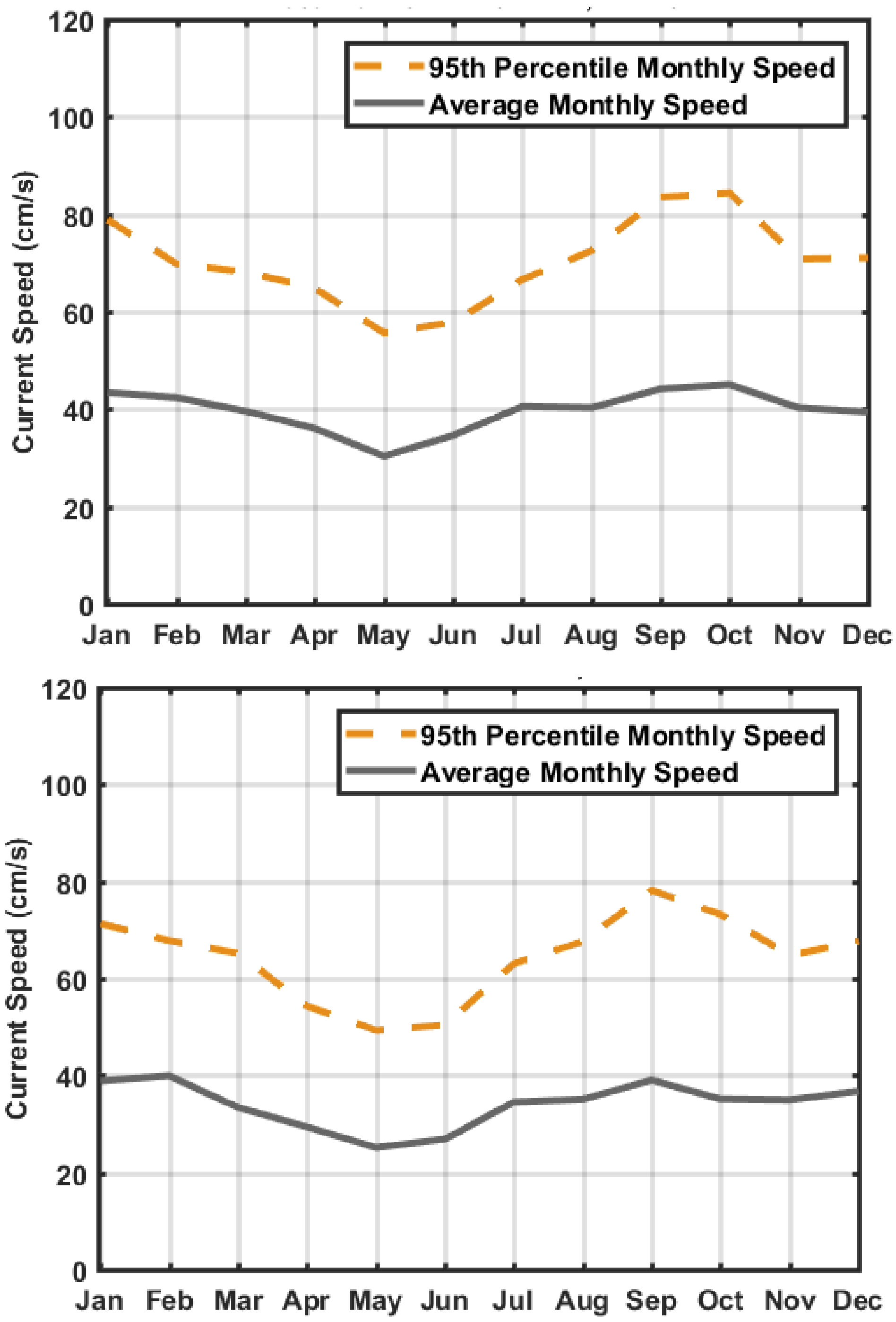
Source: RPS 2019
Note: Using oceanographic convention (i.e., direction currents are flowing towards).

