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April 18th, 2019

Re: WWF-Canada's feedback on CNSOPB's Middle Scotian Shelf and Slope Strategic Environmental Assessment

To Whom It May Concern,

Thank you for the opportunity to provide comments on the draft Middle Scotian Shelf and Slope Strategic Environmental Assessment. WW-Canada supports the Strategic Environmental Assessment (SEA) process and believes it is an important component in ensuring that offshore oil and gas activities in Canada's Atlantic waters are conducted safely with the lowest possible risk to human health and the environment, if such activities are to be carried out at all. We commend the CNSOPB for its effort to engage stakeholders throughout this SEA process.

World Wildlife Fund (WWF) is one of the largest conservation organizations in the world, with projects in more than 100 countries. For half a century, WWF-Canada has worked to protect nature in Canada, creating solutions to the environmental challenges that matter most for Canadians. We work in places that are unique and ecologically important, so that wildlife, nature and people thrive.

WWF-Canada believes healthy coastal communities depend on healthy oceans. We are working in partnership with coastal communities, indigenous peoples and other groups to advocate for marine protected areas and sustainable oceans management, and to ensure the rules governing offshore oil and gas activities are consistent with international best practices for safety, accountability and environmental protection.

WWF-Canada has reviewed the draft Middle Scotian Shelf and Slope Strategic Environmental Assessment created by Stantec Consulting Ltd. This letter provides an overview of our key

concerns, which we believe significantly limits the utility of this SEA to support decision-making, and our recommendations on what needs to be done to provide governments with the analyses required for the next stage of the decision-making process.

I. General Comments

The Middle Scotian Shelf and Slope SEA acknowledges that there is a problem with baseline data acquisition.[1] For instance, it is stated on page 5.22 that "There are large data gaps associated with the understanding of areas and timing of critical life-cycle stages of various species (see Section 5.1.3). Despite the uncertainties pertaining to environmental effects from oil and gas activities, it is important to take a precautionary approach in the vicinity of Special Areas, particularly those of well-known ecological importance**."** In addition, the impact and cumulative effects of underwater noise and potential oil spills on marine ecosystems are not well understood. In the absence of enough data, it is difficult to accurately predict the impacts of oil and gas development, which is critical for the decision-making process.

There may be valid reasons to consider oil and gas offshore of Nova Scotia as a possible economic development opportunity at some point in the future. However, before more offshore oil and gas activity proceeds, additional information is badly needed on the locations, population levels and ecological sensitivity of certain key species and there remains a troubling lack of baseline data necessary to improve our understanding of how oil and gas activities might impact physical, biological and human environments in the region.

The Middle Scotian Shelf and Slope SEA has failed to meet several important and widely-accepted international principles of SEA practice, which will significantly limit its decision-making utility for the CNSOPB and the government of Nova Scotia. According to the Organization for Economic Cooperation and Development,[2] an SEA should adhere to the following best-practice principles: establish clear development and sustainability goals; provide explicit justification for the selection of preferred options and for the acceptance of significant trade-offs related to hydrocarbon development; be flexible, iterative and customized to the Nova Scotian context; analyze the potential effects, risks and benefits of the proposed hydrocarbon development and its alternatives, against a framework of sustainability objectives, principles and criteria tailored to Nova Scotia; address the linkages and trade-offs between environmental, social and economic considerations; involve key stakeholders and encourage public involvement; include an effective and independent SEA quality assurance system; be transparent throughout the process and communicate the results in ways Nova Scotian communities can fully understand; assist in the development of outcomes that respect economic, social and environmental constraints and opportunities specific to Nova Scotia; and, encourage formal reviews of the SEA process after completion and monitor SEA and final decision outputs.

However, the CNSOPB assessment falls short in several key respects:

[1] For example, see section 5.2.3.

[2] Organization for Economic Cooperation and Development. 2006. *Applying Strategic Environmental Assessment: Good practice guidance for development cooperation.* Paris.

1. It does not establish clear development and sustainability goals for the offshore economy in Nova Scotia in general and the offshore oil and gas sector specifically;
2. It does not provide justification for the preference of offshore oil and gas over various other economic development options such as renewable energy development;
3. It does not analyze the possible impacts and benefits of offshore oil and gas in Nova Scotia in comparison to potential alternatives within a framework of sustainability objectives;
4. It does not address the linkages and trade-offs between environmental, social and economic considerations; and,
5. It does not include an effective and independent SEA quality assurance system, which is particularly important in this case, given that the assessment is being carried out by the CNSOPB, which is mandated to maximize "employment and industrial benefits for Nova Scotians and Canadians" (page 2.1).

