



Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2016 Salish Sea Ecosystem Conference
(Vancouver, BC)


Jan 1st, 12:00 AM - 12:00 AM

Environmentally Sound Energy for the Future

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<https://cedar.wwu.edu/ssec/2016ssec/habitat/59>

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Environmentally Sound Energy for the Future

SALISH SEA ECOSYSTEM CONFERENCE
15 APRIL 2016

Genevra E L Harker-Klimeš

Diverse technologies to generate marine renewable energy

▶ Waves

Attenuator | Point absorber | Oscillating wave surge | Oscillating water column | Overtopping | Pressure differential | Bulge wave | Rotating mass

▶ Tidal currents

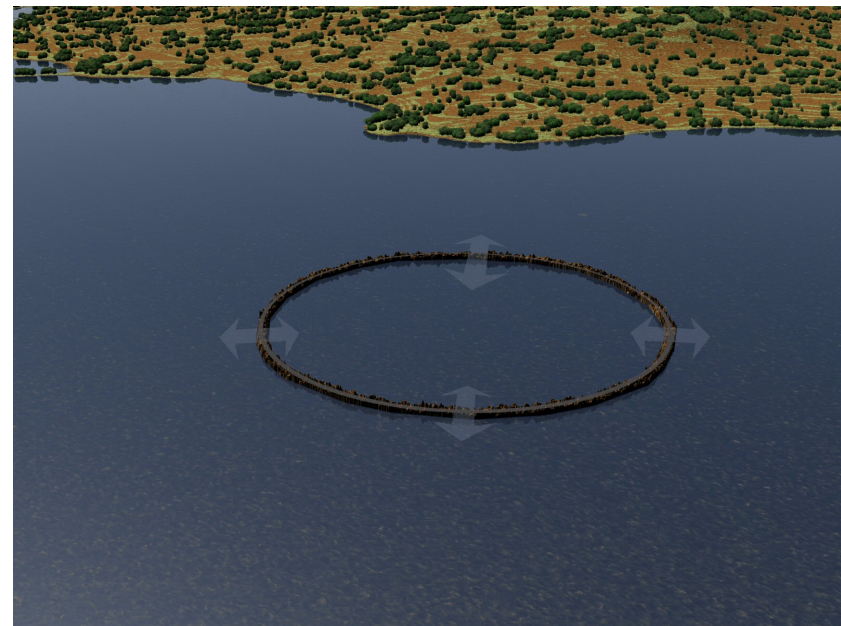
Horizontal axis | Vertical axis | Ducted | Hydrofoil | Archimedes screw | Kite