Figure 1 **Current Roses Illustrating the Distribution of HYCOM Surface Currents (speed and direction) by Month at Deep West Flemish 1 (model period from 2006-2012)**



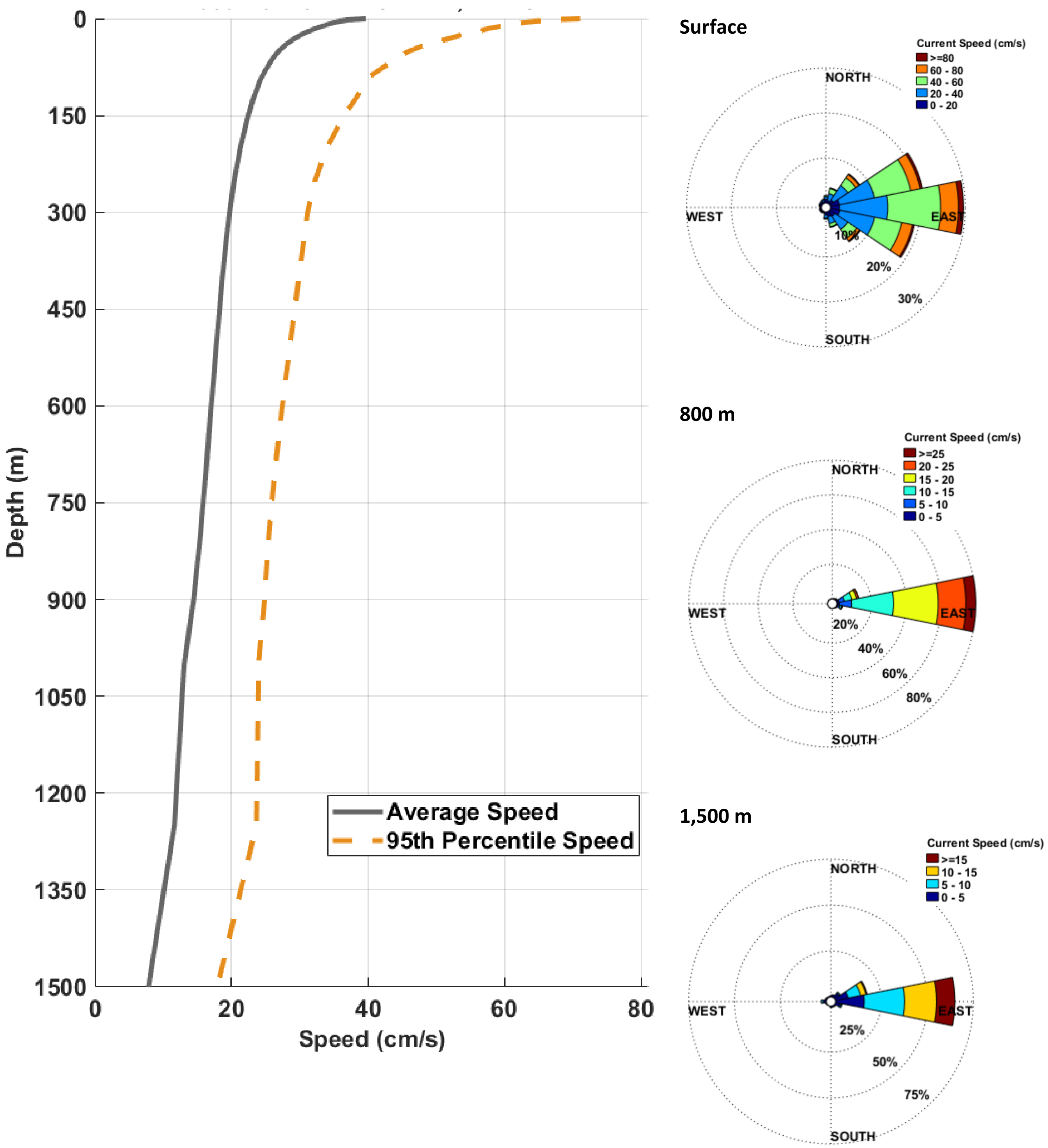
Source: RPS 2019
Note: Using oceanographic convention (i.e., direction currents are flowing towards).

