



FUNDY TIDAL ENERGY DEMONSTRATION PROJECT
Environmental Effects Monitoring Report

APPENDIX A
Environmental Impact Predictions

Environmental Impact Predictions - Fundy Tidal Energy Demonstration Project

Linkage between EEMP and Environmental Impact Predictions

The following Table summarizes the linkages between the identified **EEM program** and the environmental impact **Predictions** from the EA Registration Document. It also lists the **Significance Criteria** used to evaluate these predictions.

Page citations in Table are from: Volume 1: Environmental Assessment, Fundy Tidal Energy Demonstration Facility, AECOM 2009

EEM Program Component	Significance Criteria	Prediction
Lobster Catch Study	<p>A significant adverse effect on commercial fisheries is defined as one that is likely to cause any one or both of the following:</p> <p>1.) An unmitigated or non-compensated net financial loss to Commercial Fisheries as a result of the Project. It is understood that a net financial loss must be discernable outside the range of normal inter-annual variation in landings experienced by fishers for a variety of non-Project related reasons.</p> <p>2.) Uncompensated damage to fishing gear or vessels.</p> <p>An adverse effect that does not meet the above criteria is evaluated as not significant.</p> <p>A positive effect on commercial fisheries is defined as an enhancement of opportunities for commercial fisheries which results in an increase in harvests, revenues and/or profitability. p 189 Section 6.9.2</p>	<p>Potential adverse effects on the commercial lobster fisheries will be eliminated or minimized to insignificant levels throughout the Project life. This will be accomplished by working with the local lobster fishers to ensure ongoing and timely communication related to construction, maintenance, monitoring and decommissioning activities in order to minimize interference with lobster fishing seasons.</p> <p>The issuance of Notices to Mariners and updated charts and coordinates for turbine and cable locations, and the use of a 300 m radius fisheries/safety exclusion area around the turbines will decrease the likelihood of interaction between vessels and fishing gear with the Project infrastructure. The proposed fisheries/safety exclusion zones will be small compared to the available fishing grounds within the Minas Passage/Channel area. However, it is recognized by FORCE that a baseline lobster catch program operated over several fishing seasons will likely be required to determine if there is an effect on lobster catches and profitability for individual fishers. Gear damage losses that can be demonstrated will be addressed through compensation on a case by case basis, following international protocols.</p> <p>P 192 Section 6.9.6</p> <p>Apart from direct displacement of a limited number of individual lobsters in the immediate Project footprint, there may be indirect effects on migrating lobsters during construction as a result of noise, vibrations, or sediments. P. 149, section 6.2.4</p>
Fish Migration, Fish Behavior,	A significant adverse effect on Marine Fish and Water Quality is defined as one that creates a significant alteration to a	It is anticipated that marine fish present or migrating through the Project area may experience very limited behavioral changes such as avoidance and aversion, as

