MPRI Offshore Burning Experiment (MOBE)

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University of Manitoba

In collaboration and partnership with:

SL ROSS, TRIOX, Memorial University, Dalhousie University, Western, Canada NRC-CNRC, Huntsman Marine Science Centre, ECRC ~ SIMEC, BSEE Bureau of Safety and Environmental Enforcement, Prince William Sound Science Center, United States Coast Guard, NOAA, United States Environmental Protection Agency, ARA, MSRC Marine Spill Response Corporation, Dickins, Water Mapping, Aarhus University, SINTEF, ExxonMobil, Shell, Chevron

Introduction – In situ burning as an oil spill response tool

Pros:

- potential to remove large amounts of oil from the sea surface
- can help to protect aquatic species
- can help to prevent shoreline contact, coastal amenities and intertidal marine life
- minimizes waste generation

Cons:

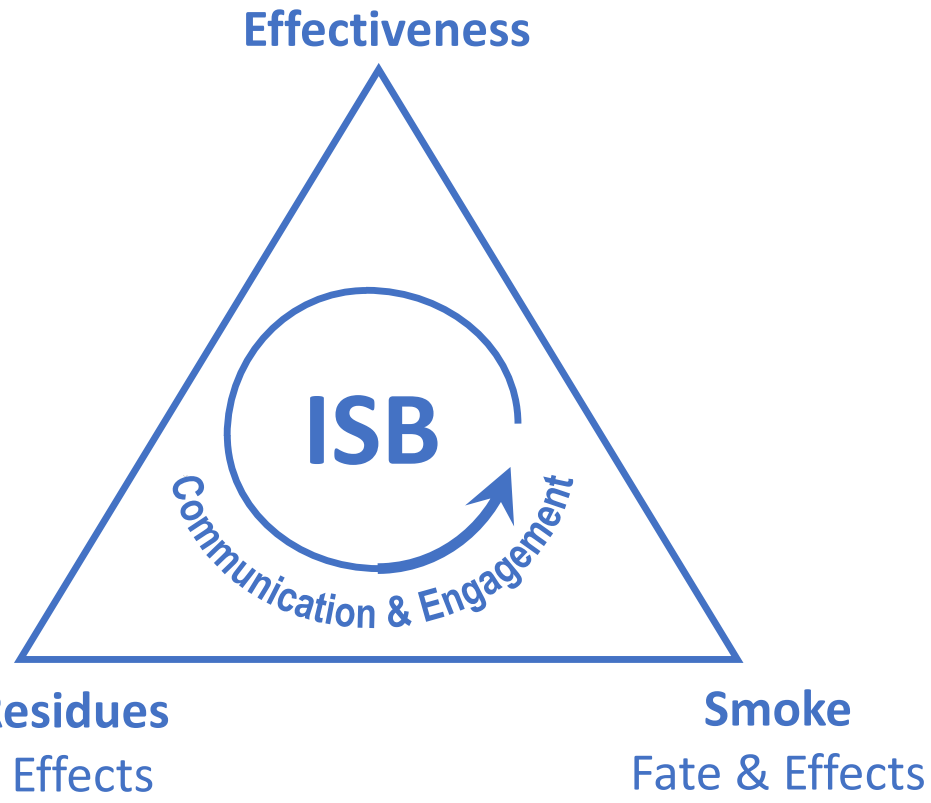
- smoke has the potential to impact human health therefore is a technique more suitable for use offshore/away from populated areas
- affects air quality in the burn area and downwind
- potential burn residue
- window of opportunity

In situ burning research under MPRI

Workshops

Lab studies

Field trials



3.01 Gap Analysis

3.02 Lab Tests

3.08 Burn residue characterization

3.10 Field Trials – MOBE

MOBE in a Nutshell

WHO	University of Manitoba, SL Ross, and 20+ universities/organizations
WHEN	2-year project (December 2020 - April 2022), building on other MPRI projects
WHAT	In situ burning field trials
WHERE	Field trials planned for summer 2021 offshore Newfoundland
WHY	Scientific advancement of emerging in-situ burning and monitoring technologies to improve marine oil spill response in Canada