▶ Tidal heights

Barrages | Lagoons

▶ Ocean currents

▶ Ocean thermal exchange



Marine Renewable Energy Potential



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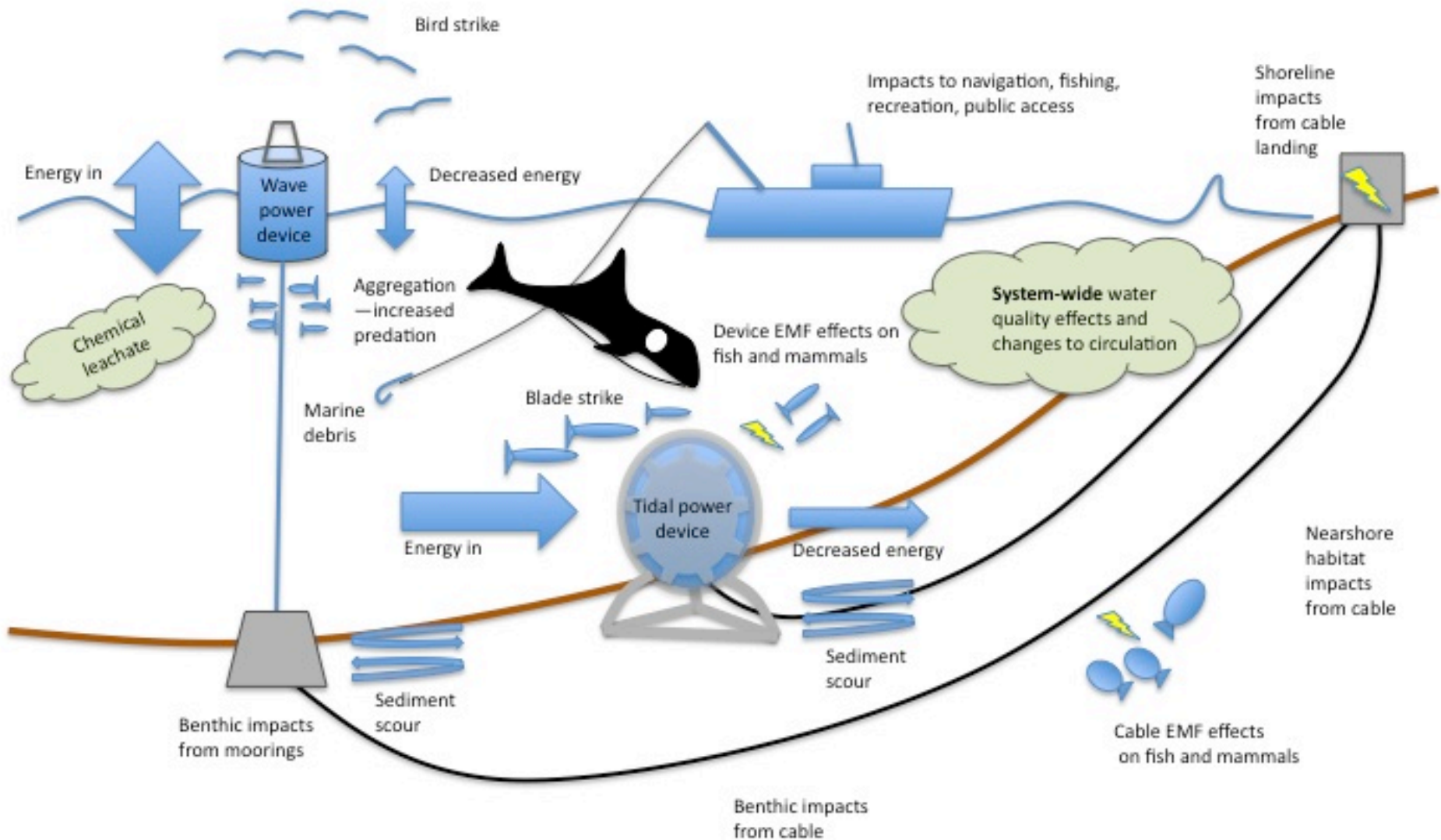