Page E.1 of the assessment states that "The SEA is not intended to replace project-specific environmental assessments (EAs) that would be required for any proposed exploration program; rather it is intended to support and facilitate future project-specific EAs." However, the SEA in its current form is not sufficient to support and facilitate future project-specific EAs. As an illustration, the following table from the International Centre for Environmental Management (ICEM) provides an instructive and widely-accepted example of the difference between an SEA and a project-level EA.[3]

Table 1: Strategic Environmental Assessments versus Environmental Impact Assessments. Adapted from International Centre for Environmental Management.[4]

Strategic Environmental Assessment	**Environmental Impact Assessment**
Takes place at earlier stages of decision-making cycle	Takes place at end of decision-making cycle
Multi-stage process with variations e.g. policy versus plans/programs	Well-defined processes, clear beginning and end
Proactive, out-in-front approach to development proposals	Reacts to specific development proposal
Broad level of analysis e.g., focus on cross-sector links and issues	Detailed, cause-effect analysis of the impact of project components
Considers potentially wide range of development alternatives	Considers limited range of feasible alternatives (how to carry out projects)
Gives early warning of cumulative impacts (sector or region wide)	Limited opportunity to address cumulative impacts at project level
Emphasis on meeting goals and safeguards for the environment	Emphasis on mitigating and minimizing impacts
Focuses on "do most good"	Focus on do no/least harm

[3] International Centre for Environmental Management. 2014. *Introduction to Strategic Environmental Assessment: Purpose, Principles and Process.* https://www.slideshare.net/ICEM-Centre-Environmental-Management/sea-intoduction
[4] Ibid.

Note that the ICEM approach focuses on cross-sectoral issues and meeting specific goals, considers a wide range of development alternatives, and focuses on "doing the most good." For example, is offshore oil and gas the approach that will "do the most good" or would other development options be more suitable to meeting Nova Scotia's long-term sustainable development goals? What are the potential jobs and economic benefits (i.e. emphasis on meeting goals) and will they outweigh the risks of offshore oil and gas to the marine environment and other industries? Will Canada's climate targets and international efforts to limit global warming to 1.5 degrees Celsius be compatible with the exploitation of offshore oil and gas in offshore Nova Scotia (i.e. cross-sectoral analysis)? None of these central questions are answered by this SEA.

There is no doubt that the SEA report will be a useful and informative tool, but it is only a first step in the decision-making process. There remain critical outstanding data and research gaps that need to be filled before a well-justified and well-supported recommendation can be made on whether offshore oil and gas activity should proceed in the study area.

II. CNSOPB Mandate

There is already concern across a broad section of the scientific community and the broader public with respect to the current responsibilities of the Atlantic offshore Boards for regulating the environmental performance of oil and gas development industries.[5] These concerns provide a context that is extremely relevant to this SEA, which is being carried out by the same agency, the CNSOPB, that is also responsible for "maximizing employment and industrial benefits for Nova Scotians and Canadians" (page 2.1).

The experience and motivations of the people who form the regulatory system and conduct environmental assessments are critical. Whether the CNSOPB is well-suited to its role as the lead regulator on offshore environmental matters is an essential and pressing question. For example, the responsibility of the CNSOPB for environmental protection may be inappropriate given that they are primarily designed to ensure economic benefits from oil and gas, according to the Accord Acts.[6] In this context, the CNSOPB may be in a perceived or real conflict of interest in conducting this SEA given its mandate and close relationship with the oil industry. In our view, this will undermine the credibility of the final SEA report. Already, some community groups perceive that offshore regulations are made to support oil activity rather than to promote environmental protection[7] and it will be understandable if this SEA process is viewed as nothing more than a rubber stamp to green light oil and gas activities in an area that contains ecologically sensitive habitats, endangered species and where many types of fishing activities are currently prohibited.

The decision of the CNSOPB to allow BP to keep a capping stack in Norway for its drilling operations in the Scotian Basin provides a case in point.[8] The Board accepted the company's argument that the low risk of a blowout and the prohibitive cost involved made keeping the capping stack on site not a "reasonable" risk reduction measure.[9] Yet from the perspective of what would

[5] See for example numerous submissions to the Government of Canada's meta-review process: 'Discussion Paper', www.discussionpaper.ca
[6] http://www.assembly.nl.ca/legislation/sr/statutes/c02.htm
[7] Fusco, Leah. "The Invisible Movement: The Response of the Newfoundland Environmental Movement to the Offshore Oil Industry." Memorial University, 2007, p. 87-97.
[8] http://thechronicleherald.ca/novascotia/1553818-opponents-of-ultra-deep-bp-well-of-n.s.-coast-speaking-at-smu
[9] https://www.cnsopb.ns.ca/sites/default/files/pdfs/bp_stakeholder_engagement_and_aboriginal_consultation_report.pdf

be safest for environmental protection and to minimize damages, capping stacks are a proven, effective technology despite being more expensive for industry. In *Edwards v. National Coal Board (U.K., 1949)*, the court ruled that there must be a "gross disproportion" between the risk reduction and the sacrifice for it to be considered not reasonably practicable. In the BP case, it is not clear how the CNSOPB decided that requiring a capping stack on site would be a "grossly disproportionate" measure and it brings into question the impartiality of the CNSOPB in completing a SEA.

