



equinor

# Bay du Nord Development Project

Virtual Information Session  
Environmental Assessment  
August 2020  
Stephanie Curran and Kimberly Coady

# Driven by purpose, inspired by vision, guided by values

## Our purpose

Turning natural resources into energy for people  
and progress for society

## Our vision

Shaping the future of energy

## Our values

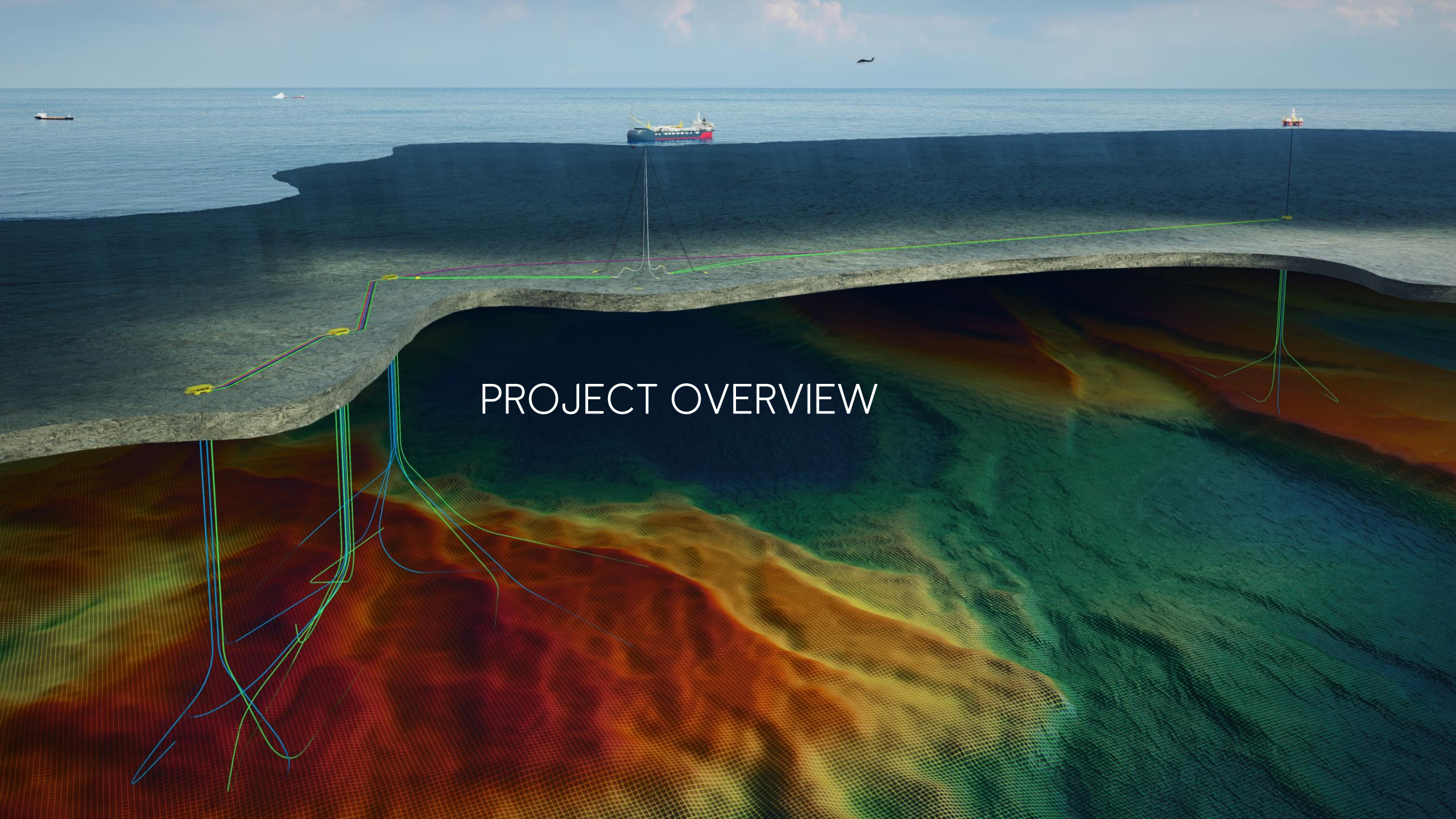
Open, courageous, collaborative and caring