Potential Environmental Effects

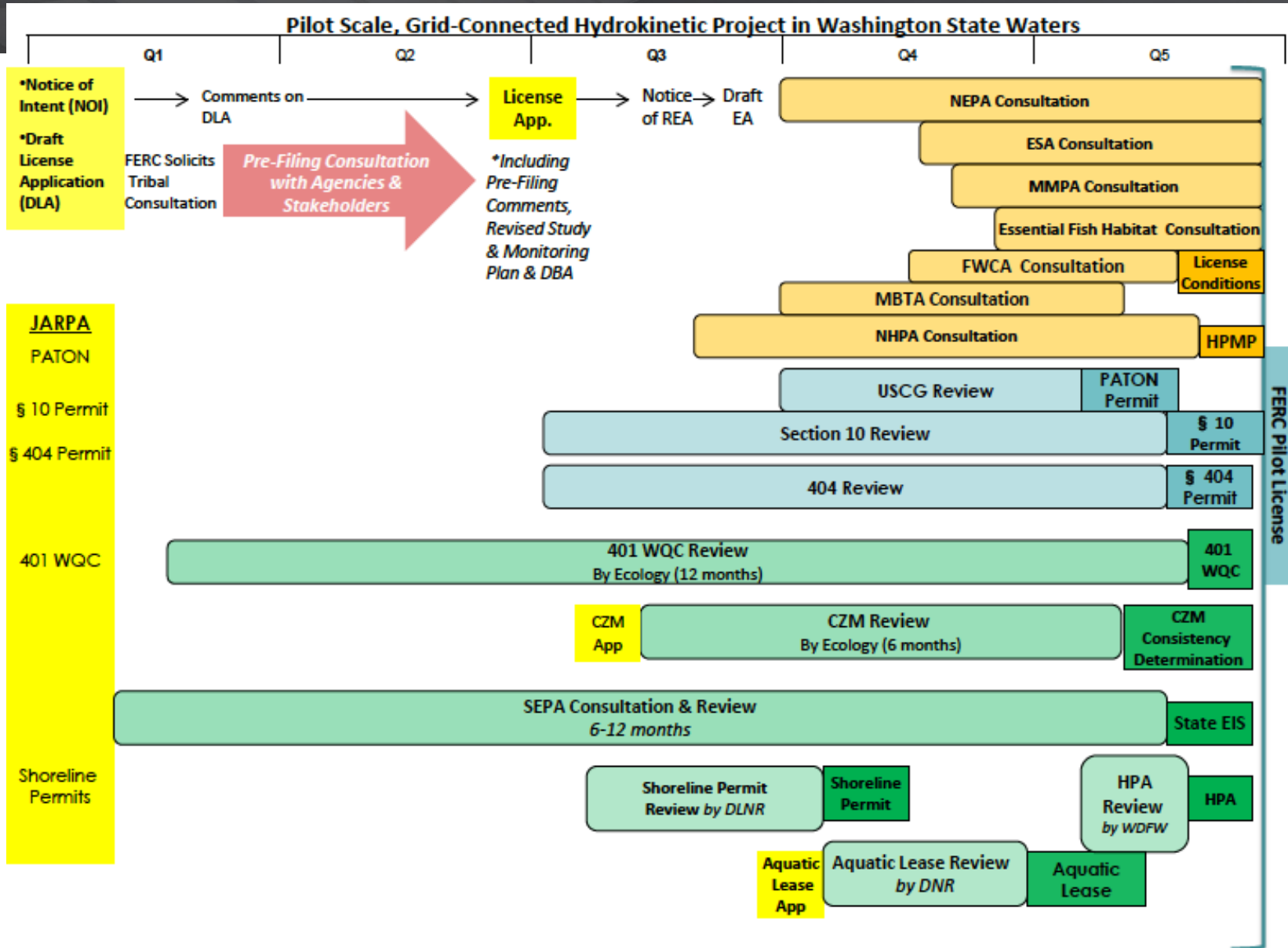