<p>studies, CTD and SPM,</p>	<p>population (or a portion of it) to cause an unnatural decline or change in the abundance or distribution of the population to a level from which recovery of the population is uncertain, over one generation or more. Original population levels may not be re-established by natural recruitment (reproduction and immigration from unaffected areas). A significant population effect on fish habitat may alter the quality or extent of valued habitat physically, chemically, and/ or biologically, such that there is a decline in the species diversity of the habitat. This effect may be demonstrated by a decline in abundance and/or change of habitat components (i.e., sediment quality, food resources, water quality, and riparian vegetation).</p> <p>An adverse effect that does not meet the above criteria is evaluated as not significant.</p> <p>A positive effect on Marine Fish and Water Quality is defined as an enhancement in the quality or extent of habitat, an increase in species diversity, or an enhancement of a population such that an increase in that population is evident, or such that natural mortality is reduced</p> <p>p 144, section 6.2.2</p>	<p>well as limited mortality and habitat disruption. The extent of these effects is not known given the lack of specific information related to noise generated by the proposed devices, and the background noise in the Project area. P 153 Section 6.2.6</p> <p>The fundamental knowledge required to assess the environmental effects of TISEC on marine fish does not currently exist; consequently, building the research knowledge base among the scientific community of the Bay of Fundy represents a valuable asset that will amplify the potential for this region to become a global centre of excellence in marine energy developments (Jacques Whitford et al. 2008). It is acknowledged that there is a degree of environmental risk involved in Project development that cannot be completely eliminated due to this lack of knowledge. Monitoring and follow-up, described previously, will be an integral part of confirming the predictions of this assessment, informing future commercial developers and will provide opportunities for further research on the Minas Passage, the Project and potential interactions.</p> <p>By following existing standard construction practices, available guidelines and associated mitigation measures, Project activities and components are not likely to cause significant adverse residual effects on marine fish within the Project area or vicinity (i.e., Minas Passage and Minas Basin). In general, this is due to the relatively small scale of the project, combined with the limited duration and intermittent nature of the Project activities.</p> <p>P. 154 section 6.2.6</p>
<p>Acoustic Environment</p>	<p>Significance criteria for the Acoustic Environment is defined by potential interaction with Marine Birds and Mammals, Benthos, Fish and the Commercial fishery.</p>	<p>Project related vessels used in all Project phases could result in increased noise levels which may cause fish to exhibit localized temporary avoidance behavior in the area of the vessels. p 145 section 6.2.3</p> <p>Increased noise (magnitude, frequency, duration and character) above background levels resulting from construction or decommissioning (including increased vessel traffic), may result in short or long-term changes to behavior and habitat use, injury or mortality of marine fish. Once the construction and decommissioning phases of the Demonstration Facility are complete, the disruption to marine fish will be related primarily to noise and vibration produced by turbine operations. P 144, section 6.2.3</p>
<p>Currents and Waves</p>	<p>Significance criteria for the Acoustic environment is defined by potential</p>	<p>No significant adverse residual effects are anticipated to be likely;</p>

	<p>interaction with Marine Fish and Water Quality, Recreational and Commercial Fishing, Marine Benthos, Marine Mammals, Marine Birds, and the Intertidal Environment.</p>	<ul style="list-style-type: none"> • Marine Fish and Water Quality: P. 154 section 6.2.6 • Recreational and Commercial Fishing: P. 149, section 6.2.4 • Marine Benthos: P 142, section 6.1.6 • Marine Mammals: p 165, section 6.4.6 • Marine Birds: p 164, section 6.4.4 <p>Turbine operation could potentially result in changes to the patterns of sediment distribution, which in turn may have an environmental effect on marine fish and invertebrates; however, this issue is not well understood. If a significant fraction of the kinetic energy is removed (i.e., commercial scale tidal facility), the overall effect in Minas Basin may include reduction in turbulent mixing, changed patterns of current movement within the Basin, and hence changed patterns of sediment distribution. Deposition characteristics outside the natural variability of an area will cause changes to the water column and, in turn, water quality.</p> <p>Such deposition may also cause changes to the local seabed, sediment dynamics and ecology of the area. Sediment properties affect the benthic organisms that inhabit them, and consequently the fish and other species that feed upon them. The distribution and abundance of marine fish species are largely a function of sediment properties, which could potentially be changed as a consequence of tidal power development. Effects associated with loss of energy from water flows in the Passage and subsequent impact on sediment deposition will be negligible based on the relative scale of the Demonstration Project and the scale of tidal flow and energy in the Minas Basin (Jacques Whitford et al. 2008).</p> <p>p. 140 section 6.1.4</p>
<p>Marine Birds and Mammals</p>	<p>A significant effect to marine birds is defined as an unnatural decline or change in abundance and/or distribution, over one or more generations, of a population of a species or portion thereof, permanent avoidance of the area, serious injury to or the loss of one or more individuals from an endangered or threatened species, the loss of its critical habitat, or any substantial change in migration patterns.</p>	<p>There is expected to be some short-term, localized changes to marine bird habitat use in the Project area as a result of noise associated with vessel traffic, particularly for installation and decommissioning. Despite the increase in vessel traffic, the risk of direct mortality from collisions for marine birds is considered to be extremely low. Additionally, installation of turbine devices and cables is not expected to have substantive residual effects on food sources or marine habitat for marine birds.</p>

