

# Welcome

## RRT5 Science and Technology Subcommittee Meeting Spring 2022

Chairs: Faith Fitzpatrick, USGS, [fafitzpa@usgs.gov](mailto:fafitzpa@usgs.gov)  
LCDR Rachel Pryor, NOAA, [rachel.l.pryor@noaa.gov](mailto:rachel.l.pryor@noaa.gov)



# S&T Subcommittee Agenda

<b>10:15</b>	<b>Introductions</b>
<b>10:15 - 10:20</b>	<b>Scott Binko, USCG Research &amp; Development Update</b>
<b>10:20 - 10:30</b>	<b>Faith Fitzpatrick, USGS Fate &amp; Transport Update</b>
<b>10:30 - 10:45</b>	<b>Guy Meadows, HF RADAR, Straits of Mackinac</b>
<b>10:45 – 11:00</b>	<b>Ayumi Fujisaki, Under Ice Oil Spill Meeting Brief</b>



## Emerging Pollution Response Technology Evaluation

1011

**Mission Need:** Understand the capability of emerging mechanical pollution-response technology.

### Objectives

- Conduct market research to identify new and emerging pollution response technologies.
- Conduct independent evaluation of select technologies using the U.S. Coast Guard's (CG) Oil Spill Response Technology Evaluation Process.
- Collaborate with other Federal agencies (Bureau of Safety and Environmental Enforcement (BSEE), Environmental Protection Agency, etc.) to conduct in-water testing of the most promising technologies.
- Provide feedback to equipment providers for consideration in advancing their technologies to enhance the nation's pollution response capability.
- Provide a knowledge product for Federal On-Scene Coordinator (FOSC) awareness of new technologies.



### Notes

- Oil Spill Liability Trust Fund funding.
- Partnership with BSEE.
- Possible use of Cooperative Research and Development Agreements.
- Opportunity to partner with Interagency Coordinating Committee for Oil Pollution Research (ICCOPR) members, Federal Laboratory Consortium members, and academic institutions involved in this area of research.

**Sponsor:** CG-MER

**Stakeholder(s):** ICCOPR, CG-721, District Response Advisory Teams, FOSCs, National Strike Force

**RDC Research Lead:**  
Mr. Alexander Balsley, P.E.

**CG-926 Domain Lead:**  
Ms. Karin Messenger

**Anticipated Transition:** Knowledge Product  
Future Technology

### Project Timeline / Key Milestones

**Project Start:** 1 Oct 21

Priority Technologies Identified and Determined	1 Nov 21 ✓
Request for Information (RFI) Issued	5 Jan 22 ✓
RFI Responses Received	28 Feb 22 ✓
In-house Technology Evaluation Conducted	Jun 22
Technical Evaluation Team Review of Emerging Mechanical Technologies (Brief)	Jul 22 ★
Ohmsett Testing Complete	Oct 22
KDP: Meeting at Ohmsett with ICCOPR Members	Oct 22
Emerging Pollution Response Technology Evaluation Findings (Report)	Jul 23 ★
<b>Project Completion:</b> Jul 23	