Figure 2 **Current Roses Illustrating the Distribution of HYCOM Surface Currents (speed and direction) by Month at Shallow West Flemish 2 (model period from 2006-2012)**



Source: RPS 2019

Figure 3 **Monthly Average (grey solid) and 95th Percentile (orange dashed) HYCOM Surface Current Speed (cm/s) Statistics at Deep West Flemish 1 (top) and Shallow West Flemish 2 (bottom)**



Source: RPS 2019

Note: presented in oceanographic convention (i.e., direction currents are flowing towards) (right) at deep West Flemish 1; derived from HYCOM current model between 2006 and 2012.

Figure 4 Vertical Profiles of Average and 95th Percentile Horizontal Current Speed (cm/s) by Depth (m) (left) and Current Roses at Multiple Depths

References

RPS. 2019. Chevron Canada Limited West Flemish Pass Exploration Drilling Project 2021-2030: Drill Release Risk Assessment.

2.6 IR-06

ID

IR-06 (C-NLOPB-12)

Reference to EIS

Accidental Events

Context and Rationale

Oil Spill modelling (stochastic and deterministic) were completed using the physical and chemical properties of West Flemish Pass Light Oil (WFPLO). The properties of the oil selected for input into the spill model may affect modelling results. A rationale was not provided to support the selection and use of WFPLO for the well blow out modelling for this project.

Specific Question / Information Requirement

Provide rationale for using West Flemish Pass Light Oil in the models.

Chevron Response

The thermal and burial history modeling of the EL1138 area indicates the West Flemish Pass Light Oil (WFPLO) will be generated from the various source rock intervals and comprise of 40° to 42° API, and reside in the reservoir at 133°C present day temperature. Additionally, geologic modelling also indicates that the EL1138 area contains a different petroleum system with lighter oil by comparison to other discoveries in Flemish Pass. Based on the modelling, the oil at West Flemish Pass is anticipated to generate from siliciclastic source rocks with low algal content and pour point <0°C.

A review of global crude oil databases was completed to determine and select a crude oil which meets the criterion and analogue physical properties anticipated in the EL1138 area so to complete the oil spill modeling (stochastic and deterministic) for the proposed exploration Project. A filtered subset of global analogues was used to model density, viscosity, API gravity, pour point, interface tension and emulsion maximum water content for the expected oil.

In the highly unlikely event of a blowout, the physical properties of the WFPLO are anticipated to result in higher flow rates, decreased extent of dispersion and slower rates of weathering processes than other oils in the Flemish Pass. In addition, marine diesel was modelled to represent the worst-case oil properties for containment after a discharge. Therefore, selecting the WFPLO and marine diesel oil types for spill modelling provides both the predicted and worst-case approximations of surface oil concentrations following a potential release.

2.7 IR-07

ID

IR-07

Reference to EIS

Accidental Events - Section 15.2.1: Overall Modelling Approach

Context and Rationale

The EIS Guidelines state that results of the fate and behaviour modelling should include a projection for spills originating at the site and followed until the slick volume is reduced to a negligible amount or until a shoreline is reached. Modelling in the EIS indicates that 90% per cent of the released oil travels outside the model domain. There is no discussion of the limitations associated with the model domain / area.

Specific Question / Information Requirement

Provide a discussion of the fate and behaviour of oil that is noted to leave the model domain, and provide an assessment of related potential environmental effects, including the potential for an oil spill to contact shorelines outside the model domain to the east. Include the potential locations of shoreline oiling.

Chevron Response

For both release sites, West Flemish 1 and 2, stochastic analyses demonstrated that the highest potential likelihood (>90%) to exceed thresholds of potential surface oil exposure and water column contamination by dissolved hydrocarbons primarily occurred to the east, up to 2,000 km from the release site (RPS 2019b). The Azores are approximately 1,880 km east of the Flemish Cap. The eastern edge of EL 1138 is approximately 150 km west of the Flemish Cap, so the Azores (2,030 km) would be barely within the extent of surface oil contact probability. Because the simulations were so long for this Project, between 3.6% to 21.2% of the oil (predominantly persistent surface oil as heavily weathered emulsifications and tarballs) was predicted to be transported by winds outside the model domain to the east over the 160-day simulation. Note that all scenarios assume a completely unmitigated release, which is an unlikely situation because various emergency response tactics would typically be employed immediately in the event of a spill (RPS 2019).