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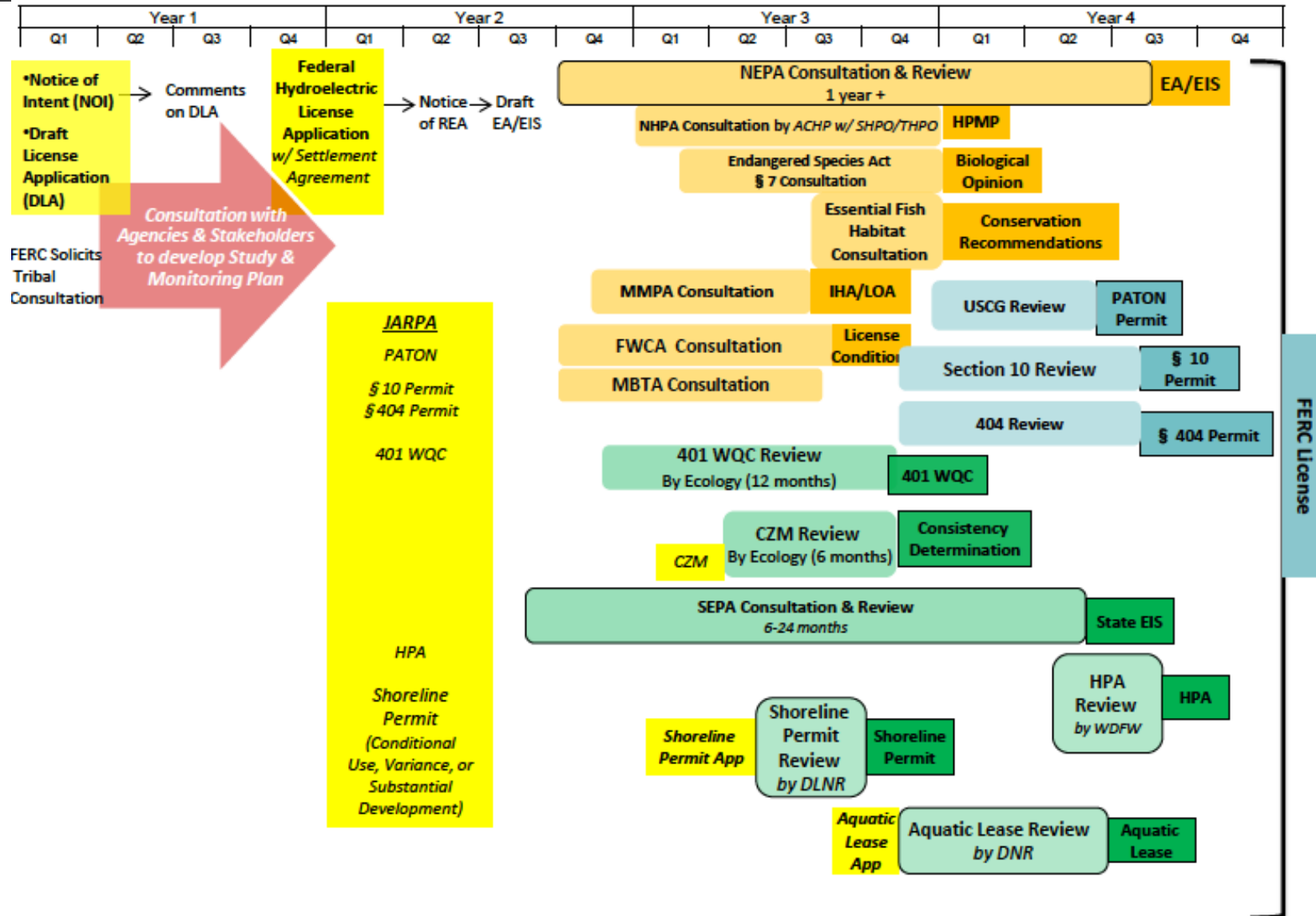