**Acquisition Directorate**  
Research & Development Center



CG Research & Development Center  
UNCLAS//Internet Release is Authorized

Indicates RDC Product ★  
March 2022

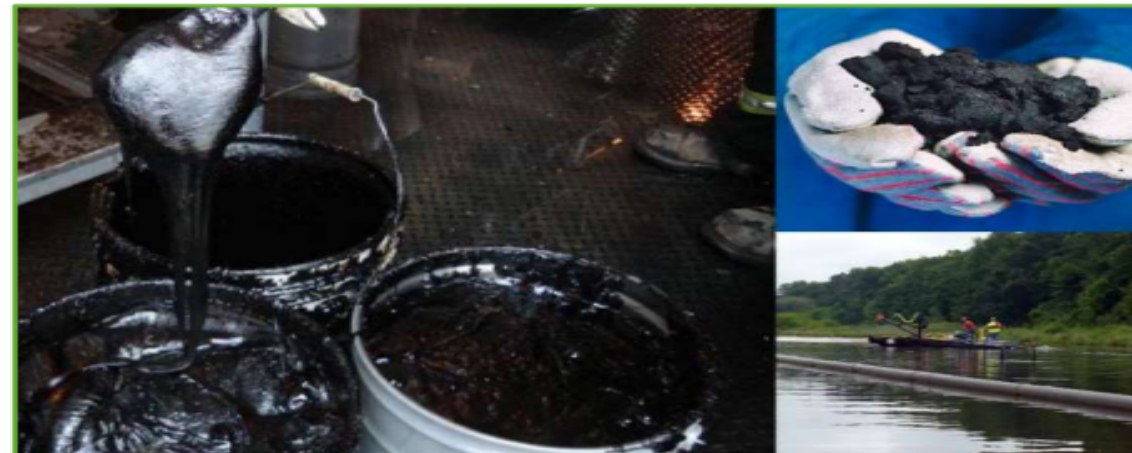


## Behavior of Diluted Bitumen (Dilbit) in Fresh Water

**Mission Need:** Enhanced decision-making for response to dilbit spills in the fresh water environment.

### Objectives

- Provide the U.S. Coast Guard (CG) Federal On-Scene Coordinators with decision-making guidance as they relate to the fate and transport of dilbit in the freshwater environment.
- Study the behavior (density and weathering) and response tools of dilbit spills in the freshwater environment.



### Notes

- Supported by Great Lakes Restoration Initiative funding.
- Leverage CG Research and Development Center Project 4705: Oil Sands Products Spill Response.
- Collaborate with the International Institute for Sustainable Development's Experimental Lakes Area and U.S. Department of Energy labs.

**Sponsor:** CG-MER, D9

**Stakeholder(s):** EPA Great Lakes Nat'l Program Office/Pollution Response Office, LANT-54, NOAA

**RDC Research Lead:**  
Benedette Adewale, PhD

**CG-926 Domain Lead:**  
Ms. Karin Messenger

**Anticipated Transition:** Knowledge Product  
*Influence Tactics, Techniques, & Procedures*

### Project Timeline / Key Milestones

**Project Start:** 1 Oct 20

Literature Review Complete 12 Feb 21 ✓

**Literature Review – Diluted Bitumen in the Fresh Water Environment (Report)** 23 Jun 21 ✓ ★

Dilbit Test Plan Complete 30 Sep 21 ✓

CRREL Dilbit Weathering Cold Weather Test Complete 30 Nov 21 ✓

CRREL Dilbit Weathering Warm Weather Test Complete Jul 22

CRREL Dilbit Weathering Ice-free Cold Weather Test Complete Oct 22

Dilbit Oil Analysis Complete Jan 23

**Guidance Document - Behavior of Diluted Bitumen in the Fresh Water Environment (Report)** Mar 23 ★

**Project Completion:** Mar 23



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March 2022



## Freshwater In-Situ Oil Burn Research

**Mission Need:** Improve In-Situ Burn (ISB) knowledge base to supplement oil spill response options.

### Objectives

- Evaluate best practices for operational use of ISB in multiple environments, including fresh water and areas with vegetation.
- Develop methods to conduct ISB smoke-plume monitoring that improve sampling accuracy and responder safety.
- Provide reference guidance for Federal On-Scene Coordinator and Regional Response Team (RRT) use.



### Notes

- Multiple funding sources including Oil Spill Liability Trust Fund and Great Lakes Restoration Initiative.
- Partner with academia and national labs to ensure result visibility and access.

**Sponsor:** EPA Great Lakes Nat'l Program Office, CG-MER

**Stakeholder(s):** CG-721, NSF, EPA, BSEE, D9, RRT5

**RDC Research Lead:**  
Benedette Adewale, PhD

**CG-926 Domain Lead:**  
Ms. Karin Messenger

**Anticipated Transition:** Knowledge Product  
*Influence Tactics, Techniques, & Procedures*

### Project Timeline / Key Milestones

**Project Start:** 1 Oct 18

Mesoscale Freshwater Burns Complete 19 Jul 19 ✓

Large-scale Freshwater Burns Complete 25 Oct 19 ✓

**Freshwater In-Situ Oil Burning (Report)** 16 Feb 21 ✓ ★

Remote Air Monitoring Market Research Complete 17 Feb 21 ✓

Remote Air Monitoring Process Framework Complete 11 Mar 21 ✓

Test Plan for Remote Air Monitoring Complete 22 Apr 21 ✓

Air Monitoring During Freshwater ISB 28 Oct 21 ✓

**Freshwater In-Situ Burning Air Monitoring (Report)** Aug 22 ★

**Project Completion:** Aug 22



**Acquisition Directorate**  
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March 2022



## Nearshore and Inland Evaluation of the Estimated Recovery System Potential (ERSP) Calculator

4710

**Mission Need:** ERSP calculator to include response systems for nearshore/inland operating environment.

### Objectives

- Determine if an enhanced version of the existing offshore ERSP calculator provides improved efficiency for planning and response to oil spills.
- Develop an inland ERSP calculator prototype tool.
- Validate ERSP calculator functionality and usefulness through an independent evaluation by a group of National Academies of Sciences, Engineering, and Medicine reviewers.