WHO: Project Team

- **Project Lead: Dr. Fei Wang, University of Manitoba**
  - Canada Research Chair (Tier 1) in Arctic environmental chemistry; Program Area Lead, MPRI In Situ Burning
- **Experimental Design and Operations Team Lead: Steve Potter, SL Ross, Ottawa**
  - International leader in in situ burning R&D, with over 600 major studies on oil spills.
- **Consultation and Engagement Team: Triox and DG Taylor**
- **Other major expertise**
  - Oil-particle interactions, oil burn residue: **Uta Passow**, MUN
  - Ocean monitoring technologies (AUV/ROV…): **Doug Wallace**, Dalhousie
  - Oil biodegradation: **Charles Greer**, NRC
  - Oil biological effects/toxicity testing: **Benjamin De Jourdan**, Huntsman Marine Science,
  - International experts:
    - ISB: **Karen Stone**, BSEE; **Tim Nedwed**, ExxonMobil; **Scott Pageau**, OSRI, USA; **Liv-Guri Faksness**, SINTEF, Norway; **Janne Fritt-Rasmussen**, Aarhus U., Denmark
    - Environmental monitoring: **Dana Tulis,** USGS; **Lisa Dipinto**, NOAA; **Brian Gullett**,EPA, USA
- **Oil response organizations: CCG, ECRC, USCG, MSRC**

WHY doing in-situ burning field trials now?

- **Newfoundland Offshore Burn Experiment (NOBE):** The last and most extensive offshore, full-scale ISB field trial experiment in Canada was performed offshore Newfoundland in August 1993.

- **Deepwater Horizon Response:** ISB was used extensively as a response measure to the Deepwater Horizon oil spill disaster in 2010, and effectively removed large amounts of the spilled oil at the ocean's surface.

- **Gaps/concerns** remain in 1) operational windows; 2) burn efficiency; 3) air quality impact of the smoke; and 4) marine ecosystem impact of burn residue.

NOBE in situ burn experiment, August 1993 (Photo by Gary Shigenaka, NOAA)

Emerging ISB and environmental technologies have been developed since NOBE/Deepwater Horizon Spills to address these gaps/concerns, but none have been tested and evaluated at the field scale

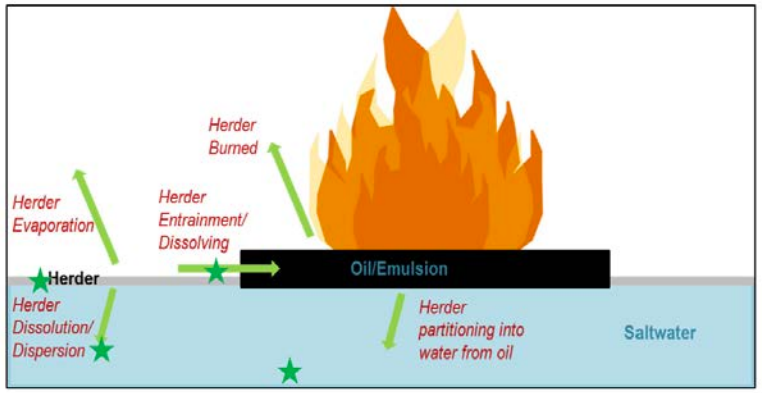
WHY?

MOBE Objective

To support the **policies, protocols, and planning** for safe and effective use of in-situ burning in Canadian waters by:

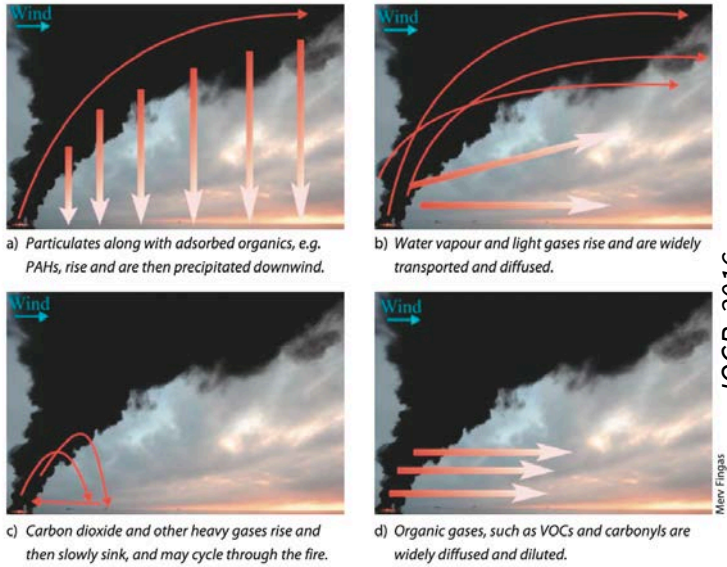
- Advancing the **science** to better characterize and reduce environmental effects
- Readying the emerging in-situ burning **technologies** for field deployment
- **Training** responders and next generation of highly qualified personnel in in-situ burning research and operations

Advancing the science of ISB environmental effects



Frit-Rasmussen et al., 2017

1. What are the fate and effects of the herding agent?



IOGP, 2016

2. What are the air quality impacts of smoke plume?

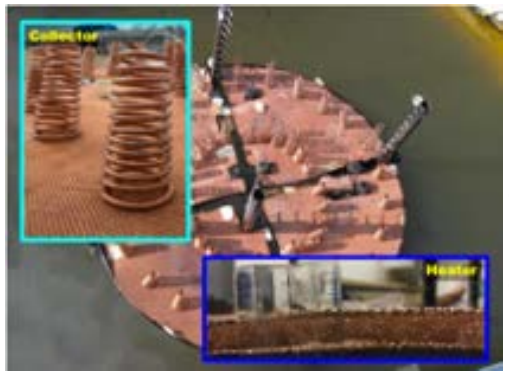
Elastec

3. What are the chemical composition, biodegradability, and toxicity of burn residue?

Readying the emerging ISB technologies

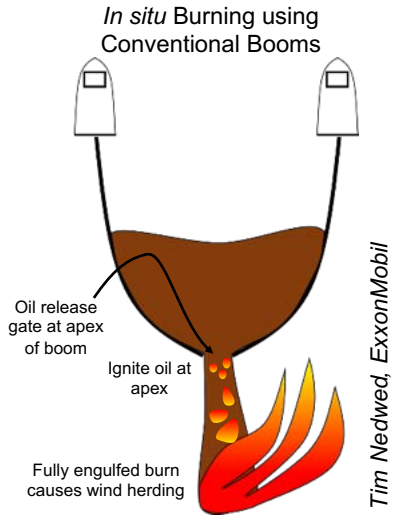
Three emerging ISB technologies

- ❑ Extending ISB window of operations
- ❑ Reducing the operational cost
- ❑ Improving burning efficiency
- ❑ Reducing smoke and residue production



Karen Stone, BSEE

Flame Refluxers allow faster burning, with 50% less production of black smoke



Tim Nedwed, ExxonMobil

Burning Tongue allows ISB with conventional booms, reducing operational cost

Tim Nedwed, ExxonMobil

RSV (remotely-operated surface vehicle)**-assisted herding** extends operational window

New generation of monitoring technologies

- ➢ **SMART Protocols** for rapid data collection and reporting
- ➢ **UAS**-borne smoke sampling and monitoring
- ➢ **ROV-** and **AUV-**borne burn residue sampling & monitoring.