## Our strategy

Always safe, high value, low carbon

Borestranda beach near Stavanger.  
Rogaland, Norway

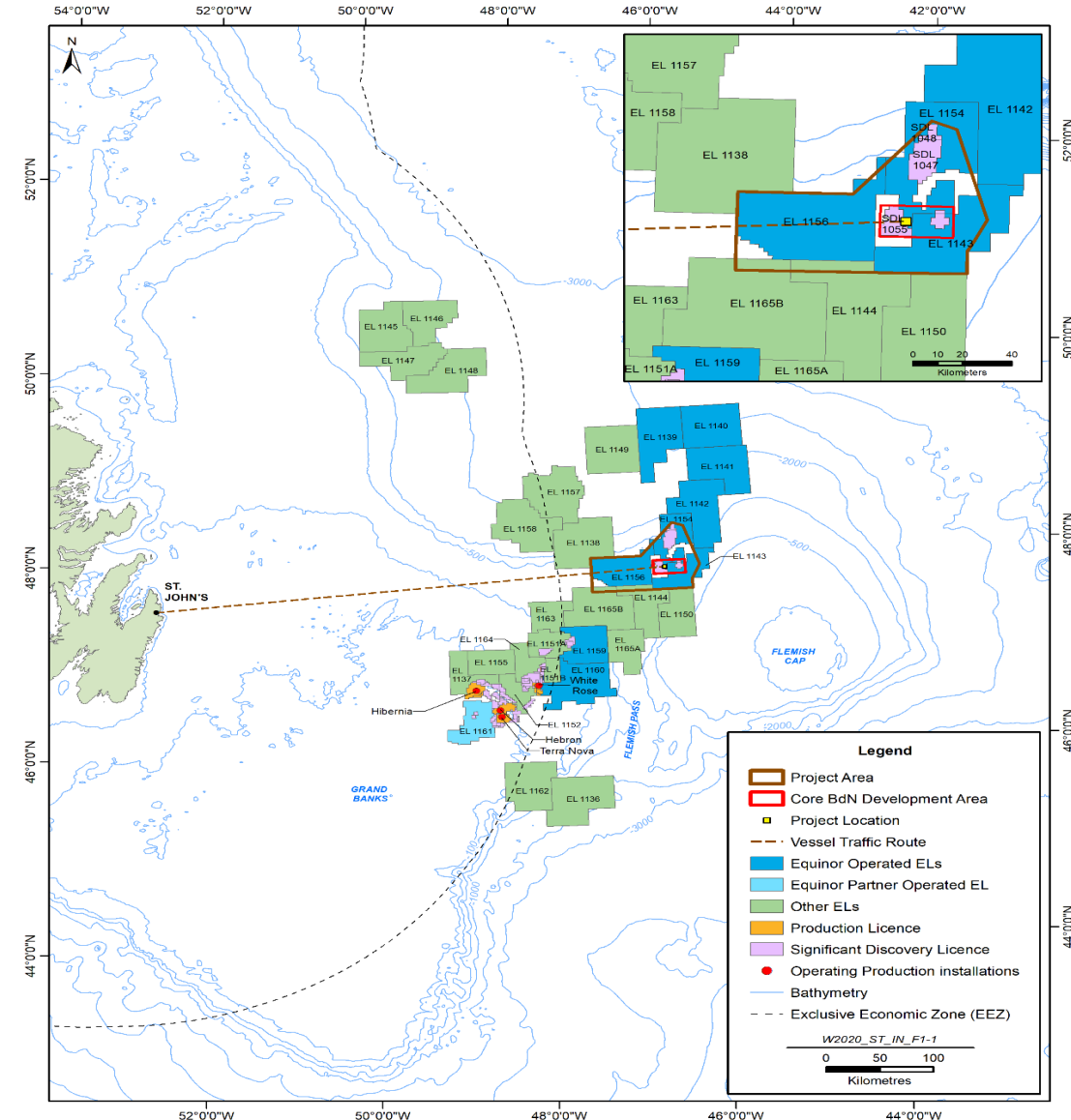




PROJECT OVERVIEW

# Project Overview

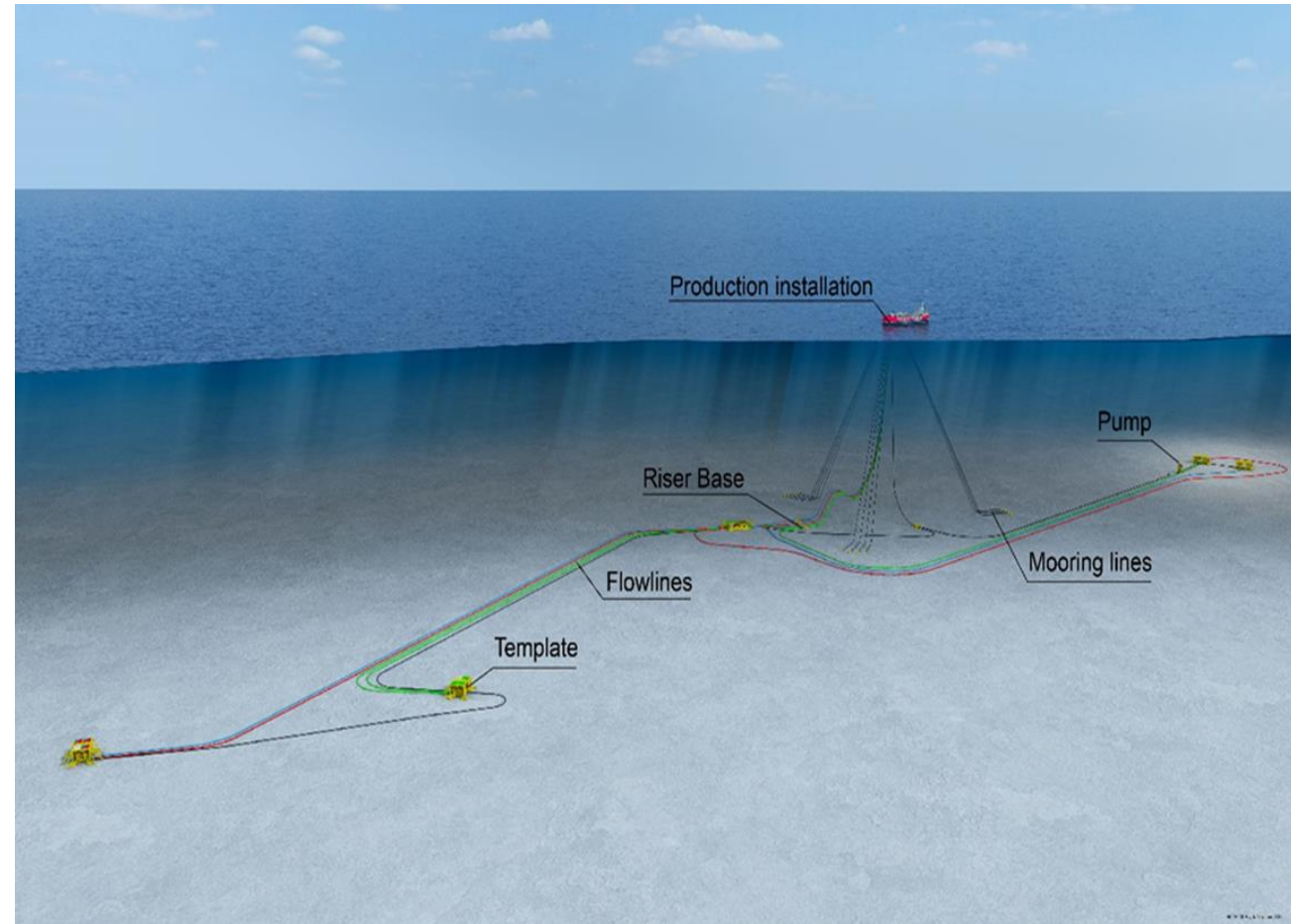
- Located in the Flemish Pass area – approximately 500 km east of St. John’s
  - The closest operating offshore oil and gas production facility is White Rose (Husky Energy) – approximately 180 km southwest.
- Estimated mean economically and technically recoverable resource of approximately 47.7 Mm<sup>3</sup> (300 million barrels) of crude
- Project Area – approximately 4900 km<sup>2</sup> – current discoveries and potential development occur within this area
  - Core project infrastructure on the seabed covers 7 km<sup>2</sup> of this area; tiebacks could be up to 13 km<sup>2</sup> each.
  - Water depths range from 350 m to 1,200 m.
- Broader Project Area includes areas where tiebacks may occur



Project Area

# Project Concept

- Disconnectable Floating, production, storage and offloading (FPSO) installation
- Subsea infrastructure (flowlines, drilling templates, moorings, riser bases, fibre optic cable)
- Drilling at well templates (4, 6 or 8 slot templates)
- Crude to be offloaded to shuttle tankers and shipped to existing transshipment facility or directly to market
- Production duration – up to 30 years
- Designed to operate in environmental conditions in Flemish Pass
- Operations build on Equinor experience offshore Norway with similar environmental conditions



Example of a production installation and subsea infrastructure

Equinor Canada Ltd.