### Notes

- Oil Spill Liability Trust Fund funding.
- Partnership with Bureau of Safety and Environmental Enforcement (BSEE).

**Sponsor:** CG-MER

**Stakeholder(s):** BSEE, AREA-54

**RDC Research Lead:**  
Mr. Alexander Balsley, P.E.

**CG-926 Domain Lead:**  
Ms. Karin Messenger

**Anticipated Transition:** Product  
Fielded Prototype

### Project Timeline / Key Milestones

**Project Start:** 1 Oct 16

Feasibility Workshop Completed	21 Jun 17 ✓
<b>Feasibility of Extending the ERSP Calculator for Nearshore and Inland Waterways (Report)</b>	<b>20 Sep 17 ✓ ★</b>
<b>Inland ERSP Preliminary Factors, Requirements and Conceptual Model (Report)</b>	<b>14 Nov 19 ✓ ★</b>
<b>Inland ERSP Operational Environment Calculator (Design Document)</b>	<b>29 Jun 20 ✓ ★</b>
Initial Development of Inland ERSP Calculator Complete	4 Jun 21 ✓
National Academy of Sciences (NAS) Review Complete	Aug 22
<b>NAS Response Review of Inland ERSP (White Paper)</b>	<b>Dec 22 ★</b>
NAS Recommended ERSP Calculator Updates Complete	Dec 23
<b>Inland Evaluation of the ERSP Calculator (Prototype &amp; User Guide)</b>	<b>Apr 24 ★</b>

**Project Completion:** Apr 24



**Acquisition Directorate**  
Research & Development Center



CG Research & Development Center  
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Indicates RDC Product ★  
February 2022



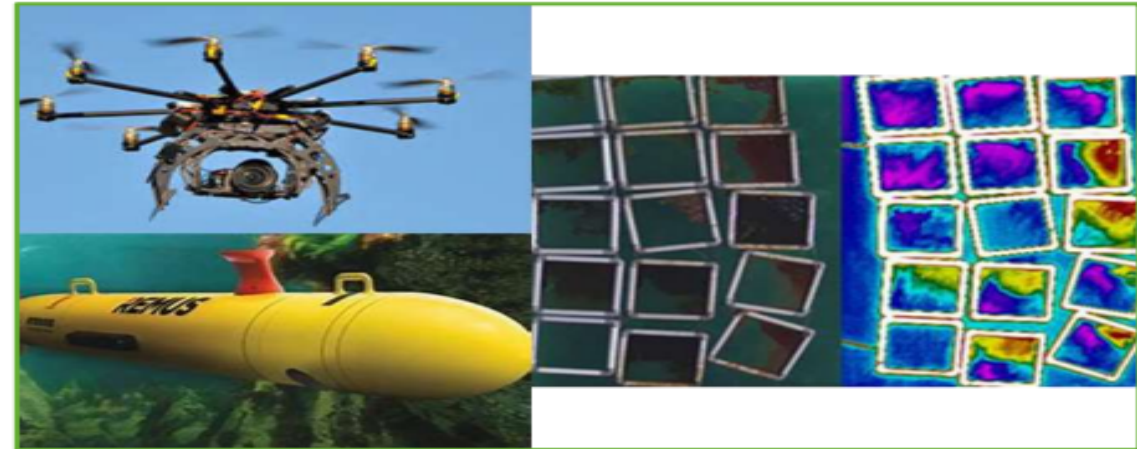
## Advancing UAS and AUV Capabilities to Characterize Water Column and Surface Oil in Ice Environments

4711

**Mission Need:** Technologies to detect and characterize oil spills in ice environments.

### Objectives

- Coordinate and conduct multi-agency lab and field tests to gain better understanding of aerial and underwater sensor capability in characterizing oil on the surface or in the water column in ice conditions.
- Determine remote vehicle telemetry capability to transfer sensor data to on-scene responders or Incident Command as actionable information.