Brian Gullett, USEPA

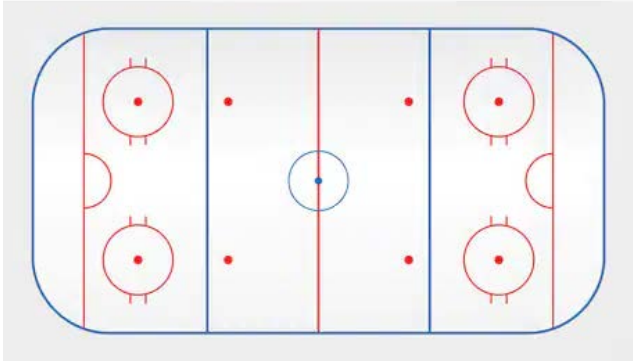
A UAS with a "Kolibri" smoke sampling system

Training the responders and HQP

- Training
- Exercises
  - Operational (STA project)
  - Operational (ISB project)
  - Table top (Incident Command Post)

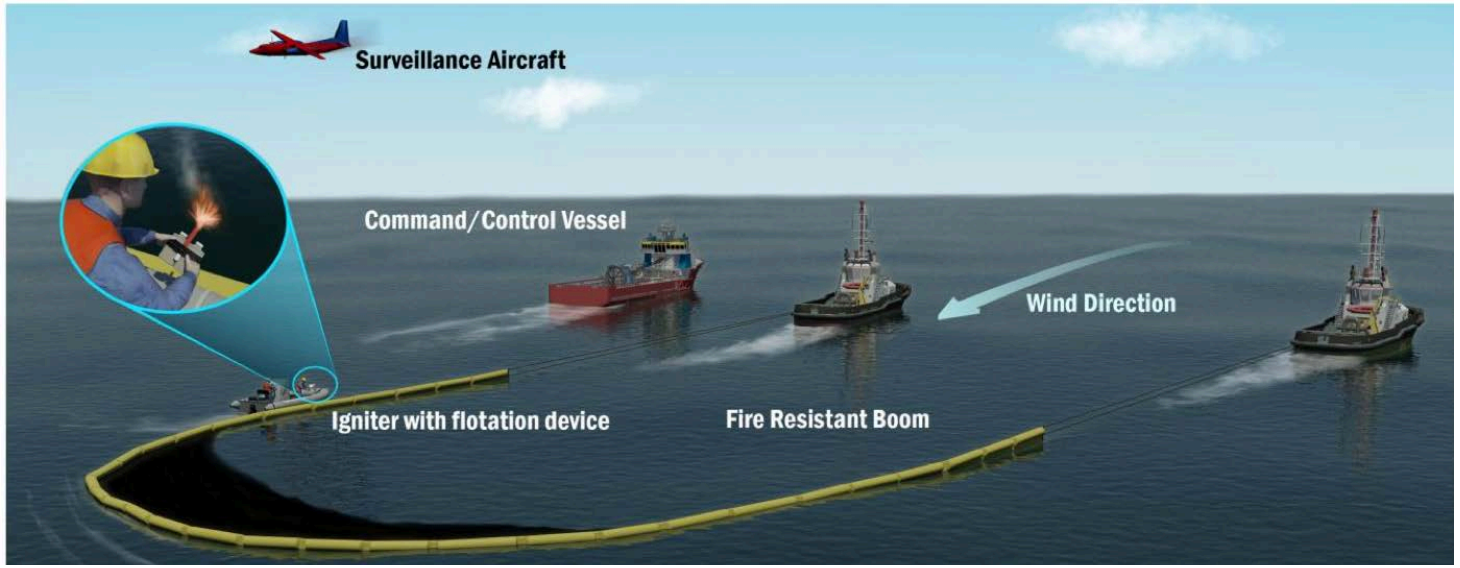
How? – Number of controlled burns

Burn #	Technology to be tested	Oil volume	Purpose
1	Test burn	1 m^3	to verify personnel & equipment readiness
2	Conventional burn	<10 m^3	to serve as a basis for comparison
3	Burn with flames refluxers	<10 m^3	To allow faster burning & reduce smoke production
4	Burning tongue	<10 m^3	to allow ISB with conventional booms
5	Remotely-operated surface vehicle assisted herding	<10 m^3	to extend operational window