A 2012 audit by the Office of the Auditor General's Commissioner of the Environment and Sustainable Development found a long list of concerns regarding the Atlantic offshore Boards and federal departments' ability to respond to oil spills, as well as the Board's regulatory role in ensuring operators were prepared to respond.[10] The Auditor General also flagged urgent questions about the Board's level of preparedness for a major spill, which seven years later, have yet to be addressed.

III. Oil and Gas in Marine Refuges

WWF-Canada has consistently called on the federal government to prohibit oil and gas activities within marine protected areas and marine refuges.[11] WWF-Canada asserts that oil and gas activities are not compatible with conservation and have in the past expressed disapproval with both the CNSOPB and the Canada-Newfoundland & Labrador Offshore Petroleum Board (CNLOPB) for putting out Calls for Bids that contain marine refuges that are currently counting towards Canada's marine conservation targets. We fully understand the jurisdictional differences between *Fisheries Act* closures and the jurisdiction of the offshore petroleum boards; however, the conservation objectives of protected areas cannot be achieved when subjected to environmentally-damaging industrial activities and infrastructure development.

Canada, as a signatory to the Convention on Biological Diversity (CBD), has agreed to reach international targets to protect 10 per cent of its marine and coastal waters through the designation of marine protected areas (MPAs) and other effective area-based conservation measures (also known as marine refuges in Canada) by 2020. Fisheries and Oceans Canada, in collaboration with Parks Canada and Environment and Climate Change Canada, have put significant effort into meeting an interim target of protecting 5 per cent of Canada's waters by 2017 and surpassed that by protecting 7.92 per cent of its ocean and coastal territory as of March 2019.[12] While this effort demonstrates Canada's national and international leadership in meeting its conservation targets, it is of great embarrassment for Canadians to forego this leadership role given that petroleum industry activities and infrastructure development have become permitted within other marine refuges.[13]

The Western-Emerald Banks Conservation Area was originally designed to protect a diversity of groundfish and invertebrate species that use the complex, unique bank habitat throughout their

[10] http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201212_01_e_37710.html
[11] http://www.wwf.ca/newsroom/?27841/Oil-and-gas-dont-mix-with-conservation-WWF-Canada-says
[12] http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/index-eng.html
[13] https://www.cbc.ca/news/canada/newfoundland-labrador/cnlopb-oil-exploration-wwf-ffaw-1.4608502

lifecycles.[14] The potential allowance of oil and gas in this conserved area threatens biodiversity and existing conservation objectives. The International Union for the Conservation of Nature (IUCN) clearly indicates that oil and gas activities are not compatible in any conserved area and will not lead to the conservation of biodiversity.[15]

It is important to remind the CNSOPB that in May 2018, WWF-Canada, with other environmental non-government organizations, argued against the 2018 Calls for Bids area on the Scotian Shelf as it overlapped with the Western-Emerald Banks Conservation Area. This Calls for Bids was set aside on May 22nd, 2018 by the Honourable Jim Carr, then Minister of Natural Resources Canada, and the Honourable Geoff MacLellan, then the Nova Scotia's Minister of Energy, citing Canada's commitments to meeting its marine conservation targets.[16] Therefore, it is very disappointing to see that the 2019 Calls for Bids area is again almost entirely comprised of the Western-Emerald Banks Conservation Area. As we have pointed out, it is unacceptable for oil and gas activities to occur with marine refuges and request that all marine refuges be removed from current and future Calls for Bids.

While we are pleased to see that section 5.2.3 mentions the National Advisory Panel on Marine Protected Area Standards recommendation that no oil and gas occurs in MPAs, it is important to remember that marine refuges are also counting towards Canada's marine conservation targets. Section 5.2 acknowledges the Western-Emerald Banks Conservation Area, the Sambro Bank Sponge Conservation Area and the Emerald Basin Sponge Conservation Area as protected areas on page 5.1.5. It also acknowledges that exploratory oil and gas activities may have long or short-term environmental effects on these special areas, "*affecting the biodiversity, abundance and/or presence of species within these areas, ecological integrity and habitat value, and/or socioeconomic value*." The report acknowledges that seismic surveys have negative impacts on sensitive benthic areas, which the sponge conservation areas are, and that seismic sound may affect juvenile fish and invertebrates near the seabed, main conservation features of the Western-Emerald Banks Conservation Area. Drilling, increased vessel traffic and accidental events can also have negative, and sometimes severe, impacts. The National Advisory Panel on Marine Protected Area Standards also recommends that "When industrial activities are allowed to occur in areas counted as other effective area-based conservation measures, the Minister of Fisheries, Oceans and the Canadian Coast Guard must be satisfied through effective legislation or regulation that risks to intended biodiversity outcomes are avoided or mitigated."[17] As there are noted environmental impacts that can occur regardless of mitigation measures, marine refuges should be provided precautionary management given their sensitivity and avoided altogether.