### Notes

- Oil Spill Liability Trust Fund funding.
- Partnerships with the Cold Regions Research and Engineering Laboratory (CRREL), Woods Hole Oceanographic Institute (WHOI), U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) Office of University Programs (OUP), National Oceanic and Atmospheric Administration's (NOAA) Office of Response and Restoration (OR&R), Bureau of Safety and Environmental Enforcement, and U.S. Environmental Protection Agency.

<b>Sponsor:</b> CG-MER	<b>Stakeholder(s):</b> CG-5RI, D1, D9, D17, ADAC, NOAA OR&R, WHOI, MBARI, DHS S&T OUP, UxS IPT
<b>RDC Research Lead:</b> Mr. Alexander Balsley, P.E.	<b>CG-926 Domain Lead:</b> Ms. Karin Messenger
<b>Anticipated Transition:</b> Product Fielded Prototype	

### Project Timeline / Key Milestones

<b>Project Start:</b> 23 Jan 20		
Interagency Reimbursable Work Agreement with NOAA Complete	3 Jun 20	✓
Phase 1: Unmanned Aircraft System (UAS)/Autonomous Underwater Vehicle (AUV) Tests at CRREL Complete	23 Apr 21	✓
<b>UAS and AUV Characterization of Oil in Ice; Laboratory Results And Way Ahead (Brief)</b>	<b>6 Jul 21</b>	✓ ★
<b>UAS Characterization of Oil in Ice: Volumes I and II (Report)</b>	<b>7 Feb 22</b>	✓ ★
Field Exercise Planning Complete	May 22	
Phase 2: UAS/AUV Systems Shore-Based Field Tests	Jun 22	
Phase 2: UAS/AUV Systems Vessel-Based Field Tests	Aug 22	
Data Schema for Data Export Complete	Oct 22	
<b>UAS/AUV Systems Field Exercise Integration (Report)</b>	<b>Mar 23</b>	★
<b>Project Completion:</b> Mar 23		





# Fate & Transport Updates

- DOI IOSPP call for proposals – let Faith know if there is an interest in pursuing studies with USGS.
- USCG Great Lakes Center of Excellence – ties to ongoing GLRI work? Opportunities for inland to coastal research/tool development?

## Tools/Applications

- Inland Riverine Oil Spill Collaboration Area (IROS) moved from web to team – recently shared tools table for Line 5 potential reroute EIS
- USGS Streamstats time of travel beta release <https://streamstats.usgs.gov/tot-beta/> -- issues or questions?, maybe add dissolved constituents with new IOSPP proposal
- FluOil model methods publication released: <https://www.frontiersin.org/articles/10.3389/frwa.2021.771764/full>
  - FluOil training being planned for lower St. Croix River with UMBRA (Mark Ellis contact)
  - FluOil modeling beginning for upper St. Croix River
- IDHydroOPA model – R script informally available.
- Growing interest in ICWater applications (link to planning and training needs)
- USGS looking into modeling as part of exercise activities in region 10 (Kyle Blasch contact)