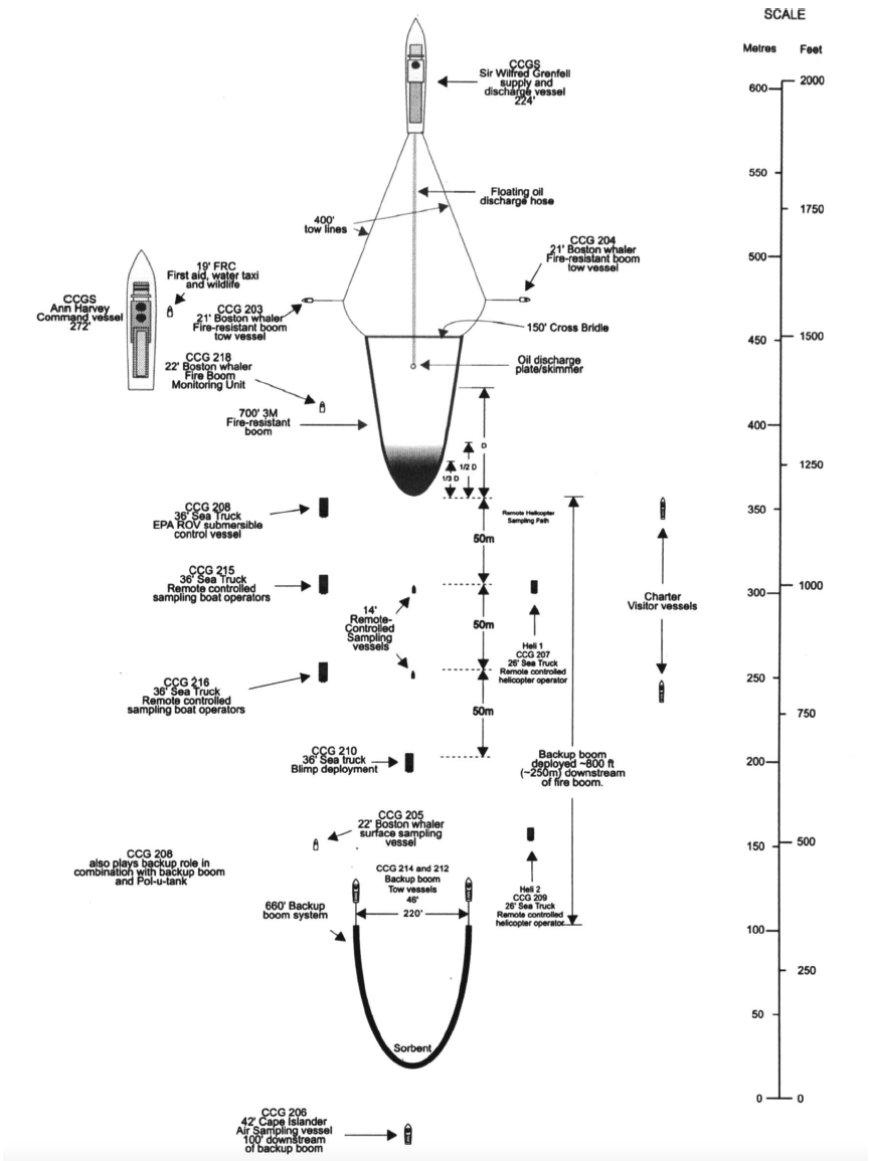


All the controlled burns will be done within 500-ft fire booms. The total surface area affected will be less than that of a hockey rink.

How? – Operation tactics



Typical in situ burning operation tactics (Mabile, 2012)



In-situ burning configuration and operations during NOBE (Fingas et al., 1995)

How? - Preparedness & mitigation measures

Contingency Plans under development (additional plans will be developed, e.g., Medical, Surveillance, Security, Fuel management, etc.)

- Safety Plan
- Oil Spill Response Plan
- Wildlife Response Plan
- Decontamination Plan
- Waste Management Plan
- Communications Plan

Dedicated response equipment

- 3 Offshore Sweep Systems
  - 500m Offshore Boom will be deployed
  - 1 Current Buster 2 will be deployed
  - 1 Current Buster 4 (on board ship)
  - Oil Recovery system on PRV3
- Bird hazing equipment + wildlife monitors
  - 2 Breco buoys (1 deployed, 1 spare)
  - Hazing kits on all vessels
- 4-gas air monitors
- Decon Equipment

WHEN & WHERE?