Allowing oil and gas operations in marine refuges would undermine their contribution to conservation and would negatively affect their ability to be considered within Canada's marine conservation targets, not to mention undermining efforts made on behalf of the commercial fishing industry to protect important fish habitats. Current and future Calls for Bids should recognize the

[14] http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/westernemerald-emeraudewestern-eng.html
[15] https://www.iucn.org/sites/dev/files/content/documents/applying_mpa_global_standards_final_version_050418.pdf
[16] https://www.cnsopb.ns.ca/sites/default/files/pdfs/0925_001.pdf
[17] https://waves-vagues.dfo-mpo.gc.ca/Library/40727191.pdf

importance of marine refuges and treat them as they do MPAs, such as The Gully, removing them from the bidding process.

IV. Blowouts, Major Accidents and Oil Spill Response

While the likelihood of a major blowout is small, the *consequences* of such an event would likely be devastating to the marine environment, due to the tremendous difficulty of ensuring adequate oil spill response in locations far offshore under potentially extreme weather conditions. The SEA notes on page 5.19 that the consequences of a major spill can be "can be severe and far reaching", and this fact fundamentally changes the risk calculation of potential oil and gas activities in the study area, which is hundreds of kilometres offshore with water depths of over 2,500 metres. Thus, despite the low probability, the high magnitude of such an event make the overall risk level of offshore oil and gas in the study area medium to high. There is currently no assessment of the risk of a major accident provided in the SEA along the lines of the risk matrix below, which was developed by the National Research Council for the U.S. Arctic.[18]

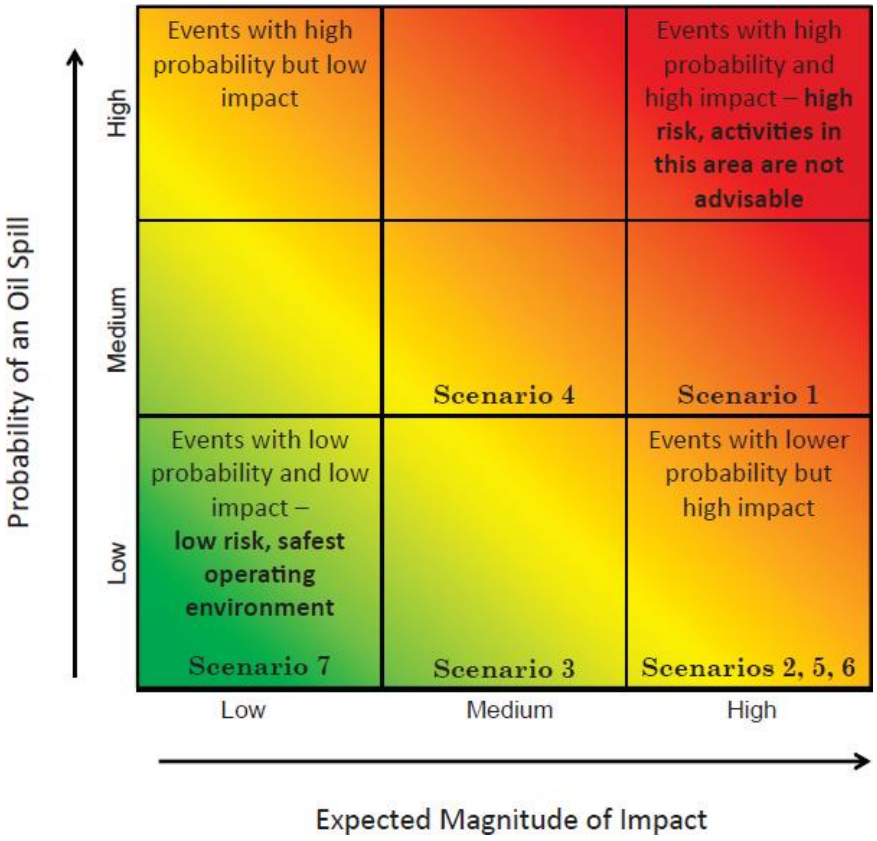

Figure 1: Oil spill risk matrix with low-probability/low-impact events in the lower left corner (low risk) and high-probability/high-impact events in the upper right corner (high risk).