	<p>Natural recruitment may not re-establish the population, or any populations or species dependent upon it, to its original level within several generations.</p> <p>An adverse effect that does not meet the above criteria is evaluated as not significant.</p> <p>A positive effect to marine birds is defined as a measurable population increase or enhancement in the quality of habitat for marine related bird species. P. 161 section 6.4.2</p>	<p>p 164, section 6.4.4</p> <hr/> <p>Project activities and components are not likely to cause significant adverse residual effects on marine birds within the Project area or vicinity.</p> <p>p 164, section 6.4.4</p>
	<p>A significant effect to marine mammals is defined as an unnatural decline, over one or more generations, in the abundance and/or change in the distribution population of a species or portion thereof, permanent avoidance of the area by marine mammals, or a serious injury to or the loss of one or more individuals from an endangered or threatened species. Natural recruitment may not re-establish the population, or any populations or species dependent upon it, to its original level within one or more generations.</p> <p>An adverse effect that does not meet the above criteria is evaluated as not significant.</p> <p>A positive effect to marine mammals is defined as one that results in a measurable population increase and/ or enhances the quality of critical habitat. p.155, section 6.3.2</p>	<p>Project activities and components are not likely to cause significant adverse residual effects on marine mammals within the Project area or vicinity (i.e., Minas Passage). p 165, section 6.4.6</p>
	<p>A significant adverse effect on all marine species at risk as listed in Schedule 1 of SARA as Extirpated”, “Endangered” or “Threatened” or listed by the Nova Scotia Endangered Species Act as “Endangered” or “Threatened”, is defined as a non-permitted contravention of any of the prohibitions stated in Sections 32-36 of SARA, or in contravention of any of the prohibitions stated in Section 13 of the</p>	<p>Project activities and components will not cause significant adverse residual effects on Marine Species at Risk within the Project area or vicinity (i.e., Minas Passage and Minas Basin).</p> <p>p. 172,section 6.5.6,</p>

	<p>Nova Scotia Endangered Species Act.</p> <p>A significant adverse effect on marine species at risk but not under the protection of SARA or the Nova Scotia Endangered Species Act (i.e., listed in SARA but not as “Extirpated”, “Endangered” or “Threatened” in Schedule 1; listed as “Species of Special Concern” within Schedule 1 of SARA; or ranked as “S1”, “S2”, or “S3” by ACCDC and also ranked “red” or “yellow” by NSDNR) is defined as an alteration of marine habitat physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of a viable population that is dependent upon that habitat, such that the likelihood of the long-term survival of these population(s) is substantially reduced, the direct mortality of individuals or communities such that the likelihood of the long-term survival of these population(s) is substantially reduced, or in the case of marine species at risk listed in Schedule 1 of SARA, noncompliance with the objectives of management plans (developed as a result of Section 65 of SARA) that are in place at the time of relevant activities.</p> <p>A positive effect on marine species at risk is defined as an increase in populations and/or diversity of species at risk, or an enhancement in the quality of critical habitat for species at risk. P. 166, section 6.5.2</p>	
<p>Benthic Habitat and Scour</p>	<p>A significant adverse effect on marine benthos is defined as a physical, chemical, or biological alteration of benthos, in quality or extent, to such a degree that there is a decline in abundance and/or change in distribution of benthos, beyond which natural recruitment (reproduction and immigration from unaffected areas)</p>	<p>The fundamental knowledge required to assess the environmental effects of TISEC on currents and therefore sediments and marine benthos does not currently exist; consequently, building the research knowledge base among the scientific community of the Bay of Fundy represents a valuable asset that will amplify the potential for the Maritime region to become a global centre of excellence in marine energy</p>

	<p>would not return that population, within a generation or more, to its former level. Such a change could result in alterations in sediment nutrient cycling, community structural complexity, biotic interactions, habitat pattern, population dynamics and ultimately genetic diversity.</p> <p>An adverse effect that does not meet the above criteria is evaluated as not significant.</p> <p>A positive effect on marine benthos is defined as an enhancement in benthic quality, increase the species diversity, or increase the area of the valued benthic habitat. p. 137, section 6.1.3</p>	<p>developments (Jacques Whitford et al. 2008). It is acknowledged that there is a degree of environmental risk involved in Project development that cannot be completely eliminated due to this lack of knowledge. Monitoring and follow-up, described previously, will be an integral part of confirming the predictions of this assessment, informing future commercial developers and will provide opportunities for further research on the Minas Passage, the Project and potential interactions.</p> <p>By following existing standard construction practices, available guidelines and associated mitigation measures, Project activities and components are not likely to cause significant adverse residual effects on marine benthos within the Project area or vicinity (i.e., Minas Passage and Minas Basin).</p> <p>P 142, section 6.1.6</p>
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