## Bay du Nord Development Project

Environmental Impact Assessment

July 2020

# ENVIRONMENTAL IMPACT STATEMENT Overview

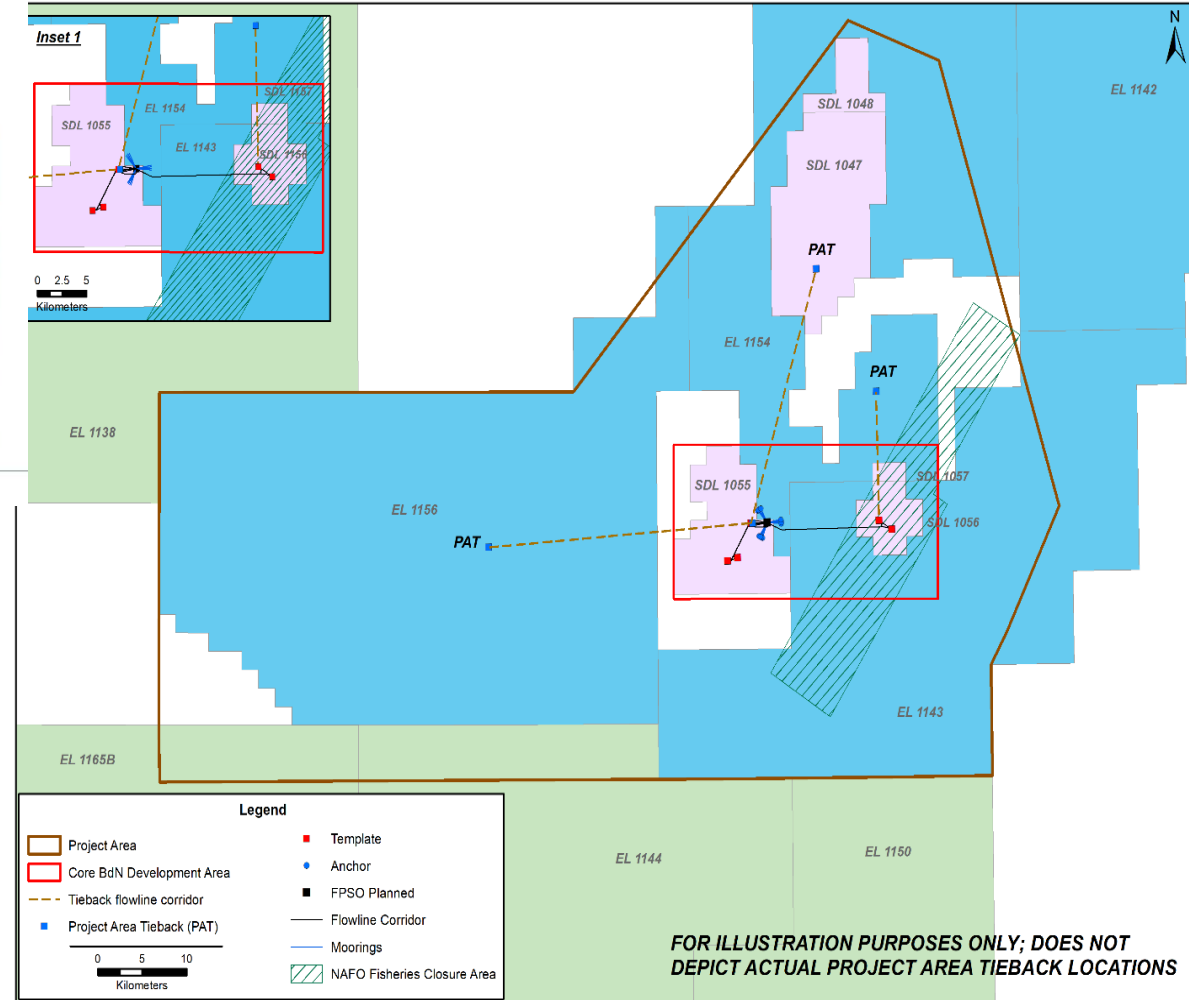


4 | Bay du Nord Development Project

Open

- ✓ Vessels and helicopter support
- ✓ Various supporting activities (e.g. geophysical [4D seismic / VSP], environmental and geotechnical)
- ✓ Decommissioning

➤ Project does not include onshore construction – equipment and production installation will be fabricated at existing specialized fabrication facilities.



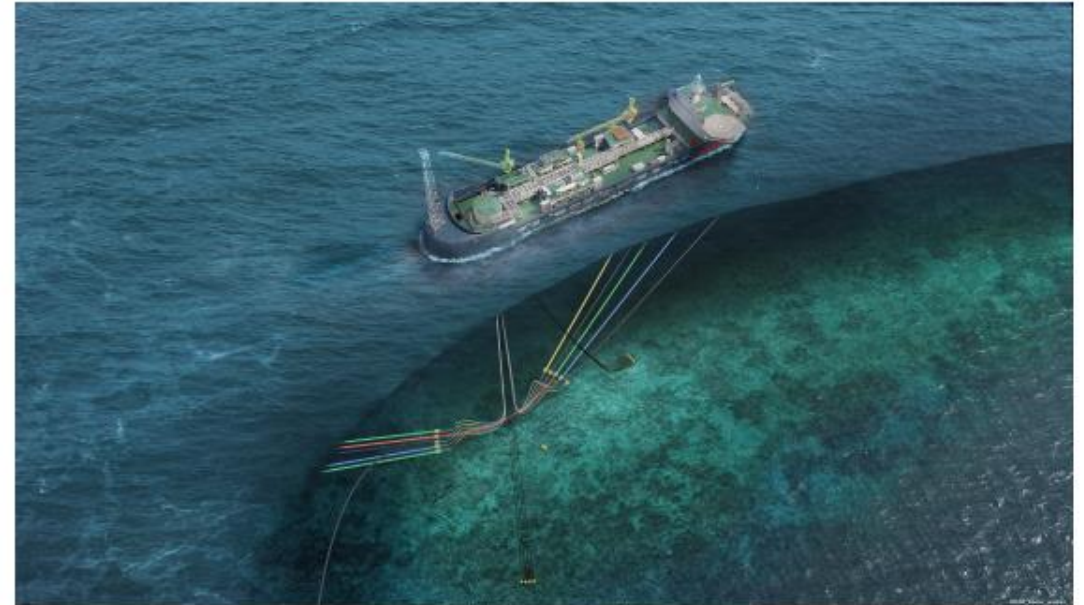
Equinor Canada Ltd.

## Bay du Nord Development Project

Environmental Impact Assessment

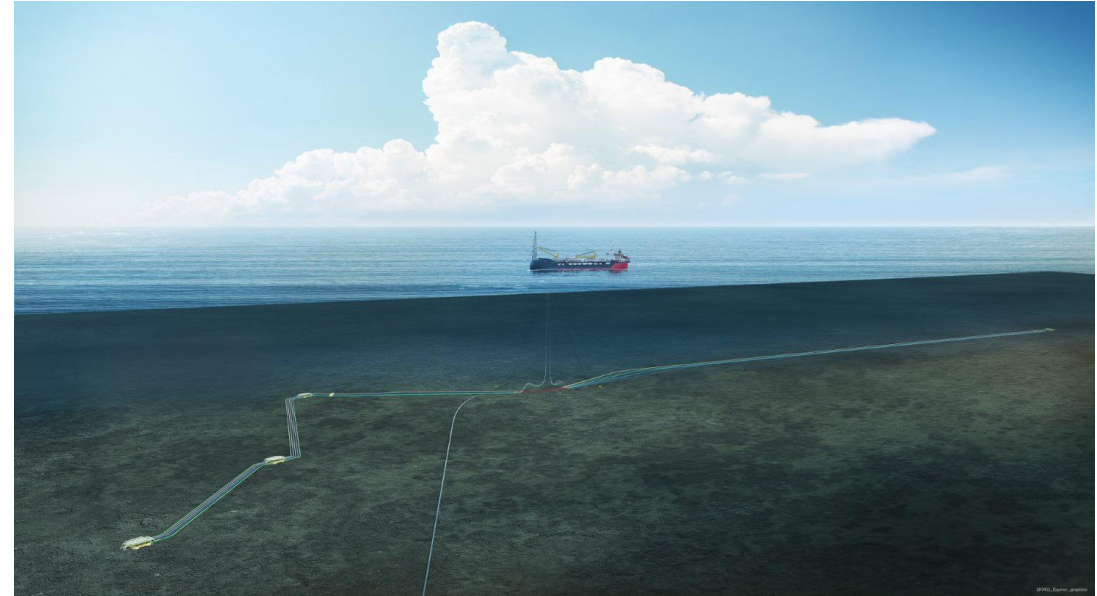
July 2020

# ENVIRONMENTAL IMPACT STATEMENT Overview



## Basis of Effects Assessment

- Best available data/knowledge from literature
  - Federal databases
  - DFO data
  - NAFO data (fisheries/corals/sponges)
  - National/International studies (Norway, North Sea)
- Equinor collection of coral and sponge data (2018)
- Modelling predictions for zones of influence
- **Focused on interactions/activities with greatest potential to have environmental effects** (EIS Guidelines)
- Input from Indigenous groups (workshops, meetings) and stakeholders
- Input from federal agencies and IAAC
- EEM results from existing production operations – decades of monitoring offshore NL and international
- Professional judgement and experience of EIS experts
- Equinor corporate experience
- Prepared by technical experts in various fields