[18] National Research Council of the National Academies. 2014. *Responding to oil spills in the U.S. Arctic.* https://www.nap.edu/read/18625/chapter/5#68

Section 5.1.1.5 'Accidental Events' deals with the issue of subsea well blowouts and states:

> *"Bacteria (specifically heterotrophic bacteria) are natural microbial agents and play a role in remediating hydrocarbon contamination in the marine environment. When there is a spill of crude oil or hydrocarbons, the bacteria capable of degrading the substance proliferate and multiply quickly (ASM 2011). In coordination with other physical processes including evaporation, dissolution, dispersion, and photooxidation, bacteria will eventually clean up the spill by consuming the hydrocarbon compounds which are biodegradable (ASM 2011). It should be noted that this process occurs over a long time period and depends on a variety of factors including the volume of oil spilled, sea-state, and weather conditions."* (Emphasis added.)

It is important to note the significance of the underlined passage above to avoid any inference from the SEA that a major spill would naturally dissipate and therefore be limited in its impact. Thirty years after the Exxon Valdez spilled 4.2 million liters of crude oil into Prince William Sound in Alaska, the fishing industry has not fully recovered[19] and many Alaskan beaches remain polluted to this day with an estimated 20,000 gallons (75,000 liters) of crude oil buried just inches below the surface. Challenging environmental conditions meant that only 15 to 25 per cent of oil was recovered by mechanical means and, in a study published in Scientific Reports in 2015, researchers found that the spill was even more ecologically catastrophic than originally predicted as even very low levels of oil contamination can disrupt normal development.[20] Oil also degrades much more slowly in cold water because low temperatures change the chemical properties of spilled oil making it more viscous and thereby inhibiting the efficiency of oil-eating microbes, which are more effective when oil is broken up into small droplets.[21]

Rapid and effective oil spill response is therefore critical in limiting the environmental impacts of a spill. However, as previously noted, documents filed to the Canadian Environmental Assessment Agency (CEAA) in relation to drilling projects in the Flemish Pass indicate that, if there were a well blowout, the capping stack would have to be shipped from Norway or Brazil, a process that could take between 14 and 36 days.[22] If a major blowout does occur, many of the techniques that are used to clean up oil could be useless if the spill were to occur in rough seas.[23] Oil controlling booms start to lose their effectiveness in meter-high waves and stop working entirely when the waves reach two metres high and cold weather can make it difficult to apply dispersants to oil slicks.

It is worth noting that the BP Deepwater Horizon blowout resulted in 670 million liters of oil being spilled into the Gulf of Mexico over 4 months, most of which was never cleaned up.[24] Though not a blowout, a chronic leak from the Taylor drilling rig in the Gulf of Mexico has been leaking an

[19] Yardley, W. May 5, 2010. Recovery Still Incomplete After Valdez Spill. New York Times. https://www.nytimes.com/2010/05/06/us/06alaska.html

[20] Incardona, J. P. et al. 2015. Very low embryonic crude oil exposures cause lasting cardiac defects in salmon and herring. *Scientific Reports* volume5, Article number: 13499 (2015) https://www.nature.com/articles/srep13499

[21] Aarhus University. February 21, 2018. Oil-eating microbes are challenged in the Arctic. *Phys.org.* https://phys.org/news/2018-02-oil-eating-microbes-arctic.html

[22] https://www.cbc.ca/news/canada/newfoundland-labrador/oil-capping-timelines-nl-1.4933106

[23] Nuka Research. *Estimating an oil spill response gap for the U.S. Arctic Ocean (Revised).* 2018. https://nukaresearch.com/wpfb-file/estimating-an-oil-spill-response-gap-for-the-us-arctic-ocean-revised-pdf/

[24] Waldman, S. July 19, 2017. The U.S. Is Not Ready to Clean Up an Arctic Oil Spill. *Scientific American.* https://www.scientificamerican.com/article/the-u-s-is-not-ready-to-clean-up-an-arctic-oil-spill/

estimated 10,000 - 30,000 gallons of oil per day since 2004 and will soon be the largest offshore oil spill in U.S. history.[25] Both of these events took place in the Gulf of Mexico where there is substantially more infrastructure and response capacity than in Nova Scotian offshore.

Finally, page 2.16 of the SEA recalls that the largest ever oil spill in Newfoundland and Labrador's history occurred recently at the site of the Husky Sea Rose FPSO but makes no mention of environmental impacts. Some experts have estimated that a "horrendous" number of sea birds, possibly over 100,000, may have been killed because of the spill.[26] The official investigation into the cause of the accident has not yet been released and it is still unclear why Husky re-started operations during an extremely violent storm, which apparently led to a flowline being disconnected. Weather conditions at the time of the Husky spill meant that no oil was recovered and response capacity in these situations was severely compromised. Such extreme conditions, which can be present off the coast of Nova Scotia, and the fact that companies are drilling in deeper and deeper water (BP's Scotian Basin Exploration Project involves drilling 2,777 metres under water) mean that every reasonable measure must be taken to prevent accidents from happening. The environmental impacts of a major spill are potentially catastrophic and our ability to adequately respond is limited at the current time. Yet despite this fact, the Atlantic offshore boards and the CEAA do not require offshore operators to have safety equipment on hand, such as a capping stack, which has been proven effective in stopping well blowouts.