CNOOC (2019) extended their modelling domain eastward to include the Azores. Modelling from EL 1150 (approximately 120 km southeast of Chevron’s nearest well site) predicted 70% to 77% probability of surface oil contact with 634 km of shoreline along the Azores more than 40 days from an unmitigated subsurface blowout. Deterministic modelling predicted that only the 120-day spill would result in shoreline oiling above the ecological threshold (100 g/m^2). In all cases, based upon the minimum time to shore, oil was predicted to be extremely weathered by the time it reached shorelines (CNOOC 2019).

Any oil from an unmitigated spill that made contact with Azores shorelines would be expected to be patchy, discontinuous, heavily weathered emulsifications and tarballs. As mitigation measures, including shoreline protection measures, would be implemented, it is unlikely that oil would reach the Azores shoreline. Therefore, residual environmental effects on the Azores are considered of low probability, minor overall, and not significant.

References

CNOOC Petroleum North America ULC. 2019. CNOOC International Flemish Pass Exploration Drilling Project (2018-2028) Environmental Impact Statement Addendum (Revised) - Appendix C - Section 16: Accidental Events.

RPS. 2019. Chevron Canada Limited West Flemish Pass Exploration Drilling Project 2021-2030: Oil Spill Trajectory and Fate Assessment.

2.8 IR-08

ID

IR-08

Reference to EIS

Accidental Events - Section 15.1.2.2: Well Blowout Incident

Context and Rationale

Except for a brief discussion on capping stacks relative to model scenarios in Section 15.2.6.1, there is no discussion of the use, availability (including nearest location), timing (testing and mobilizing) and feasibility of a capping stack to stop a blowout and resultant spills.

Specific Question / Information Requirement

Provide information on the use, availability (including nearest location), timing (testing and mobilizing) and feasibility of a capping stack to stop a blowout and resultant spills.

Chevron Response

Chevron's rigorous well control philosophy is focused on prevention of incidents by employing industry-leading safety and risk management systems, management of change procedures, and global drilling standards. The Chevron Wellsafe™ assurance program and overall well control strategy is to "Design for control, guarantee containment". As part of the well design process, along with pre-studies of formation pressure evaluation, training, appropriate well designs and rigorous equipment inspections and testing, an emergency response plan will be generated that will include the possible deployment of a capping stack.

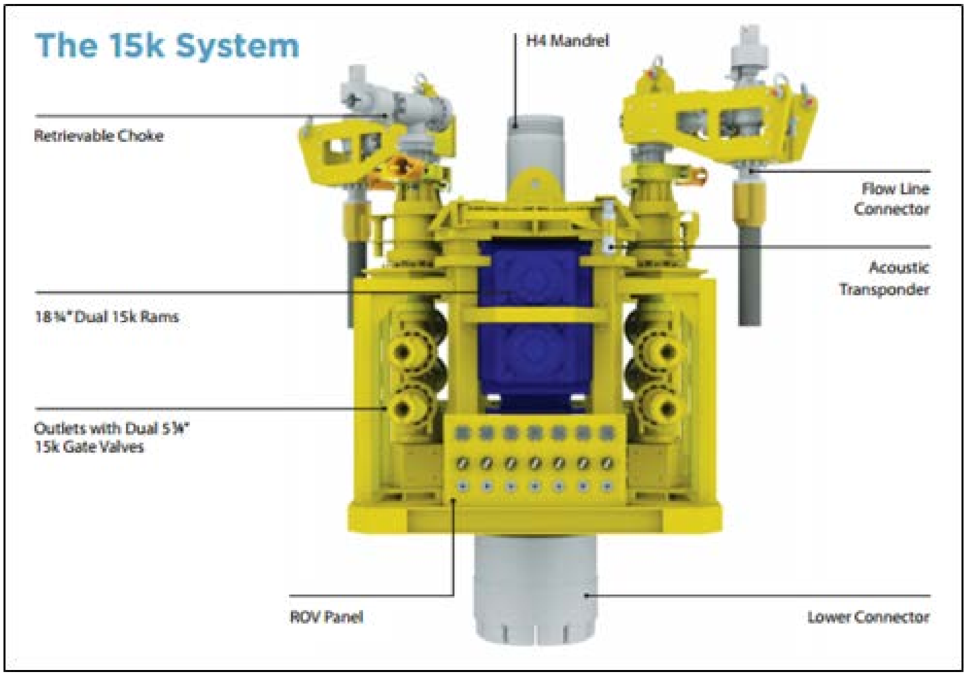
In a well design, a barrier is a component that contributes to total system reliability by preventing formation fluid or gas flow. A barrier system is a combination of barriers in a well design that acts together to prevent unintended fluid and/or gas flow. These include hydrostatic barriers, cement barriers, mechanical barriers, permanent barriers, and well control devices.