Permitting Requirements - Pilot



Permitting Requirements - Commercial

Commercial Hydrokinetic Project in Washington State Waters



Potential Environmental Effects



**UNCERTAINTY =
INCREASED TIME & MONEY**



State of the Science



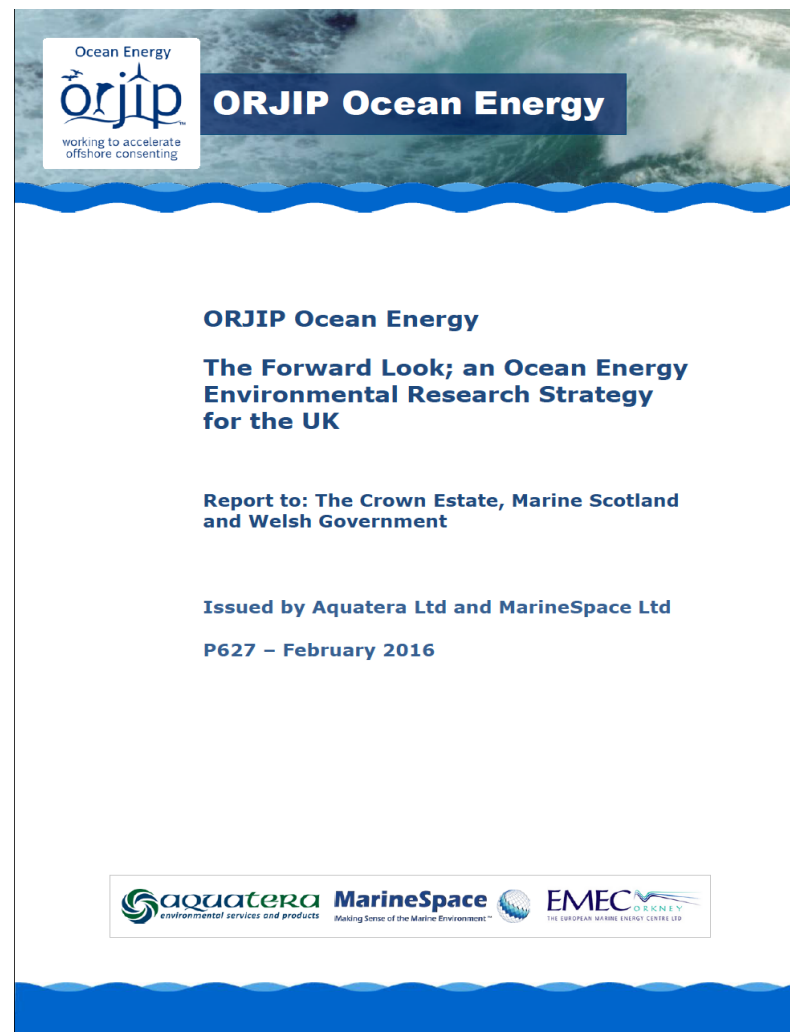
- ▶ Collision risk for animals around tidal turbines
- ▶ Risk to animals from underwater sound
- ▶ Changes in physical systems: energy removal and change in flow
- ▶ Effects of EMF on marine animals from cables and MRE devices
- ▶ Changes to habitats: benthic habitats and reefing patterns
- ▶ Marine spatial planning

<http://tethys.pnnl.gov/annex-iv-2016-state-science-report-public-review-draft>

Offshore Renewables Joint Industry Programme – UK focus

Key ecological issues identified as:

- ▶ Collision risk with tidal devices – birds, marine mammals and fish
- ▶ Underwater noise – lack of existing data for operational devices, and unknown effects
- ▶ Electromagnetic fields – unknown effects, particularly on fish
- ▶ Displacement – particularly marine mammals, basking sharks and fish