## OPA Research

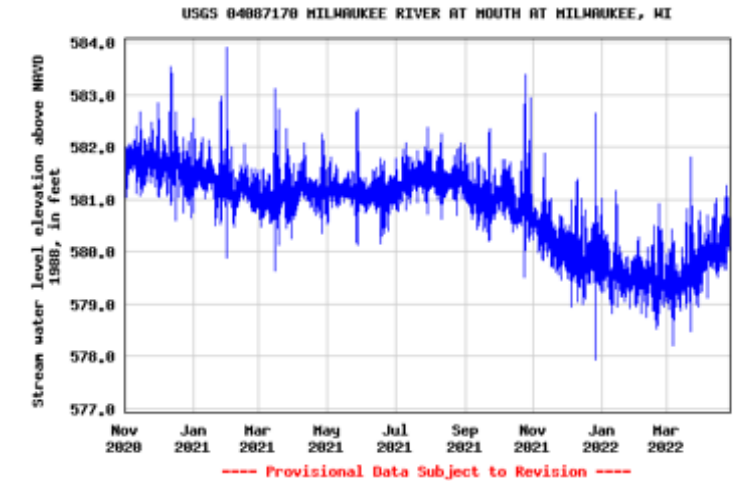
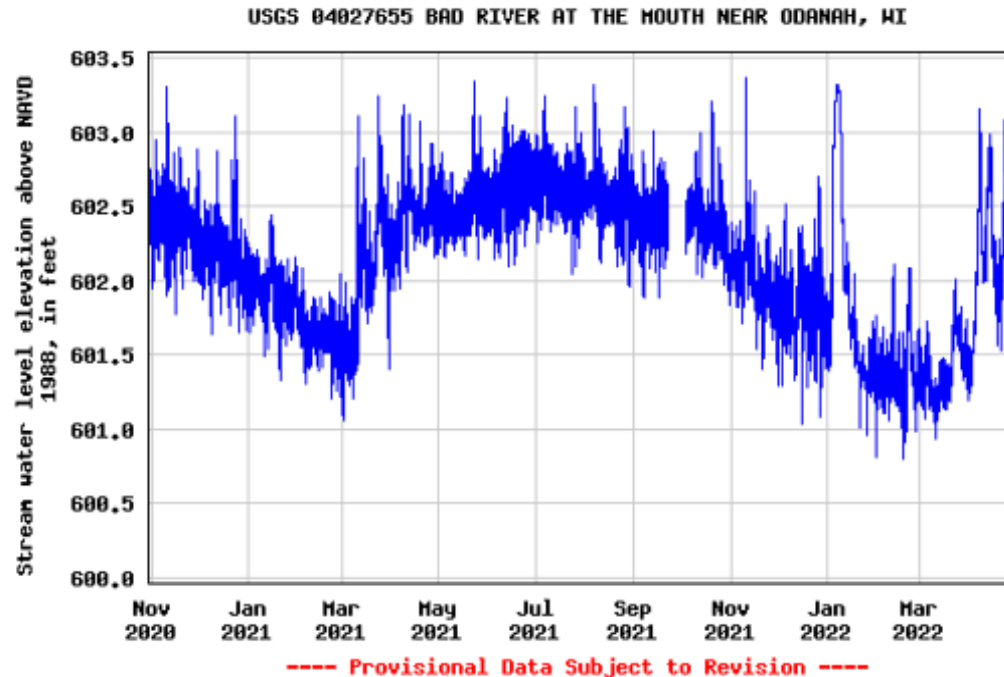
- EPA Research Brief completed on the formation, transport and breakup of OPA:  
[https://cfpub.epa.gov/si/si\\_public\\_record\\_Report.cfm?dirEntryId=354255&Lab=CESER](https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=354255&Lab=CESER)
- Oiled sediment interactions for USCG Center of Excellence bitumen studies –Benedette Adewale
- MPRI study on behavior of OPA breakup (saltwater to freshwater) – Michel Boufadel lead



# Fate & Transport Updates – cont.

Water levels and currents in Great Lakes estuaries and harbors –  
is this a good collaboration topic for a multi-agency/university group within the Great Lakes Center of Excellence?

Examples USGS Bad (Mashkiziibii)/Kakagon estuary and Milwaukee Inner Harbor (year round/continuous water levels and currents):