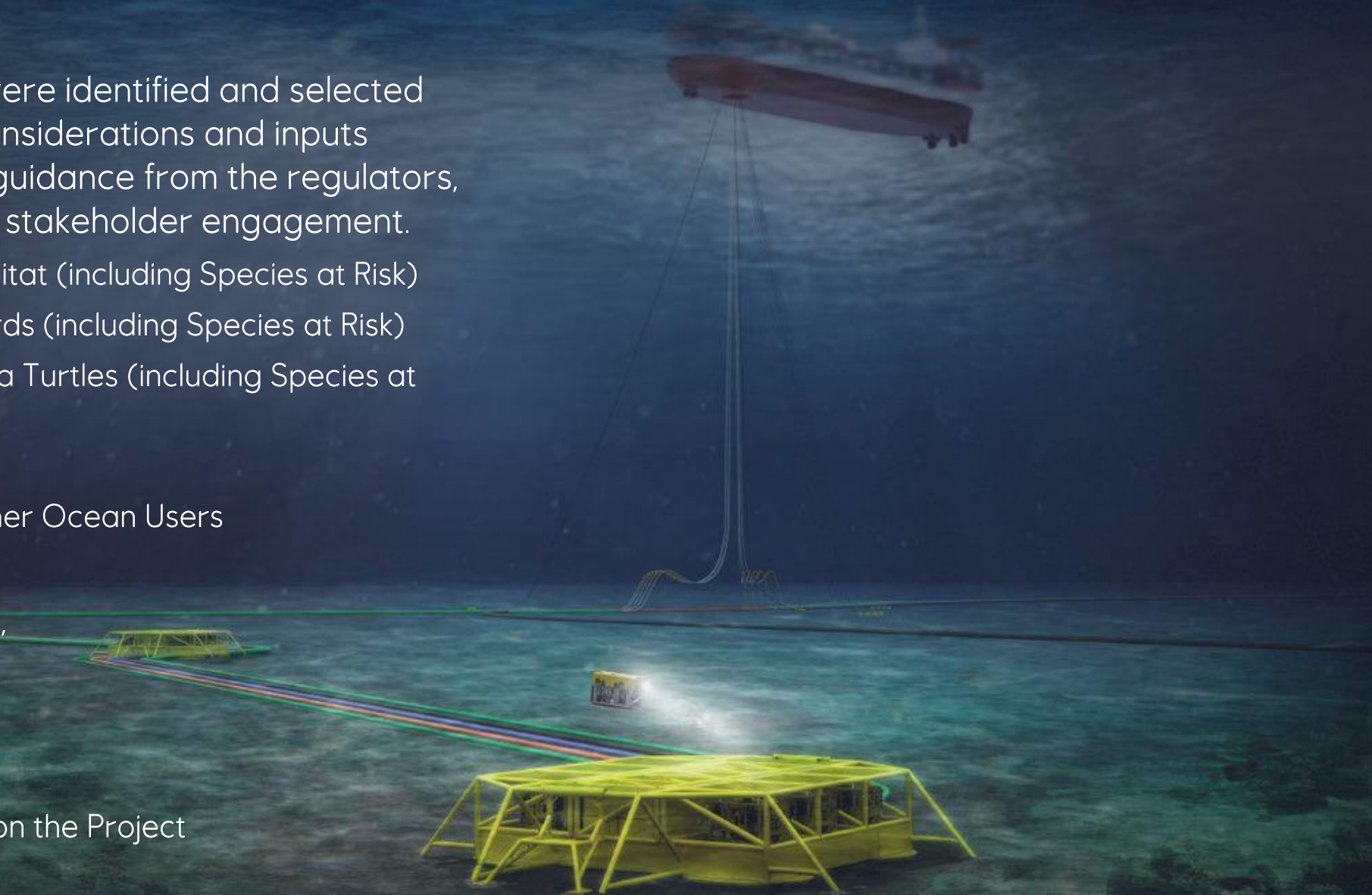
## Zone of Influence Modelling

- EIS guidelines required
  - Drill cuttings dispersion modelling
  - Spill Trajectory Modelling
- Equinor Canada Ltd. undertook the following additional modelling:
  - Air emissions
  - Produced water discharge dispersion
  - Underwater Sound Modelling



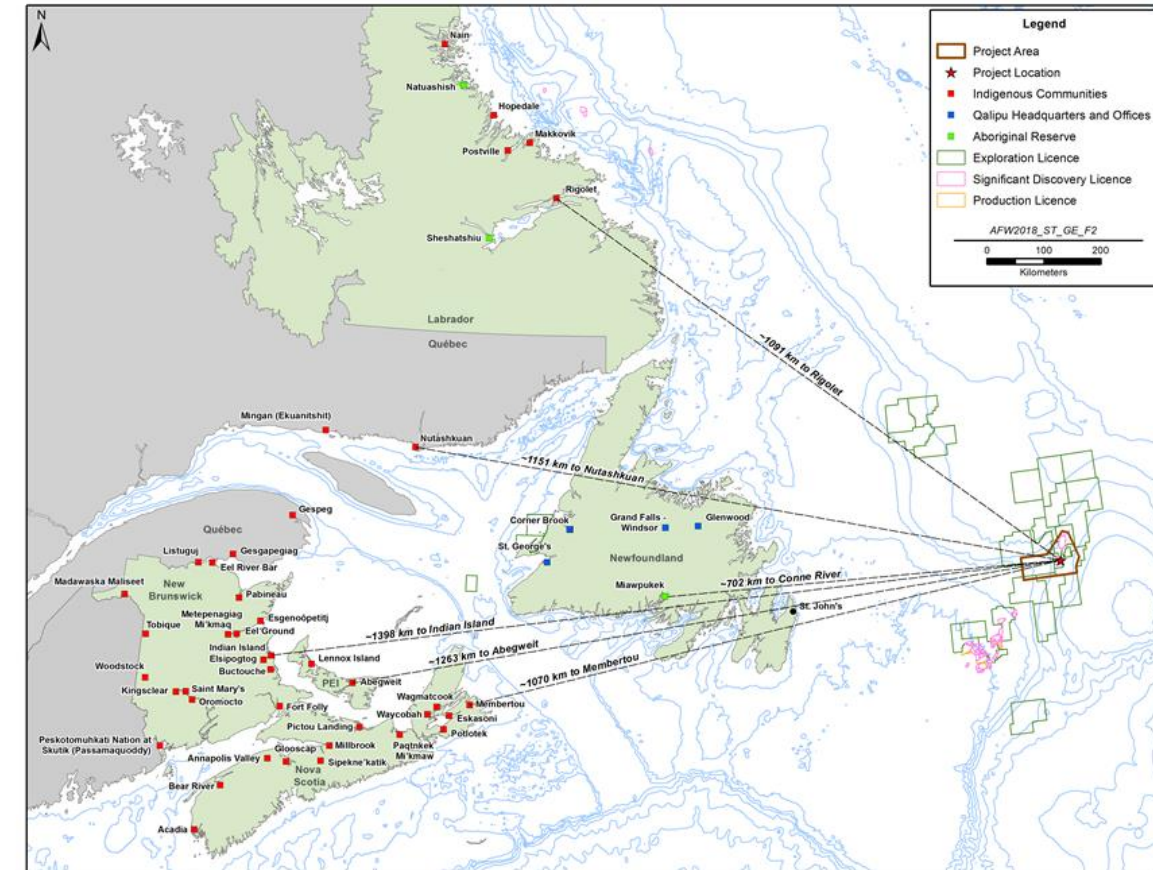
## EIS Structure

- Valued Components (VCs) were identified and selected based on a number of key considerations and inputs including the EIS Guidelines, guidance from the regulators, Indigenous engagement and stakeholder engagement.
  1. Marine Fish and Fish Habitat (including Species at Risk)
  2. Marine and Migratory Birds (including Species at Risk)
  3. Marine Mammals and Sea Turtles (including Species at Risk)
  4. Special Areas
  5. Marine Fisheries and Other Ocean Users
  6. Indigenous Peoples
- Effects analysis also included,
  - Accidental Events
  - Cumulative Effects Analysis
  - Atmosphere Environment
  - Effects of the Environment on the Project