During the drilling of any well, a variety of standard well control methods are readily available for implementation. Well control scenarios are evaluated through a company's management system process, and the appropriate mitigation measures and contingencies are developed accordingly. These would include:

- Procedures
- Equipment selection
- Training and competency requirements
- Control measures to reduce the likelihood or escalation in a well control incident

Redundancy is built into the well control systems in terms of equipment and well integrity management. For well integrity, the well configuration at each step of the drilling, completion, and abandonment process is examined for redundancy in well barriers. The relationship of the well control barriers is considered when developing the well design, and redundancy is maintained at all times during normal operation. Contingency planning for the loss of one barrier is considered, and procedures are developed to correct the situation at each stage. Furthermore, some well control equipment has additional redundancy, such as the blowout preventer (BOP), which has multiple methods of activation.

For the past decade, capping stacks have become a standard part of subsea drilling emergency response planning. A capping stack is a specialized piece of equipment that can be used to “cap” (i.e., stop or redirect) the subsurface well flow while work to permanently kill the well is undertaken (see Figure 5). Industry operators, including Chevron, are continually reviewing, refining and enhancing the processes and procedures associated with the deployment of capping stacks. Cooperative industry consortiums have designed and built capping stacks to ensure that industry has a substantially enhanced capability to respond to a subsea well blowout, such as the capabilities offered by Oil Spill Response Limited (OSRL).



Source: OSRL 2014

Figure 5 18 ¾” 15,000 PSI Capping Stack Currently on Standby at OSRL

As a member of OSRL, Chevron follows OSRL’s Subsea Well Intervention Service - a non-profit joint initiative providing industry with the capability to better respond to subsea well-control incidents. OSRL owns, maintains and stores, in a response-ready state, the equipment required for well-intervention operations, including provision of capping stacks. Capping stacks can be deployed from one of four strategically located permanent bases worldwide, which operate in addition to OSRL’s comprehensive conventional spill response capability. The closest permanent base to offshore Newfoundland hosting response-ready capping stack capability is at the OSRL facility in Stavanger, Norway.

Capping stacks are designed to withstand the maximum anticipated wellhead pressure generated by the well. In the highly unlikely event of an uncontrolled blowout, all efforts would be made to stop the flow of hydrocarbons in the shortest time possible. While a capping stack can control or divert flow, a relief well is drilled on a separate drilling unit adjacent to the uncontrolled wellbore and, upon intersection, it will permanently stop flow using cement plugs. There are multiple preparation activities required to be worked on in parallel prior to the capping stack arriving at the well site. Assessment of the wellhead via a remote observation vehicle, possible clearing of debris, and seabed inspections will need to be completed before a capping stack can be safely deployed and be effective. As such, work to control and stop the flow of oil will be executed while the capping stack is being transported from the OSRL facility in Stavanger, Norway. Transport of the capping stack by sea is the preferred alternative as opposed to aircraft as sea transport of a fully assembled capping stack allows faster deployment of the capping stack upon arrival at the well site. The time required from first call out to subsea deployment of the capping stack at the well site is anticipated to be 30 days or less.

Prior to conducting the drilling program for the potential Project, detailed logistics and execution plans will be developed to include a capping stack mobilization and demobilization process that will outline OSRL, contractor, and operator responsibilities. Additionally, execution plans and activities will be outlined through a well capping workshop held prior to spud of the well.

References:

OSRL (Oil Spill Repsonse Ltd.) 2014. SWIS Capping Stack System: Technical information Sheet. 2 pp. Available at: https://www.oilspillresponse.com/globalassets/services/subsea-well-intervention-services/capping/tis-capping-stack-system.pdf