# **First US Operational Freshwater HF Radar System**

**RRT5 Science & Technology Subcommittee Meeting**

**Spring, 2022**

**Lorelle Meadows, Ph.D.**

**Guy Meadows, Ph.D.**

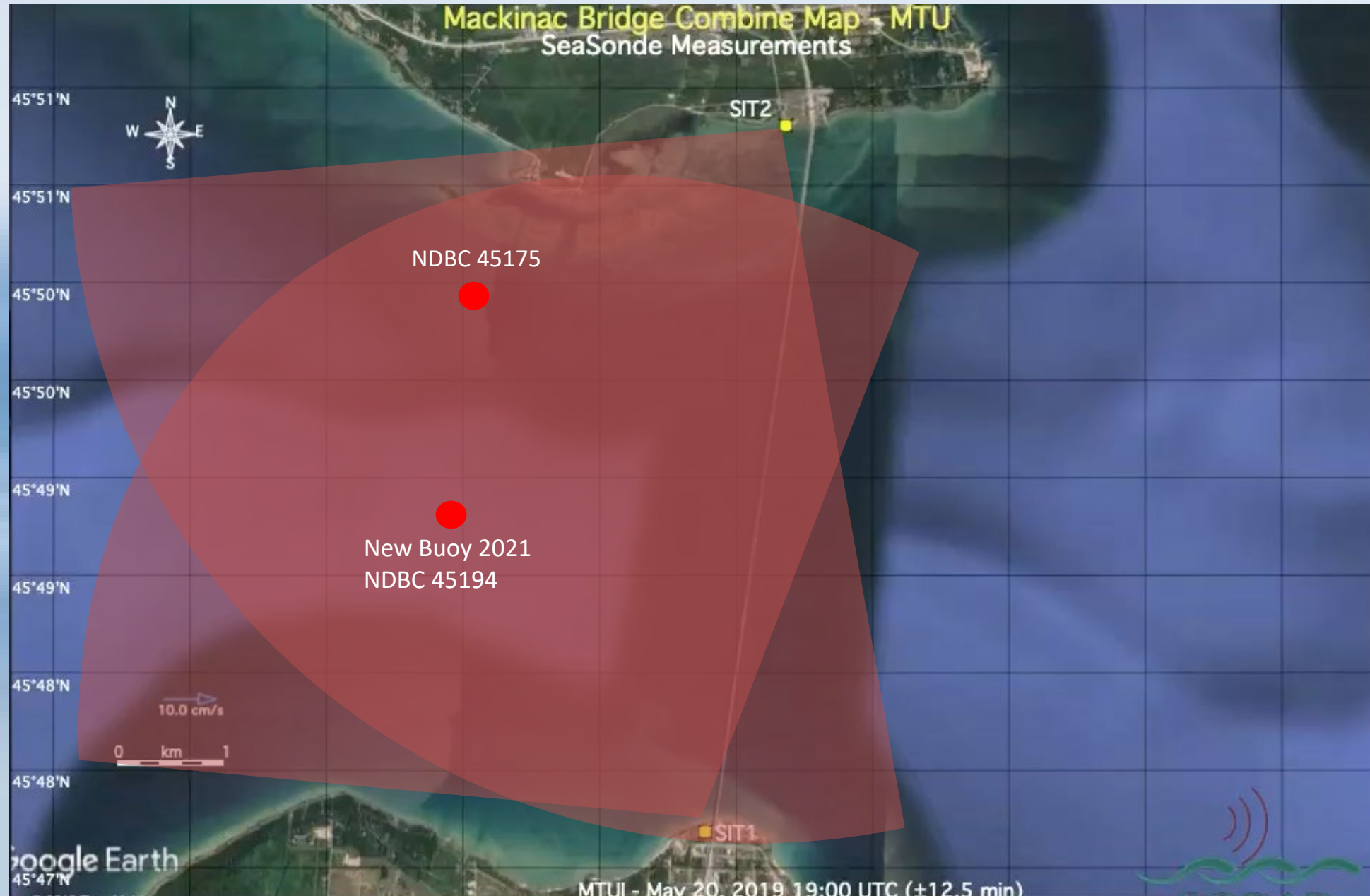
**John Lenters, Ph.D.**

**Great Lakes Research Center – Michigan Technological University**





# Straits HFR System Map



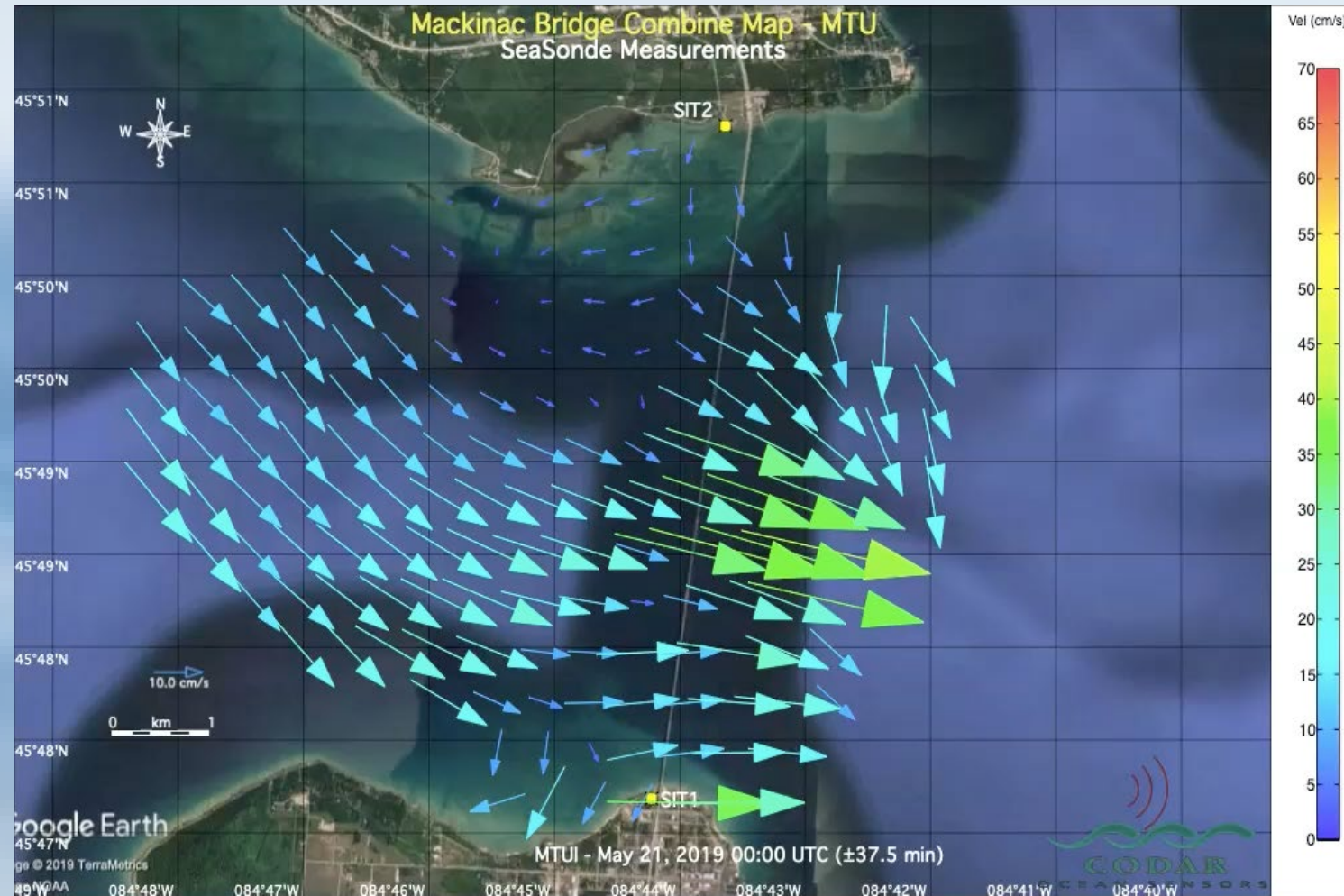
# Straits Operational System

- Installation and testing – June - July 2021
- Operational - October 18, 2021

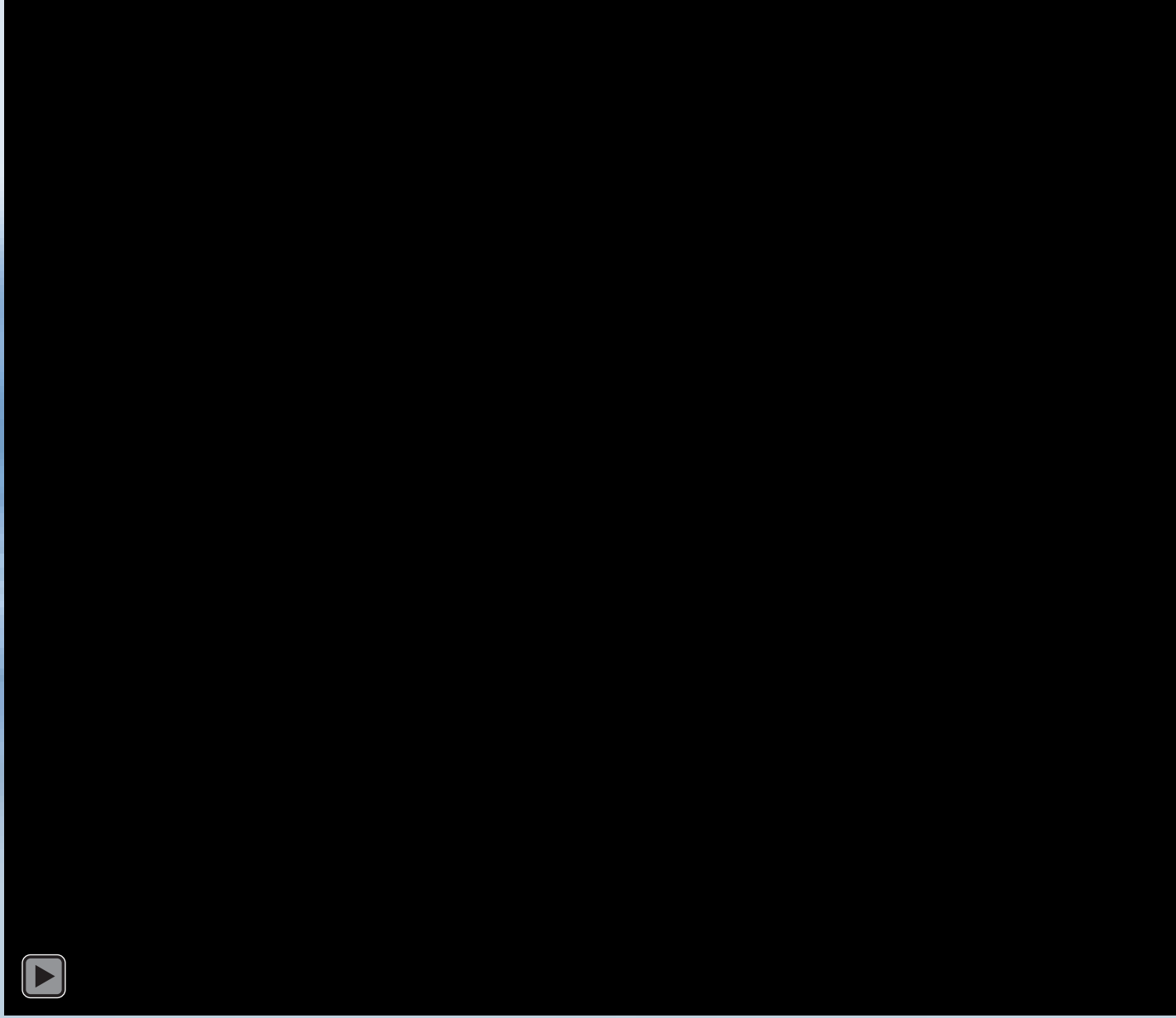




# Sample Vector Map (Hourly Surface Current Maps)



**Example: The month of November 2021**  
**[http://uglos.mtu.edu/hf\\_radar.php](http://uglos.mtu.edu/hf_radar.php)**



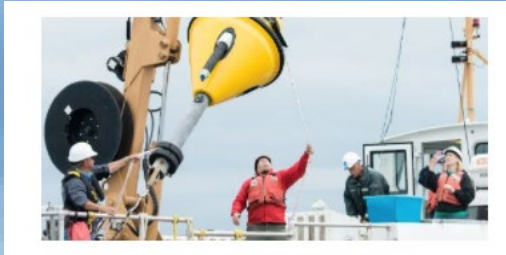


# Where to find the data...

## Great Lakes Research Center



<https://www.mtu.edu/greatlakes/>



Great Lakes Buoys and HF Radar  
[http://uglos.mtu.edu/hf\\_radar.php](http://uglos.mtu.edu/hf_radar.php)

## Great Lakes Observing System




<https://glos.org/observing/high-frequency-radar/>