Key Issues



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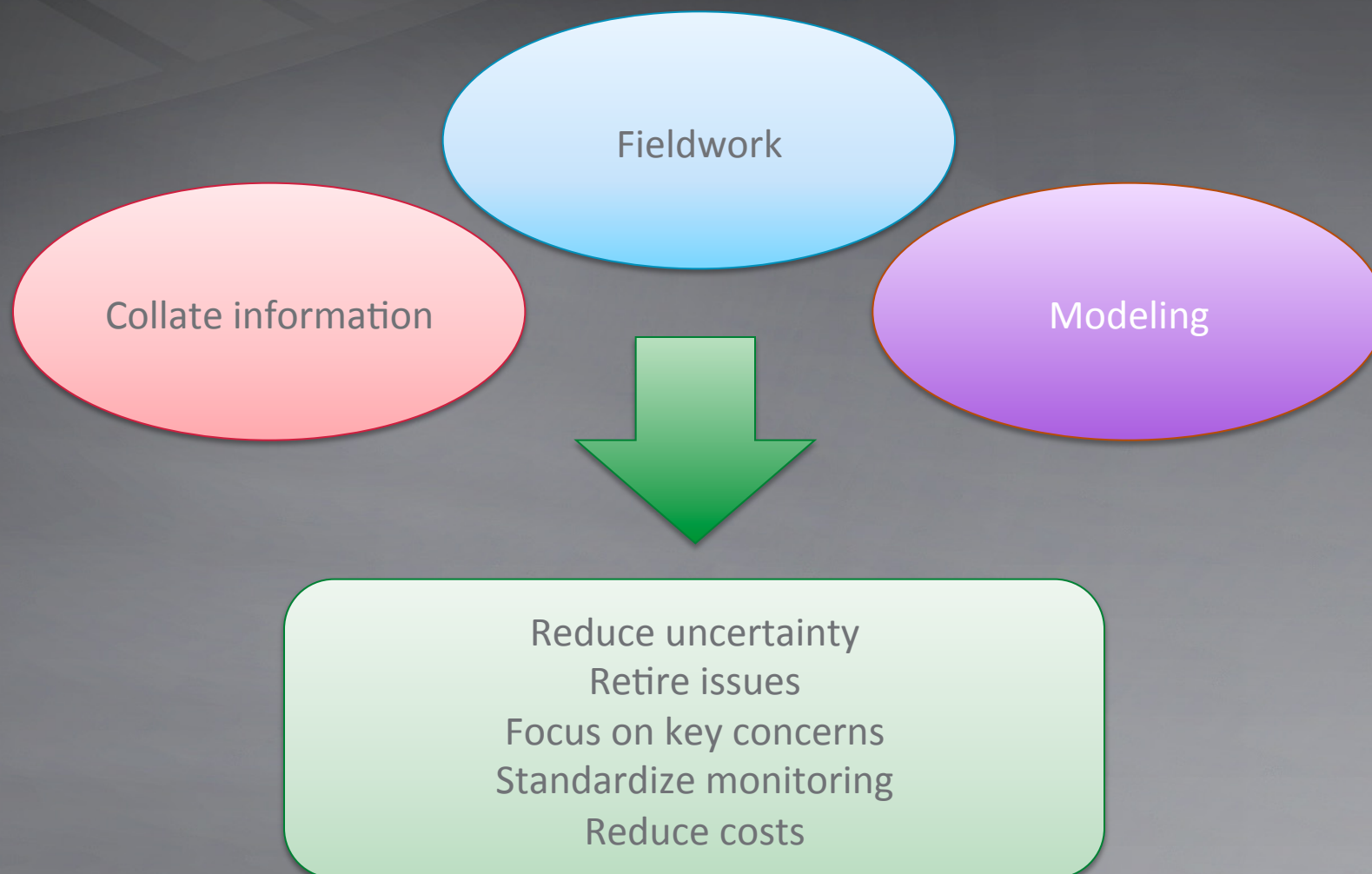
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Reduce Uncertainty