# Indigenous Peoples

- The assessment of Project-related environmental effects on Indigenous Peoples is focused on the following potential environmental effects:
  - Change in commercial-communal fisheries
  - Change in current use of lands and resources for traditional purposes
- Project Area is between 640 and 2,000 km from Indigenous groups in NL and Maritime provinces
  - No overlap between territory of any of the 41 Indigenous groups and the Project Area
  - Equinor Canada's understanding that none of the 41 Indigenous groups have asserted or established Indigenous Rights to, in or near the lands and waters of the Project Area



# Indigenous Peoples

- Examples of issues and concerns raised by Indigenous groups at EIS workshop and meetings
  - Impact of the Project on FSC and commercial fish species
  - Produced water discharge – effects and dispersion area
  - Impacts from accidental events
  - Effects on Atlantic Salmon; American Eel (migration/overwintering)
  - Ship strikes and marine mammals
  - Underwater sound effects on marine life
  - Incorporation of Indigenous Knowledge
    - Desktop IK study - appendix to EIS
  - Environmental Effects Monitoring
- Workshop held October 2018 to develop mitigations
  - St. John's, Moncton, Quebec City
- The following discussion of the effects assessment for specific VCs (i.e., fish, marine mammals, birds, commercial fisheries) are equally applicable to Indigenous Peoples



# Marine Fish and Fish Habitat including Special Areas

Interaction	Potential Effects/Factors	Examples of Proposed Mitigation Measures	Effects Analysis
<p>Changes to seabed habitat (e.g. installation of subsea infrastructure; decommissioning)</p>	<ul style="list-style-type: none"> <li>• Changes in water quality (e.g. reduced visibility)</li> <li>• Behavioural changes (e.g. temporary avoidance and feeding behaviour)</li> <li>• Sedimentation and/or burial of benthic species</li> <li>• Presence of subsea infrastructure may increase habitat</li> <li>• Footprint – approximate 22 km<sup>2</sup></li> <li>• Subsea infrastructure in NAFO Fisheries Closure area               <ul style="list-style-type: none"> <li>• Footprint less than 1 percent of area of FCA</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Well templates will not be placed over <i>Lophelia pertusa</i> corals</li> <li>• Where Project activities may affect fish habitat, and it is determined through DFO’s “Request for Review” process pursuant to the Fisheries Act that a Fisheries Act Authorization is required, a habitat offsetting program will be developed in conjunction with DFO</li> </ul>	<ul style="list-style-type: none"> <li>• Negligible to low magnitude of effect               <ul style="list-style-type: none"> <li>• Foot print is approximate 0.5 percent of Project Area</li> <li>• Adjacent available habitat larger Project Area</li> </ul> </li> <li>• Medium to long term effect depending on timeframe for benthic recovery</li> <li>• Monitoring under Offsetting Plan, if required</li> </ul>
<p>Produced water discharge from the FPSO</p>	<ul style="list-style-type: none"> <li>• Changes in water quality</li> <li>• Uptake of hydrocarbons and chemicals contained in produced water discharge</li> <li>• Zone of influence within 1 km of discharge; with highest concentration within 100 m</li> <li>• Small plume of higher temperature water at discharge location</li> <li>• Limited potential for interaction of Atlantic Salmon/American Eel with discharges due to migratory pattern and localized PW discharge; no effects predicted</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment of produced water using best treatment practices that are commercially available and economically feasible with discharge to marine environment</li> <li>• Treated produced water and cooling water will be combined prior to discharge, and samples will be collected prior to combining</li> <li>• Produced water re-injection is being investigated</li> </ul>	<ul style="list-style-type: none"> <li>• No effects observed from other production operations</li> <li>• Negligible to low magnitude of effect</li> <li>• Long term effect</li> <li>• Follow-up monitoring proposed               <ul style="list-style-type: none"> <li>• Verify plume dispersion modelling</li> <li>• Monitor for potential effects on fish</li> </ul> </li> </ul>

# Marine Fish and Fish Habitat including Special Areas

Interaction	Potential Effects/Factors	Examples of Proposed Mitigation Measures	Effects Analysis
Discharging drill cuttings	<ul style="list-style-type: none"> <li>• Sedimentation and/or burial of benthic species</li> <li>• Contamination of seabed sediments</li> <li>• 200 m zone of influence on seabed in deep water;</li> <li>• 2 km zone of influence on seabed in shallower water</li> <li>• Drilling occurs in NAFO FCA; zone of influence predicted to be less than 0.5% of total area of FCA</li> <li>• Limited potential to no interaction with Atlantic Salmon/American Eel to nature of discharges and migratory patterns of species; no effects predicted</li> </ul>	<ul style="list-style-type: none"> <li>• Use best treatment practices for drill cuttings that are commercially available and economically feasible</li> <li>• Synthetic-based mud-related drill cuttings will be returned to the drilling rig and treated prior to release and water-based mud-related cuttings will be discharged without treatment (e.g. Offshore Waste Treatment Guidelines)</li> <li>• Discharge locations for water-based cuttings, when cuttings transport system is used, will be determined based on the C-NLOPB requirements to avoid Lophelia pertusa complexes and/or assemblages of 5 or more corals in 100 m<sup>2</sup> with heights greater than 30 cm within 100 m of the discharge location.</li> </ul>	<ul style="list-style-type: none"> <li>• Negligible to low magnitude of effects (low for special areas)</li> <li>• Medium to long-term duration, depending on benthic recovery timeframes</li> <li>• Follow-up Monitoring proposed               <ul style="list-style-type: none"> <li>• Verify Cuttings dispersion model</li> <li>• Effects on benthic habitat</li> </ul> </li> </ul>