It is not yet known whether Husky followed its own environmental and safety plans and, if so, why their plans, which were approved by the CNLOPB, were insufficient in preventing the accident and how improved regulations could ensure that it doesn't happen again. The Husky incident once again made clear that stronger regulations are required to protect marine wildlife, especially seabirds, from oil and gas operations and that the offshore boards' dual responsibilities for developing the offshore industry and for environmental protection need to be separated to ensure public confidence.

SEAs and project-level EAs should be carried out by an independent offshore safety authority, like what exists in Norway and Australia and as recommended by the inquiry looking into the 2004 Terra Nova spill.[27] The authority would monitor adherence to environmental and safety protocols and impacts to marine wildlife including seabirds. As noted, the Middle Scotian Shelf and Slope SEA does not consider important questions related to regulatory effectiveness and oversight. Although the SEA outlines the current protocols regarding spill prevention and response, no attempt is made to evaluate the effectiveness of these protocols or identify areas for improvement.

V. Seismic testing

[25] Covington, R. December 29, 2017. *Taylor Energy Cumulative Spill Report – 2017 Update.* https://skytruth.org/2017/12/taylor-energy-site-23051-cumulative-spill-report-2017-update/

[26] https://www.cbc.ca/news/canada/newfoundland-labrador/searose-spill-seabird-threat-1.4914730

[27] https://www.cnlopb.ca/wp-content/uploads/ohsi/ohsir_vol1.pdf

Page 5.1 of the SEA discusses the impacts of seismic testing programs on marine wildlife. While acknowledging many known impacts and noting the need for further research, it sometimes downplays the risks posed by seismic testing to marine life. For instance, the SEA gives insufficient consideration to cumulative underwater noise effects and the SEA study area, which was designated "to recognize a potential zone of influence of environmental effects from activities that could occur within the Project Area" (page E.1) is far too small to adequately consider the potential geographic extent of seismic impacts. Sound underwater can travel thousands of kilometers under the right conditions, meaning that effects would not be limited to the project area. Nieukirk et al. (2012) analyzed 10 years of underwater recordings from the Mid-Atlantic Ridge, finding that seismic airguns were heard at distances of 4,000 km from survey vessels and present 80-95 per cent of the days per month for more than 12 consecutive months in some locations.[28] When several surveys were recorded simultaneously, whale sounds were masked (drowned out), and the airgun noise became the dominant part of background noise levels. These sorts of transmission distances do not occur in all cases, but without the appropriate noise measurements, it should be assumed they are possible.

To date 130 species have been documented to be impacted by human-caused underwater noise pollution, including species present in the study area such as plankton, benthic organisms, whales, invertebrates, some fish species, narwhals, harbour porpoises, squid and shrimp, although more research is needed for these and many other species.[29] The precautionary approach should be applied for those species in which seismic impacts are unknown or uncertain. Before any seismic activity is approved, thorough, long-term studies should be carried out to get robust baseline biological information on the distribution and abundance of some species. Seismic activities should not be conducted in sensitive marine environments until more is known about the full impacts on certain species.

We know enough from noise impact studies to date, especially those involving seismic airgun surveys, to conclude that anthropogenic underwater noise is a serious and transboundary pollutant, which can negatively affect and degrade huge ocean areas. We know enough to legitimately expect negative impacts severe enough to affect the health, welfare, and sustainability of at least some animal populations, from plankton, through fish to whales.

We may not know the exact details of which organisms will be harmed by seismic airgun noise and to what degree, but this does not mean that the negative effects will be limited to the immediate area, will stop once oil and gas activities cease, and that the effects will be reversible. More research is needed, and the precautionary approach should be applied for those species in which seismic impacts are unknown or uncertain.

WWF-Canada therefore recommends that thorough, long-term (over several years) studies be carried out to establish baseline data on the distribution and abundance of valued ecosystem components, and the long-term impacts of seismic testing, together with threats such as climate change and ocean acidification, on the ecosystem and population biology should be thoroughly

[28] Nieukirk, S.L., Mellinger, D.K., Moore, S.E., Klinck, K., Dziak, R.P. and Goslin, J., 2012. Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999–2009. *The Journal of the Acoustical Society of America*, *131*(2), pp.1102-1112.

[29] Weilgart, L., 2018. The impact of ocean noise pollution on fish and invertebrates. *Report for OceanCare, Switzerland. https://www.oceancare.org/wp-content/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf*

studied. Such studies are very challenging to carry out, but the burden of proof (to show no harm) should be on the project proponent, who wishes to alter the environment, rather than those wishing to preserve it.