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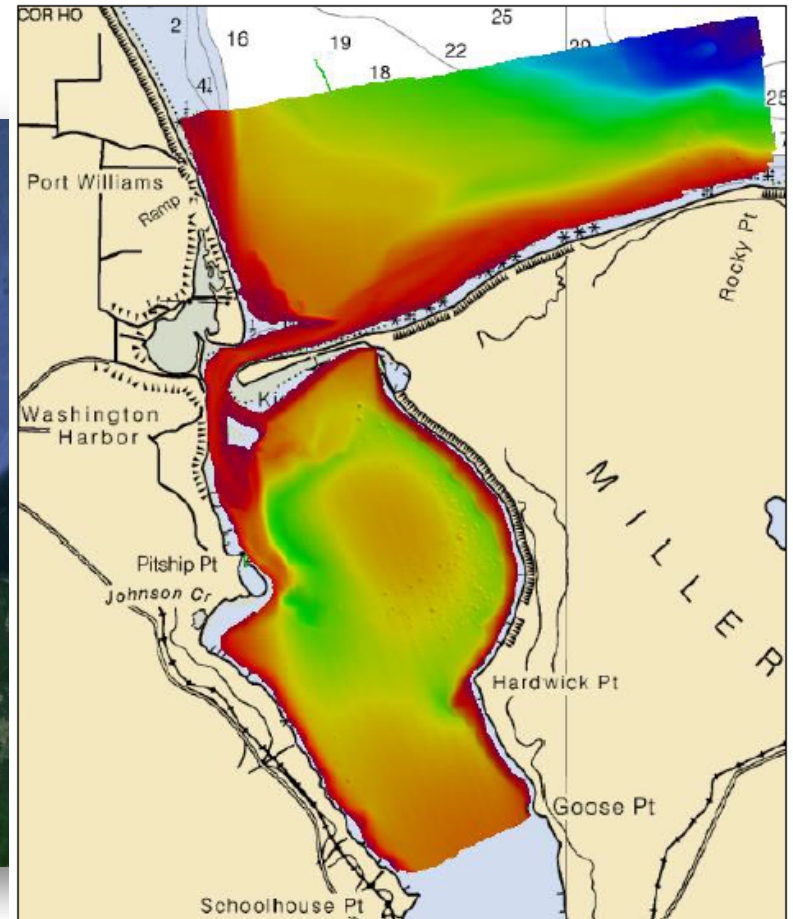
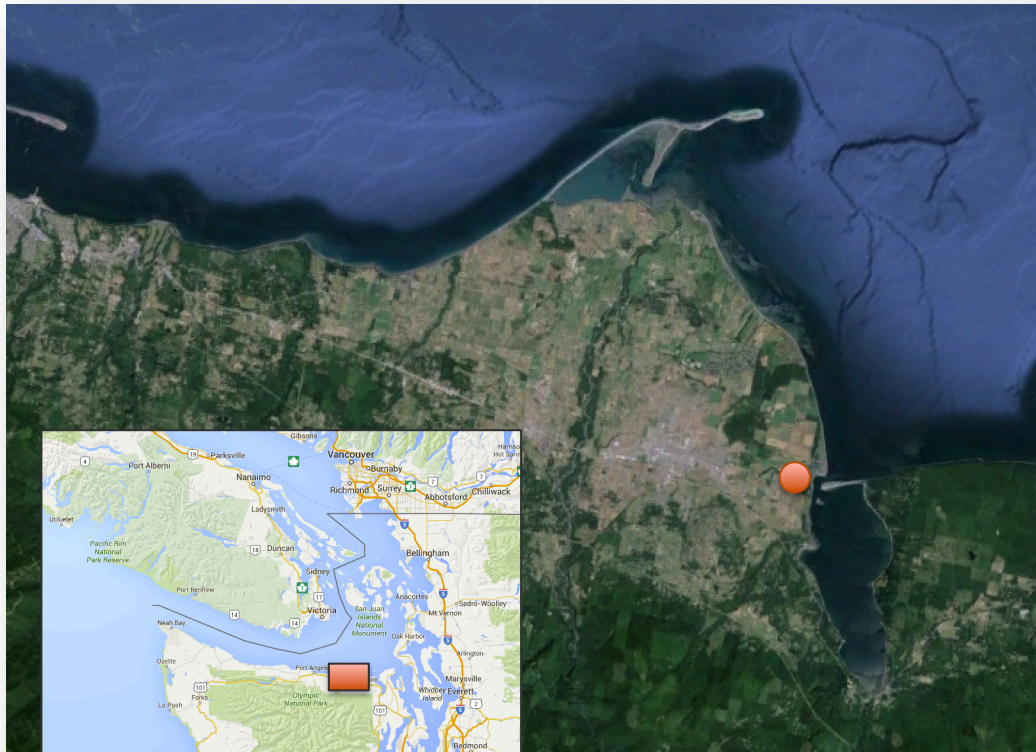


Marine Sciences Laboratory



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Location



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- ▶ Relatively high flow through channel
- ▶ Ability to avoid external noise sources
- ▶ Low background EMF
- ▶ Introduce structures on seabed for monitoring
- ▶ Easy access
- ▶ Scientific facilities and personnel
- ▶ Ability to collect wide range of field data



In-water Activities



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- Specific environmental issues