# Marine and Migratory Birds

Interaction	Potential Effects/Factors	Proposed Mitigation Measures	Effects Analysis
Lighting from FPSO, drilling installation and vessels	<ul style="list-style-type: none"> <li>Attraction of birds to lighting could result in possible injury or mortality (e.g. strikes, strandings, disorientation)</li> </ul>	<ul style="list-style-type: none"> <li>FPSO - Reduced lighting subject to worker and operational safety (e.g. shading, use of spectral lighting, avoiding use of unnecessary lighting, directional lighting)</li> <li>ECCC to be engaged in lighting design options;</li> <li>Routine searches by trained personnel for stranded birds on the FPSO, drilling installation and vessels;</li> <li>In addition, use of digital technology (i.e., cameras/radar ) to detect/monitor bird attraction.</li> <li>Annual Seabird Handling Permit will be obtained from Canadian Wildlife Service</li> </ul>	<ul style="list-style-type: none"> <li>Medium magnitude of effect from lighting</li> <li>Long-term duration</li> <li>Attraction may occur within 15 km radius of FPSO/drilling installation</li> <li>Annual reporting to ECCC</li> <li>Follow-up monitoring is proposed               <ul style="list-style-type: none"> <li>Observational monitoring regarding attraction, including potential intra-project attraction when concurrent FPSO and drilling installation on-site</li> </ul> </li> </ul>
Flaring on the FPSO	<ul style="list-style-type: none"> <li>Attraction of birds to light and/or heat from flaring activities could result in possible injury or mortality</li> </ul>	<ul style="list-style-type: none"> <li>No flaring during routine operations and excess gas will be re-injected into the reservoir</li> <li>Flaring only during upset events and turnaround/maintenance activities</li> </ul>	<ul style="list-style-type: none"> <li>Medium magnitude when flaring occurs</li> <li>Short-term duration</li> <li>Follow-up monitoring is proposed, same as above</li> </ul>
Discharging produced water from the FPSO	<ul style="list-style-type: none"> <li>Produced water may form sheen on water during calm conditions</li> <li>Extremely unlikely to occur</li> </ul>	<ul style="list-style-type: none"> <li>Treatment of produced water using best treatment practices that are commercially available and economically feasible and discharge to marine environment</li> <li>Spill response measures if sheening occurs</li> </ul>	<ul style="list-style-type: none"> <li>Low magnitude of effect</li> <li>Low probability of occurring</li> <li>Long-term duration</li> <li>Follow-up monitoring not proposed</li> </ul>

# Marine Mammals and Sea Turtles

Interaction	Potential Effects/Factors	Examples of Proposed Mitigation Measures	Effects Analysis
Underwater sound (e.g. vessels, FPSO, drilling installation, decommissioning)	<ul style="list-style-type: none"> <li>Physical effects (e.g. hearing impairment)</li> <li>Behavioural changes (e.g. avoidance, reduced communication)</li> <li>May result reduced food sources due to scaring/movement of fish to same sound</li> <li>Unlikely to result in physical (e.g. hearing impairment) or behavioural changes (e.g. masked communication)</li> <li>Northern Bottlenose whales sighted in Flemish Pass area; may be present in Project Area</li> </ul>	<ul style="list-style-type: none"> <li>No mitigation measures are proposed.</li> </ul>	<ul style="list-style-type: none"> <li>Medium magnitude of effects for behavioural changes; negligible to low for injury/prey availability</li> <li>Long-term duration</li> <li>Underwater sound modelling - FPSO, Drilling installation; concurrent operations               <ul style="list-style-type: none"> <li>FPSO - 14 km zone of influence for behavioural effects</li> <li>Drilling installation - 25 km</li> <li>Concurrent - 31 km</li> </ul> </li> <li>Long-term duration</li> <li>Follow-up monitoring is not proposed</li> </ul>
Underwater sound generated during VSP and seismic surveys	<ul style="list-style-type: none"> <li>Physical effects (e.g. temporary reduction in hearing sensitivity, hearing impairment)</li> <li>Behaviour effects (e.g. changes in behaviour and distribution, masked communication)</li> <li>2 weeks in duration</li> <li>Not same as larger scale 2D/3D seismic surveys in larger areas</li> <li>Limited to location of reservoirs in Project area</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation measures outlined in DFO's Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP); examples include:               <ul style="list-style-type: none"> <li>MMO for seismic surveys only</li> <li>Ramp-up and shut-down if of sound source if marine mammal or sea turtle is detected within the 500 m safety zone</li> <li>Shut down of the sound source if a endangered or threatened marine mammal or sea turtle listed as endangered or threatened; and all beaked whales, if detected within the safety zone</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Medium magnitude of effects for behavioural changes</li> <li>Short-term duration</li> <li>Underwater sound modelling for air source array - approximately 20 km zone of influence (maximum) for behavioural effects</li> <li>Follow-up monitoring proposed               <ul style="list-style-type: none"> <li>Collect underwater sound data during seismic surveys</li> <li>Collect observational data during seismic surveys</li> </ul> </li> </ul>



# Marine Mammals and Sea Turtles

Interaction	Potential Effects/Factors	Examples of Proposed Mitigation Measures	Effects Analysis
Vessel traffic	<ul style="list-style-type: none"> <li>Physical contact with a vessel during supply vessel transit, which could cause injury or mortality</li> <li>Right whales have not been observed in Project area or along vessel traffic corridor</li> </ul>	<ul style="list-style-type: none"> <li>There is no critical habitat (per Species at Risk Act) identified within the Project Area.</li> <li>Consistent with International Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications, Rule 5, every vessel shall maintain a proper lookout at all times. Project vessels will alter course and/or reduce speed if a marine mammal(s) (or sea turtle) is detected ahead of the vessel.</li> <li>In the unlikely event of a collision with a marine mammal or sea turtle, Equinor Canada will contact DFO.</li> </ul>	<ul style="list-style-type: none"> <li>Effect not likely to occur based on available data</li> <li>Low in magnitude, if occurs</li> <li>Long-term in duration</li> <li>Follow-up monitoring is not proposed</li> </ul>

# Marine Fisheries and Other Ocean Users

Interaction	Potential Effects/Factors	Examples of Proposed Mitigation Measures	Effects Analysis
<p>Loss of access to established fishing grounds</p> <p>Interaction is low in Core BdN Area and higher in western and northern portions of Project Area</p>	<p>Economic effects</p>	<ul style="list-style-type: none"> <li>• Establish an anti-collision zone and safety zone in accordance with regulations and notify applicable regulatory authorities (e.g. add to marine navigational charts).</li> <li>• Ongoing communication with commercial and commercial-communal fishers</li> <li>• Ongoing communications with the NAFO Secretariat, through DFO</li> <li>• Implement a standard marine communication protocol</li> <li>• Communication to fishers– Navigational Warnings; Notices to Mariners</li> <li>• Develop and implement a compensation program for damages resulting from Project activities</li> <li>• Determine need for a Fisheries Liaison Officer during drilling installation movement from NL port to its offshore location</li> </ul>	<ul style="list-style-type: none"> <li>• Negligible magnitude of effect for Core BdN Development and low magnitude for tiebacks in the Project Area</li> <li>• Long-term in duration</li> <li>• Follow-up monitoring is not proposed</li> </ul>