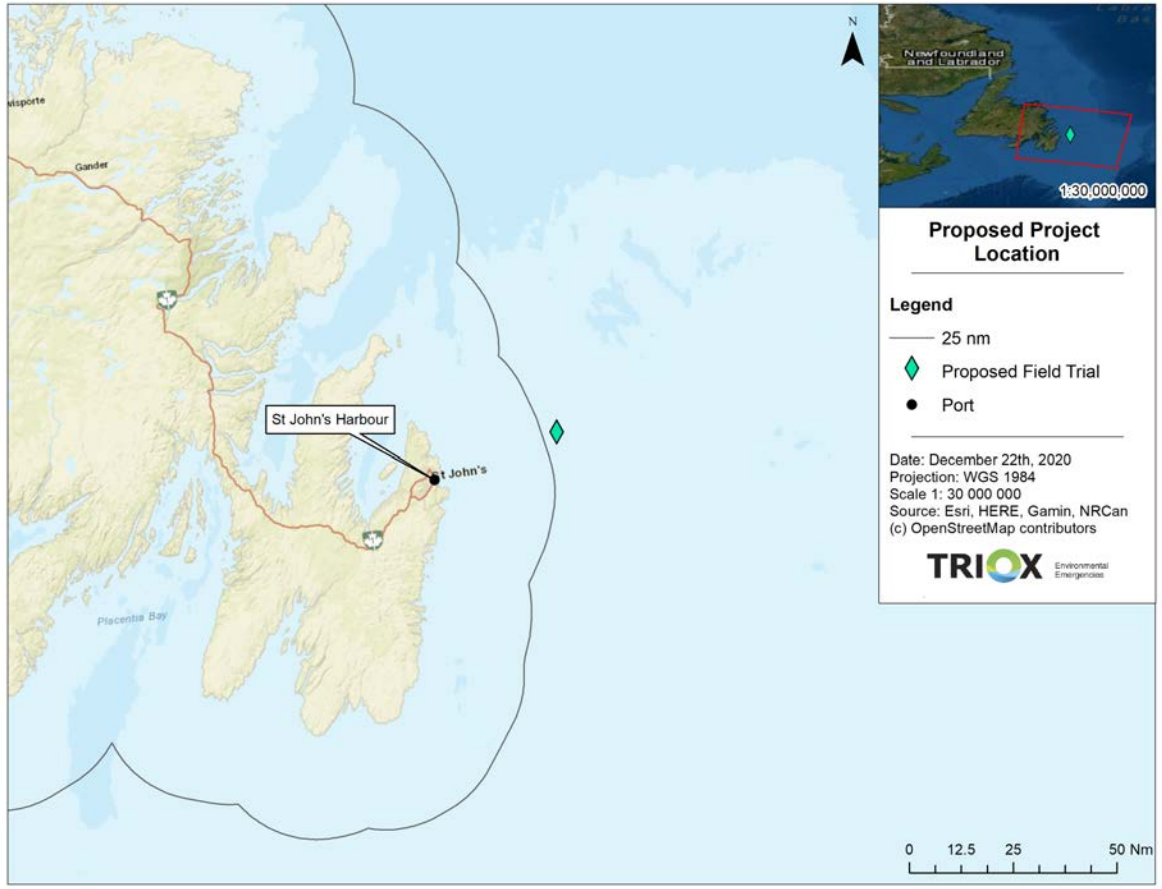
- Where

  ~25 nm from Port

  (*due to restrictions on board vessels, the ship carrying personnel other than ship's crew must dock at night)*

- When

  August 2021 (tentatively)



WHERE we are with the authorization process

Phase 1

- Submit project descriptions for a preliminary review to ECCC
  - Purpose and need for the project, experimental design, proposed location, identify impacted stakeholders and Indigenous Groups, possible environmental effects
- Review period by federal agencies
- ECCC will notify Indigenous Groups
- NRCan engagement with Province