Finally, it should be noted in the SEA that behavioral disturbance studies can be notoriously difficult to interpret, as they may yield counterintuitive or paradoxical results. For instance, for some species and in certain situations, the weaker the behavioural response, the more serious the impact on the population. Individuals with lower energy reserves or no alternative habitat cannot afford to flee repeatedly from disturbance but are forced to remain and continue feeding, apparently unresponsive to disruption.[3031] Yet these individuals are in fact more vulnerable to disturbance. Animals do not always react in an outwardly observable or obvious manner even if they are seriously impacted. What appears to be habituation, where animals respond less and less over time to a stimulus or disturbance, may in fact be the reaction of the most sensitive individuals, while the least sensitive stay.[32] These two scenarios can only be distinguished if all individuals are known and tracked.[33] This is why in-depth long-term studies are needed to clarify the full picture of impacts.

In terms of mitigating the impacts of seismic testing, the options that currently exist are largely unproven in their effectiveness. For instance, most whales are rarely visible at the surface, especially the deep divers, such as Northern bottlenose whales, and especially in anything but perfect visibility. Quantitative analysis has shown that mitigation monitoring detects fewer than 2 per cent of beaked whales (e.g. Northern bottlenose whale) even if the animals are directly in the path of the ship.[34] Other species might be slightly easier to sight, but again monitoring cannot be relied upon to be satisfactorily effective. Marine Mammal Observers are often not sufficiently trained (specifically in the use of Passive Acoustic Monitoring) nor suitably rested, nor are they necessarily listened to when they claim to have sighted a marine mammal.[35] The safety radius is also very dependent on the sound transmission conditions which change with bathymetry, nature of the seafloor, salinity, and the sound speed profile which can change between seasons. There is not even good information as to what constitutes a “safe” exposure, particularly for whales whose hearing cannot be measured. This also varies between past exposure, recovery time, species, age and sex.

In addition, ramp-ups or soft starts, where the number of airguns firing are gradually and audibly increased, do not appear to be consistently and reliably effective in causing humpback whales to move away from the source vessel, a species that is found within the study area.[36] There is large

[30] Gill, J.A. et al. 2001. Why behavioural responses may not reflect the population consequences of human disturbance. *Biological Conservation.* 97:265-268. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.546.453&rep=rep1&type=pdf

[31] Stillman, R.A. & Goss-Custard, J.D. 2002. Seasonal changes in the response of Oystercatchers Haematopus ostralegus to human disturbance. *J. Avian Biol*. 33: 358–365.
http://obpa-nc.org/DOI-AdminRecord/0064594-0064602.pdf

[32] Bejder, L., Samuels, A. M. Y., Whitehead, H. A. L., Gales, N., Mann, J., Connor, R., Heithaus, M., Watson-Capps, J., Flaherty, C., & Kruetzen, M. (2006). Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance. *Conservation Biology*, *20*(6), 1791-1798.

[33] Bejder, L., Samuels, A., Whitehead, H. and Gales, N. (2006) *Interpreting short-term behavioural responses to disturbance within a longitudinal perspective.* Animal Behaviour, 72 (5). pp. 1149-1158.

[34] Barlow, J. and Gisiner, R. 2006. Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. *Journal of Cetacean Research and Management*, *7*(3), pp.239-249.

[35] DFO. 2010. Guidance Related to the Efficacy of Measures Used to Mitigate Potential Impacts of Seismic Sound on Marine Mammals. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/043. http://www.dfo-mpo.gc.ca/Library/341565.pdf

[36] Dunlop, R.A. et al. 2017. Response of humpback whales to ramp-up of a small experimental airgun array. *Marine Pollution Bulletin*. 103: 1-2.

variation in whale behavior, with some groups swimming away from the sound source whereas others approached even relatively loud noise levels, possibly viewing them as a challenge that needed to be confronted. Whales that did avoid the (source) vessel emitting airgun noise may have avoided the vessel itself, not the noise.[37] Although the sound source was different (naval sonar vs. seismic airguns), and the ramp-up procedures are different, it was also found that gradually increasing the sonar source intensity was not an effective method to reduce the risk of physiological effects for humpback whales overall, mainly because most whales did not exhibit very strong avoidance responses to the sonar signals.[38] Animals that had not been exposed to sonar recently, that were not feeding, or were with a small calf were more responsive to the sonar signals. This again illustrates how difficult it is to form conclusions about innocuous noise impacts since especially whales, but also fish, show greater behavioral variation in the wild. Moreover, when animals have a strong motivation not to move away from their current location, ramp-ups are unlikely to be effective.