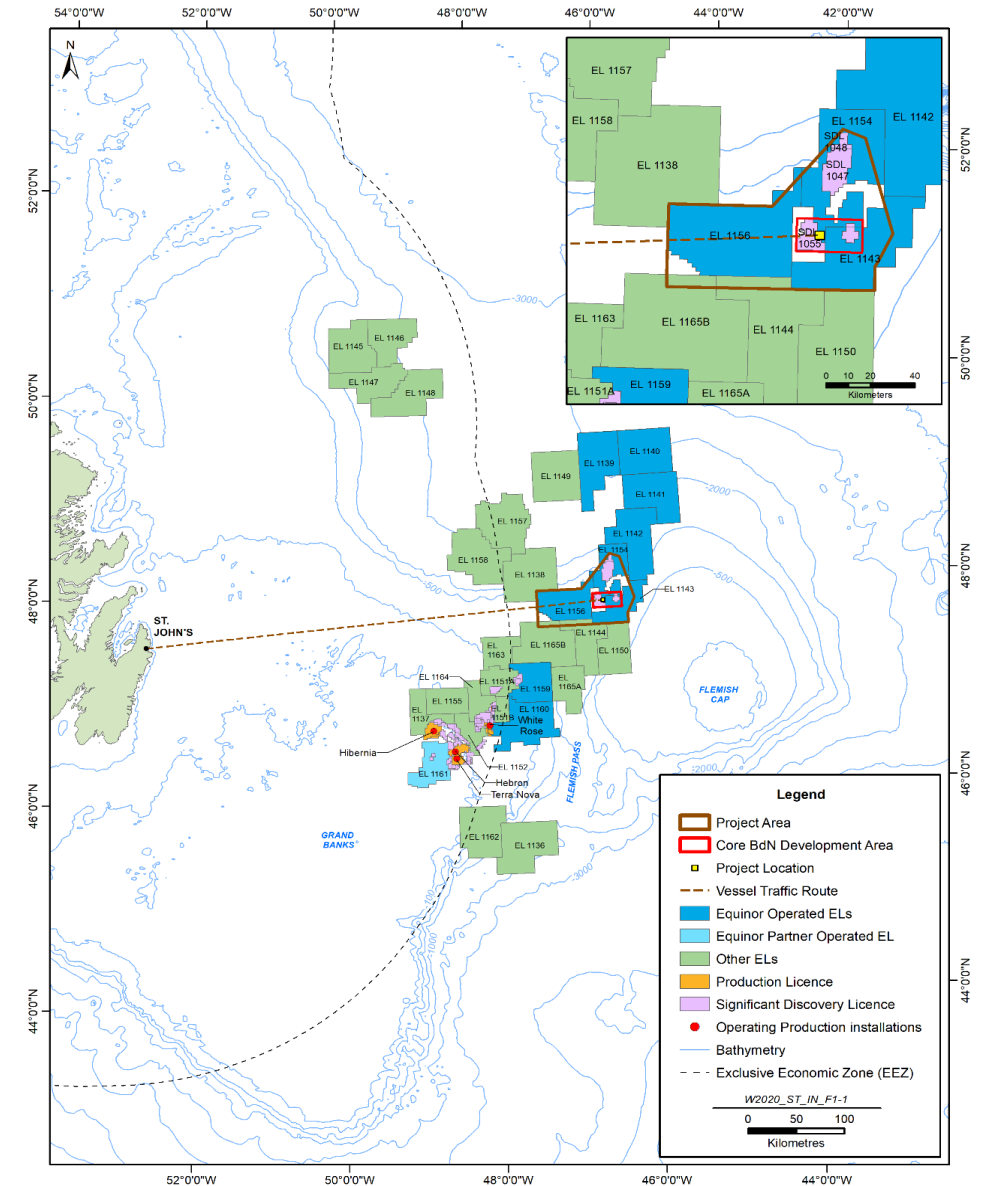
# Atmospheric Environment

- EIS examined air emissions associated with the Project during routine and accidental events (i.e., non-routine flaring)
- Predicted SO<sub>2</sub>, PM<sub>2.5</sub> and annual NO<sub>2</sub> are below guideline levels
- Lowest GHG emissions of production installations offshore NL
  - CO<sub>2</sub> emissions estimated to range from approximately 176,000 CO<sub>2</sub>e/yr to 258,000 CO<sub>2</sub>e/yr
  - Represent 2.4% or less of NL's GHG emissions and less than 0.04 national GHG emissions
- Mitigations to reduce air emissions
  - ✓ Use of energy efficient equipment
  - ✓ No flaring during routine operations and excess gas will be re-injected into the reservoir
  - ✓ Use of high efficiency burners when flaring is required
  - ✓ Sulphur content in diesel fuel for vessels will meet federal regulatory requirements



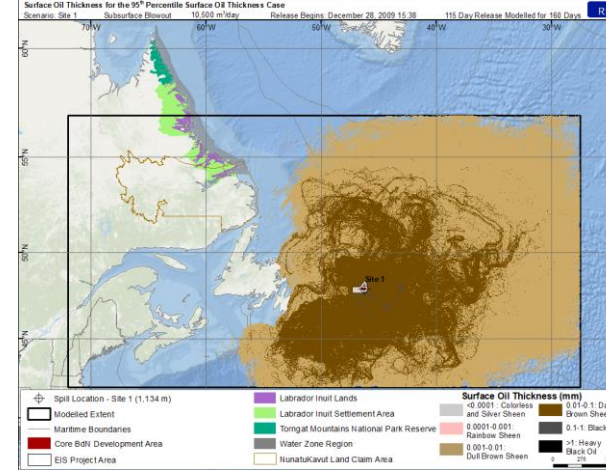
# Cumulative Effects

- Bdn Development will be only production facility in Flemish Pass; approximately 500 km offshore
- Nearest offshore production facilities is approximately 180 km to the southwest (White Rose)
- Activities such as geophysical surveys and exploration drilling (short term and seasonal) and fishing may overlap with the Project Area
- No overlap with existing production facilities
- Exploration drilling - based on drill cuttings modelling, zones of influence of drill cuttings dispersion in project area unlikely to overlap with drilling in adjacent/nearby exploration licences; adjacent licences primarily held by Equinor
- Seismic surveys – concurrent seismic surveys adjacent to Project Area has potential for cumulative behavioural effects on marine mammals; effects predicted to be localized and short-term with application of mitigation measures
- Mitigation measures associated with each VC are intended to avoid or reduce the potential effects of the Project, and therefore the Project’s contribution to cumulative effects
- Overall, cumulative effects are predicted to be not significant

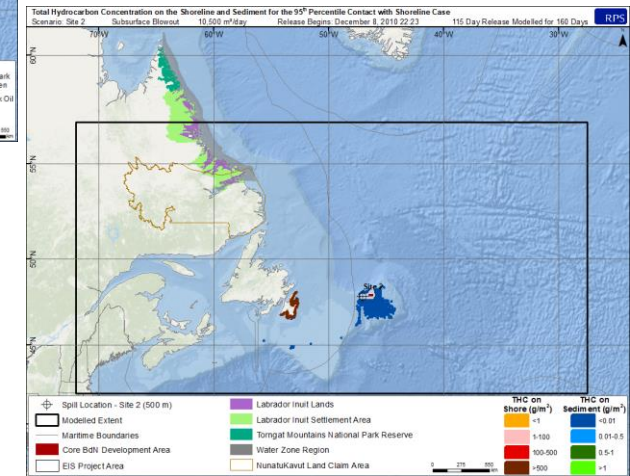


# Accidental Events

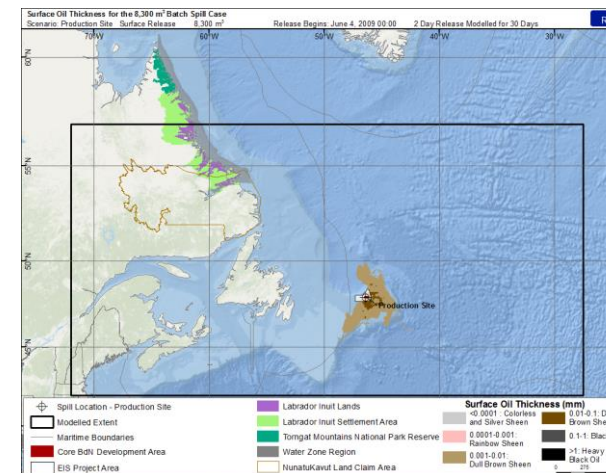
- **Unmitigated** Scenarios Modelled
  - Subsurface blowout
  - Batch spills of crude (surface and subsea); marine diesel (bunkering); Vessel to vessel collision
  - Synthetic Based Muds (SBM) spills – surface and subsea
- Subsurface crude oil blowout predicts surface/in water hydrocarbons within the EIS Regional Study Area
  - Very low probability event ( $1 \times 10^{-4}$ )
  - First contact with shoreline occurred at 14 or 45 days (depending on scenario)
  - Oil is predicted to be highly weathered (i.e., lighter and more toxic components would have evaporated, dissolved, and degraded thereby reducing the toxicity of the residual oil), patchy and discontinuous
- Batch crude spills – zone of influence varies depending on type of hydrocarbon; no shoreline contact predicted
- SBM spills - zone of influence predicted to be localized to site of spill; no shoreline contact predicted
- No significant effects for all VCs with the exception of Marine Birds (blowout scenario only)
- Significant effect based on extremely low probability blowout event occurring at a time when there are concentrations of susceptible birds in the area (i.e., alcids), and no mitigation/response measures employed