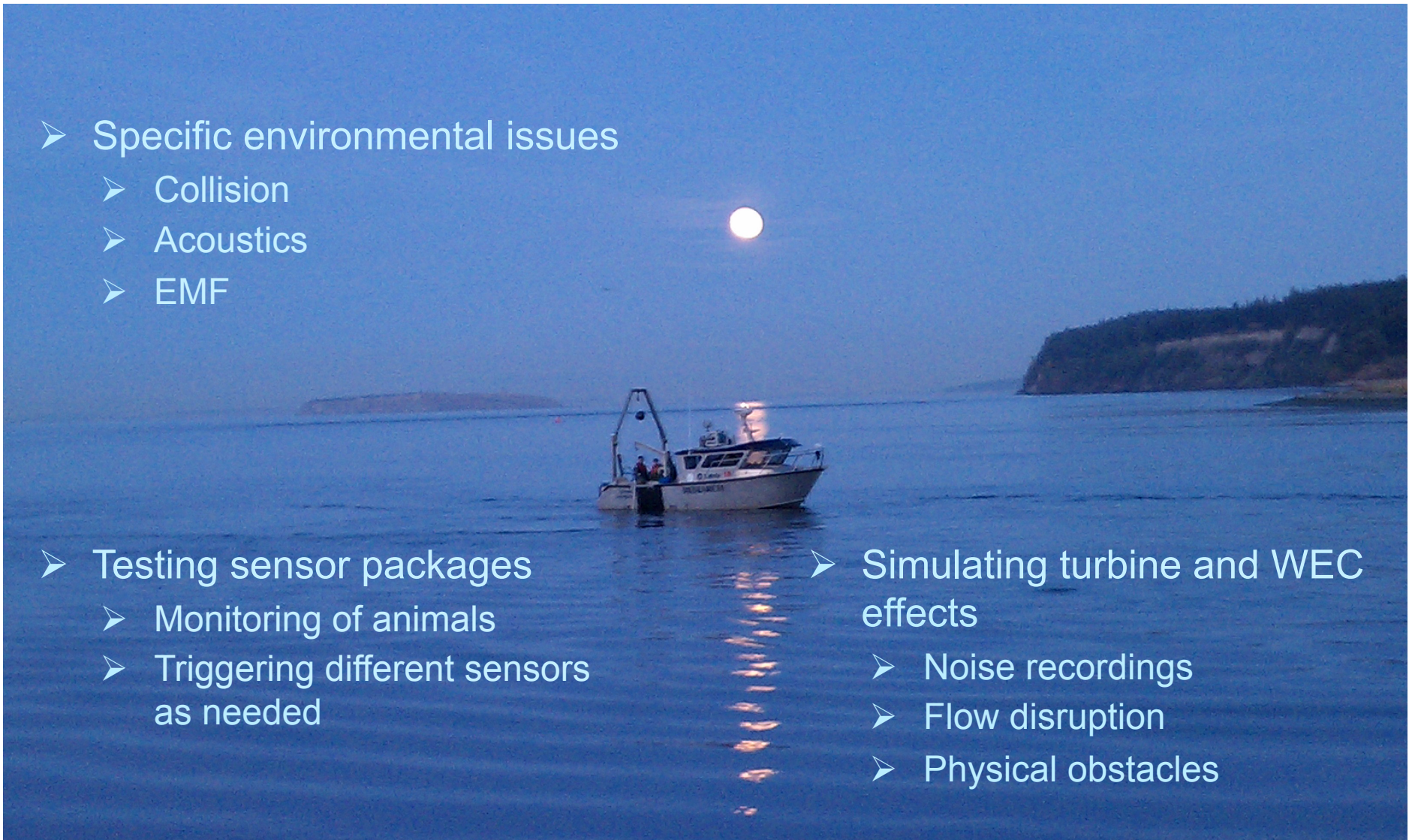
- Collision
- Acoustics
- EMF

- Testing sensor packages

- Monitoring of animals
- Triggering different sensors as needed

- Simulating turbine and WEC effects

- Noise recordings
- Flow disruption
- Physical obstacles



Contact Details



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Thank You