VI. Climate Change

Climate change impacts were notably absent in the Potential Cumulative Effects section. Exploring for, drilling and the eventual burning of any fossil fuels recovered and the impacts that this will have on the climate should be considered in this analysis. In 2015, nations of the world committed through the Paris Climate Agreement to a substantial decline and possibly a near phase-out out of fossil fuels within 3 decades in order to keep global warming below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius since this would substantially reduce the risks and effects of climate change.[39] Further to that the Intergovernmental Panel on Climate Change (IPCC) released a report in October 2018 stating that the 2 degrees Celsius target is insufficient, and that 1.5 degrees Celsius above pre-industrial levels is the desired goal in order to have clearer benefits for people and natural ecosystems including reducing sea level rise by 10 cm and reducing the likelihood of sea ice free summers in the Arctic Ocean.[40]

The world has already warmed almost 1 degree since humans started burning fossil fuels like oil, gas and coal, and we are already seeing the consequences of this warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, to name a few. Different organizations may apply a range of carbon budgets, meaning the precise amount of unburnable carbon cited under a 1.5 degrees Celsius scenario varies. However, there is a consensus that all the world's known fossil fuel reserves cannot be burned as the level of potential carbon emissions exceeds any reasonable carbon budgets under the 1.5 degrees Celsius scenario.

Numerous calculations have been done on how much of our total global reserves of fossil fuels could be burned to meet even a 2 degrees Celsius warming scenario, which as we know from the IPCC report is insufficient, but that provide important context. Carbon Tracker released a report in 2013 called 'Unburnable Carbon', which concluded that only 20 per cent of total global reserves

[37] Ibid.
[38] Wensveen et al. 2017. Lack of behavioural responses of humpback whales indicate limited effectiveness of sonar mitigation. Journal of Experimental Biology. 220(22): 4150-4161.
[39] https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[40] https://www.ipcc.ch/sr15/

can be burned, leaving up to 80 per cent of assets technically unburnable.[41] The International Energy Agency (IEA)'s World Energy Outlook stated that "No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 degrees Celsius goal, unless carbon capture and storage technology is widely deployed."[42] The Executive Director of the IEA, Fatih Birol, said that two-thirds of proven reserves have to be left undeveloped for a 2 degrees Celsius pathway.[43] In 2015, the Bank of England warned that policies designed to limit carbon emissions could mean some fossil fuels become "stranded assets". Mark Carney, the Bank of England governor, stated "the vast majority of reserves are unburnable if global temperature rises are to be limited to below 2 degrees Celsius." Finally, in a 2013 blog post, even the oil giant Shell stated: "The issue of the bubble arises because the combined proven oil, gas and coal reserves currently on the books if fossil fuel companies (and governments in the case of NOCs) will produce far more than this amount of carbon dioxide when consumed. This implies that in a world where the 2 degrees Celsius limit is imposed and achieved, most of the future value generation of the companies involved will never be realized."[44] These statements are even more important to consider when we are now striving to keep warming to no more than 1.5 degrees Celsius based on the best available science.

Which reserves get burned and which do not will be driven by economic considerations, but it is expected that the cheaper reserves will be consumed first. McGlade & Ekins published an article in the journal Nature called 'The geographic distribution of fossil fuels unused when limiting global warming to 2 degrees Celsius', which concluded that more expensive reserves would not be possible within a 2 degree Celsius scenario, not to mention a 1.5 degrees Celsius scenario.[45] In 2016, the United States president Barack Obama took steps to begin constraining the expansion of fossil fuel production on climate grounds – the rejection of the Keystone XL pipeline, making, the Arctic and notable for this SEA, the Atlantic, off-limits to further exploration and drilling and initiating a programmatic review of coal leasing policies.

This raises the issue of what has come to be known as stranded assets. Before proceeding with a long-term investment in the offshore oil and gas industry, the province of Nova Scotia and the CNSOPB may want to consider the business case for fossil fuels in a world rapidly trying to decarbonize. These projects require billions in investment, and they are intended to produce oil for decades to be economically viable, yet by 2050, only 30 years away, an 80 per cent reduction in carbon emissions is required under the Paris Agreement.

There remain critical outstanding data and research gaps that remain to be filled in this SEA. We have provided several recommendations as to how the SEA could be improved, and hope they are incorporated into the final document.

[41] Carbon Tracker 2013. 'Unburnable Carbon 2013: Wasted Capital and Stranded Assets.' http://carbontracker.live.kiln.digital/Unburnable-Carbon-2-Web-Version.pdf
[42] International Energy Agency. 2012. World Energy Outlook 2012. http://www.iea.org/publications/freepublications/publication/English.pdf
[43] https://thinkprogress.org/june-13-news-leave-two-thirds-of-fossil-fuels-in-the-ground-says-international-energy-agency-e7a4d4177453/
[44] Shell Climate Change. May 3, 2013. 'The Carbon Bubble Reality Check.' Blog post by David Hone, Chief Climate Change Advisor for Shell. https://blogs.shell.com/2013/05/03/bubble/
[45] McGlade, C. and Ekins, P. 2015. 'The geographical distribution of fossil fuels unused when limiting global warming to 2° C'. 517 Nature 187. https://www.nature.com/articles/nature14016

Sincerely,

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