Surface Oil Thickness for the Unmitigated 95<sup>th</sup> percentile surface oil thickness case (Site 1) 115d release



Total hydrocarbon concentration on the shore and sediment for the 95<sup>th</sup> percentile contact with shoreline case from a subsurface blowout at the Site 2; 115-day release



Surface Oil Thickness for the Unmitigated FPSO Site Surface Batch Spills of 8,300 m<sup>3</sup>

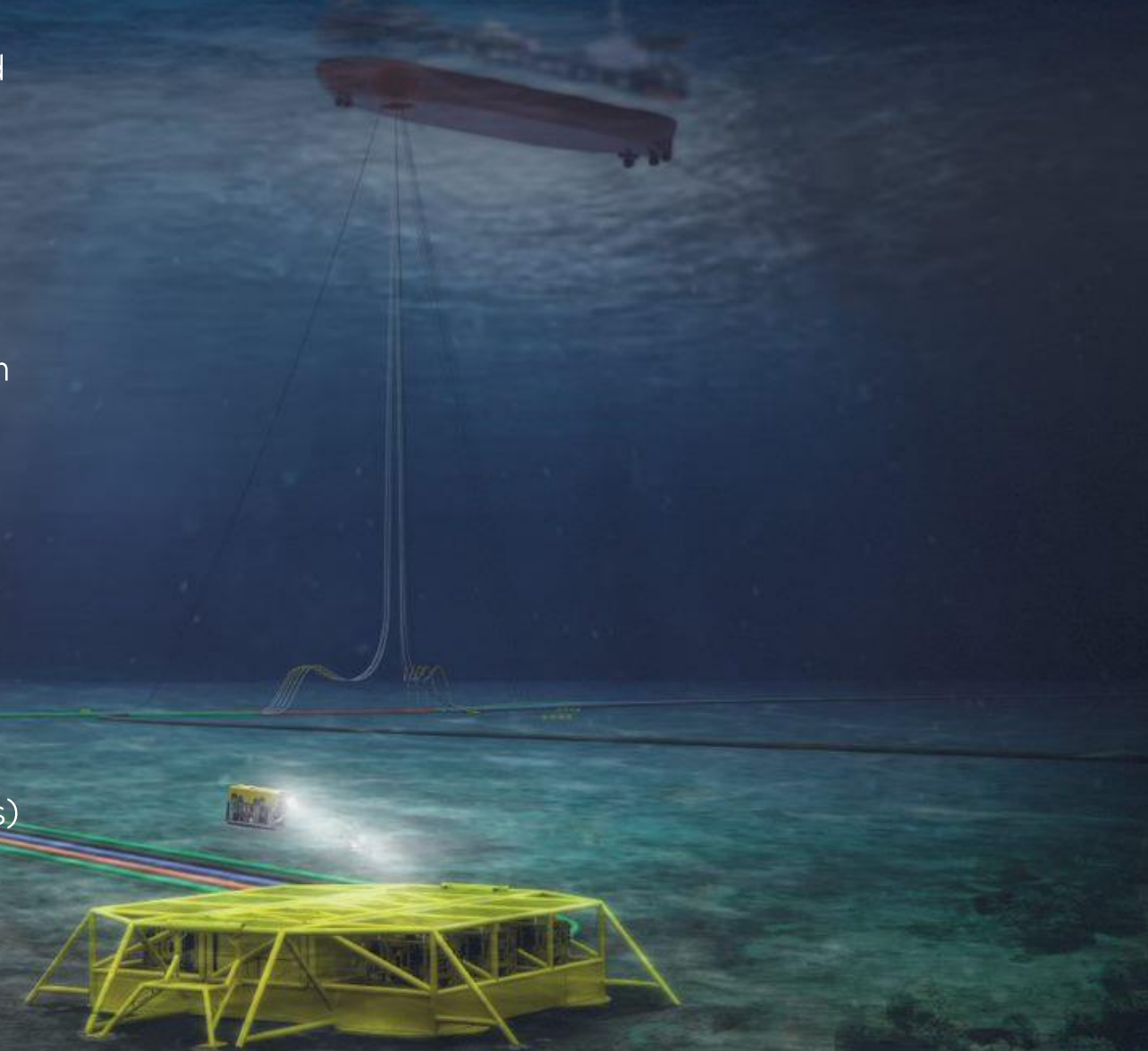
# Accident Prevention and Response

- Robust Safety culture
- Risk management proactively incorporated into the design, construction and operation stages of the Project
- Implementation of spill prevention measures in all Project activities
- Develop and implement an Oil Spill Response Plan
- Training programs (e.g. emergency response procedure, deploying spill response equipment, oil spill surveillance and monitoring, oil and wildlife sampling procedures, etc.)
- Spill and emergency response drills/exercise at local and global levels
- Leak detection technology
- Spill reporting (e.g. internal and external)



# Follow-Up Monitoring

- Design will be developed in consultation with the C-NLOPB, government departments (e.g., DFO, ECCC), indigenous groups and stakeholders
- Design will consider results of ongoing EEM programs for existing production operations offshore NL (+ 20 years of data)
- Aim to utilize technology specifically suited to monitoring in 1200 m water depth
- Adaptive management will be a key component of the EEM program
  - For instance - where monitoring shows no effect, or model predictions are validated, these components will be removed from future monitoring
- EIS identifies following the following components for follow-up monitoring
  - Validation/confirmation of modelling prediction for zone of influence for produced water, drill cuttings and underwater sound emissions
  - Potential effects from produced water discharges (fish species) and drilling cuttings discharges (benthic habitat)
  - Observational-based monitoring regarding bird attraction to lighting and/or flaring during non-routine flaring events.



## Conclusion

- Potential environmental interactions and effects well understood
  - ✓ 4 production installations offshore Newfoundland with decades of environmental effects monitoring;
  - ✓ Equinor operational and monitoring experience - 40+ installations offshore Norway and international
- Mitigations – number of mitigations shown by operational experience to be effective
- No significant residual environmental effects in normal operations
- Extremely low probability blowout scenario has potential to cause significant effects to birds depending on their presence and spill/environmental conditions
- New Technology Innovation and Application in Offshore NL – flare gas recovery, lighting design, bird monitoring, environmental monitoring (water and sediment)
- Environmental Effects Monitoring Program to be developed





## Engagement – Next Steps

- IAAC IR process
- Equinor EEM design
- Ongoing engagement with Indigenous groups
  - Nature and frequency to be developed through discussions with Indigenous groups
  - Fishing industry – One Ocean
- Individual follow-up as needed/requested



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Questions?