

The Multi-Partner Research Initiative: Canada Field Trials

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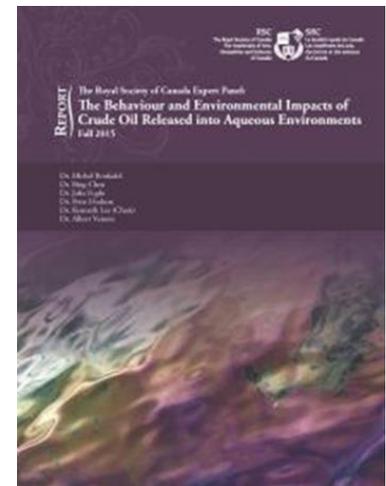


Multi-Partner Research Initiative (MPRI)

GOAL: To *establish an integrated, global research network* to advance oil spill research in Canada and enhance Canada's level of preparedness and response capability

FOCUS: To *advance scientific knowledge* to address major gaps in oil spill response and remediation strategies that will support the development, validation and Canadian regulatory approval of Alternative Response Measures (ARMs).

PRIORITIES: Aligned with recommendations of the *Royal Society of Canada 2015 Report* on Behavior & Environmental Impacts of Crude Oil Released into Aqueous Environments as well as *Transport Canada's Tanker Safety Expert Panel Report*



RSC - High Priority Research Themes

1. Environmental impacts of oil spills in high risk and poorly understood areas
2. Effects of oil spills on aquatic life and wildlife at the population, community and ecosystem levels
3. Determine environmental and ecological characteristics of areas that may be affected by future oil spills and to identify any unique sensitivity to oil effects
4. **Controlled field studies** and “spill of opportunity” long-term monitoring programs to understand spill behaviour and effects across a spectrum of crude oil types in different ecosystems and conditions
5. **The efficacy of different oil spill response techniques**
6. *Improved spill prevention and decision support systems to ensure sound response decisions and effectiveness*
7. *Updating and refining risk and impact assessment protocols for oil spills in Canada*

Multi-Partner Research Initiative (MPRI)

NETWORKING: *Oil spills are a global concern.* The MPRI network of projects aims to create valuable training opportunities in academia and industry and foster and partnerships between key international organizations in oil spill research to reduce duplication of research effort, optimize the use of resources

ENGAGEMENT: Involvement of key clients and stakeholders that include representatives from the Federal Government, Provinces and Territories, Indigenous Groups, the Oil and Gas Industry, regulators, operational oil spill response organizations, academia, fisheries groups NGO's, and **international research organizations**

TRAINING THE NEXT GENERATION: Nearly all projects have significant budgets for training of students and other levels of personnel

LEVERAGE OF FUNDS: DFO has currently funded 35 projects for a total of \$46M over 4 years. Additional leveraged funding is essential for conduct of field trials

MPRI Program Areas

Based on advice from the *MPRI Advisory & Steering Committees* and an *Expert Workshop* the program was focused on six key areas of research to increase Canada's response tool-box were identified :

- *Spill treating agents*
- *In situ burning*
- Oil translocation
- Decanting and oily waste disposal

- *Natural attenuation / Bioremediation*
- Crosscutting Expertise

Alternative Response Measures (ARMs) - complement conventional mechanical clean-up techniques while offering a net environmental benefit



Permitting of Field Trials

Canadian Oil and Gas Operations Act (COGOA) & Accord Implementation Acts

Schedule 2 - Scientific research S25.4(1): *For the purpose of a particular research project pertaining to the use of a spill-treating agent in mitigating the environmental impacts of a spill, the Minister of the Environment may authorize, and establish conditions for, the deposit of a spill-treating agent, oil or oil surrogate in the zones referred to in paragraph 3(d) or the waters superjacent to the continental shelf of Canada.*

Canadian Environmental Protection Act (CEPA)

Section 125: Despite subsection 36(3) of the Fisheries Act, subsection 123(1) and regulations made under paragraphs 93(1)(a), (b), (c) and (d) and 209(2)(a), (b), (c) and (d), the Minister may (a) examine and conduct research, including tests, respecting the causes, circumstances and effects of and remedial measures for an environmental emergency; and (b) conduct and publicize demonstration projects.

SPILL TREATING AGENTS (STAs)

- Study of products that change the behaviour of spilled oil in the environment to facilitate response and clean up
- Research to understand and predict the effectiveness and potential environmental interactions/impacts (oil droplet formation/interactions with suspended particles, fate, behaviour, toxicity, etc.) associated with use of STAs
- Pending development - A controlled offshore oil study possibly including a subsurface release of oil with and without the addition of spill treating agents (oil dispersants) to understand oil droplet formation and plume dispersion for use in predictive models.

Keywords: Dispersant effectiveness, blowouts, churn flow, photo-oxidation, oil droplets, oil particle interactions, plume behaviour, surface transport, shoreline cleaning agents, bio-based agents, oil spill reconnaissance

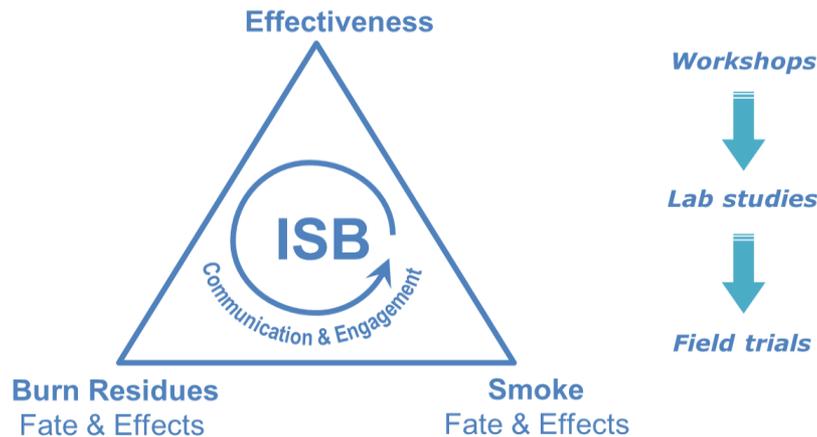
SPILL TREATING AGENTS (STAs)

- 1.02 – Memorial U. *Effectiveness of using dispersants/biodispersants*
- 1.03 – Memorial U. *Oil spill reconnaissance (AUV)*
- 1.04 – Texas A&M *Subsurface blowout modelling (Canada)*
- 1.05 – NJIT *Churn flow / plume dynamics*
- 1.06 – WHOI *Photochemical oxidation*
- 1.07 – Memorial U. *Dispersant interactions (oil particle interactions)*
- 1.08 – John Hopkins U. *Plumes and slicks (oil droplet)*
- 1.09 – Concordia U. *Shoreline treating agents*
- 1.10 – NJIT *Surface transport of oil*
- 1.11 – SINTEF *Dispersant effectiveness*
- 1.12 – SINTEF *Biobased agents*

**Only Lead Agency identified*

IN-SITU BURNING (ISB)

- Controlled ISB have been demonstrated in Canada, the US and Scandinavia since 1970s to remove oil spills in ice conditions
- >400 burns removing 220,000 to 310,000 bbls oil following the DWH incident resulted in state of knowledge reports (OGP) and a renewed research interest to support its future use



IN-SITU BURNING (ISB)

- Review ISB state of knowledge
- Document/analyze concerns/perceptions of local and indigenous communities
- Evaluate the application methods and effectiveness of herding agents
- Conduct of field trials to assess the efficacy and environmental impacts of the technology (eg., toxicity of atmospheric contaminants/burn residues)
- Develop operational guidelines

Keywords: ISB review, field trials, fire booms, herders, ignitors, burn residues, toxicity

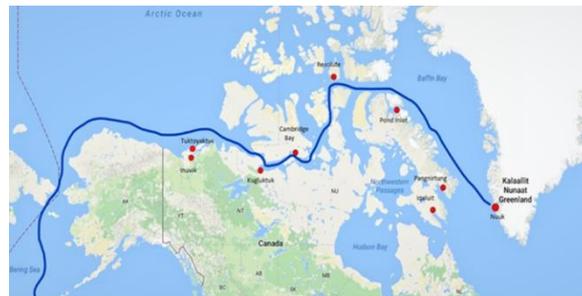
MPRI – ISB Funded Projects

MPRI is supporting 6 projects under the ISB theme:

- In Situ Burning: Progress, Perceptions, and Recommendations (UofM, SL Ross)
- Small-scale Testing of Alternative Response Options for Spilled Conventional Oils and Unconventional Oils Transported in Canada (UofM, SL Ross)
- Experimental Field Study of In-Situ Burning with Fire Booms to Reduce Burn Residues (UofM, SL Ross)
- Experimental Field Study of Aerial Herder and Igniter Use for In Situ Burning (UofM, SL Ross)
- Better characteristics of burned residues from field- and laboratory-generated ISB (SINTEF)
- Toxicity and Biodegradation of Treated Petroleum Oils (US EPA)

NATURAL ATTENUATION

- Monitored natural recovery (natural attenuation) should be recognized as an operational spill response strategy
- Biodegradation is a major process in the removal of the oil components through the action of microorganisms.
- Evaluation of bioremediation effectiveness for fuel (Marine diesel, bunker C, low-sulfur fuel) and crude oils



NATURAL ATTENUATION

- Determination of in situ oil biodegradation capacity for different substrates in different geographical locations (inherent natural attenuation capacity) is a key aspect of developing relevant oil spill remediation approaches for Canada (McGill U., U of M)
- Conduct studies in the Arctic where the risk of oil spills is anticipated to increase due to increases in marine traffic from global warming (i.e. extended open water season in the North West Passage) and enhanced urban/industrial development (including offshore oil and gas) (McGill U., U of M)
- Forecasting spilled dilbit fate & behaviour (Memorial U., SOA)

Keywords: Biodegradation potential, arctic baseline/response, field studies, dilbit,

MPRI Cross-cutting Science in Field Trials

Chemical Composition and Properties

- Characterization of fresh and weathered crude, unconventional crude and refined oils

Oil Detection and Identification

- Environmental forensics
- Remote sensing, In situ monitoring

Oil fate, behaviour, and transport

- Oil-ice interactions
- Oil droplets, oil-particle interactions
- Oil trajectory modelling (surface and deep-water)
- Mass balance

Microbial ecology/genomics

- Microbial population and community structure
- Microbial oil degradation potential

Biological /Toxicity analysis

- Natural variability (population & community response)
- Environmental effects monitoring (EEM), baseline information, monitoring protocols
- Fisheries impacts

Data analysis for oil spill prevention, preparedness, response and recovery

- Environmental risk assessment, resilience to oil, ecosystem recovery, predictive modelling impacts/recovery
- Decision support system development, spill control strategies
- Endpoints for clean up, Net Environmental Benefit Analysis
- Ecosystem services and socio-economic impacts