# Where to learn about HFR...

## <https://www.mtu.edu/greatlakes/research-highlights/hfradar/>

Campus Health and Safety Level: Level Two

**Michigan Tech**

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## Great Lakes Research Center

[GLRC](#) > [Research Highlights](#) > [HF Radar](#)


### Research Highlights

#### HF Radar

### The Researchers:




Dr. Guy Meadows



Dr. Lorelle Meadows

[Contact the Research Team](#)

## High Frequency Radar in the Straits of Mackinac



High-frequency or HF radar is a shore-based remote sensing system used to measure offshore sending a low-power electromagnetic pulse over the water surface. The electromagnetic pulse waves on the lake/ocean and bounces back to the antenna. By measuring the characteristics of the return signal, we can map the speed and direction of the underlying (near surface) lake currents.

With funding from the [Great Lakes Observing System \(GLOS\)](#) and the [State of Michigan Department of Natural Resources \(DNR\)](#), the Great Lakes Research Center of Michigan Technological University is installing two [CODAR SeaSonde](#) HF radar antenna masts and computer systems, one on each side of the Mackinac Bridge.

What these two radars observe of the surface currents across the Straits is combined to form a map of current speed and direction across this body of water. These maps provide crucial data that can be used for a variety of purposes, including monitoring and recovery efforts, inform ships and smaller vessels of currents, guide fishermen to optimal fishing grounds, and generally help us better understand and manage this critical natural resource.

### Radar and Risk in the Straits of Mackinac

### About HF Radar

### Deploying High-frequency Radar in the Straits of Mackinac

### HF Radar Videos

**Great Lakes Research Center**  
Michigan Technological University



# Current Update...



**Doing our annual  
maintenance**

**Since, nothing is moving.**



# Ice Movement ?



**Great Lakes  
Research Center**  
Michigan Technological University

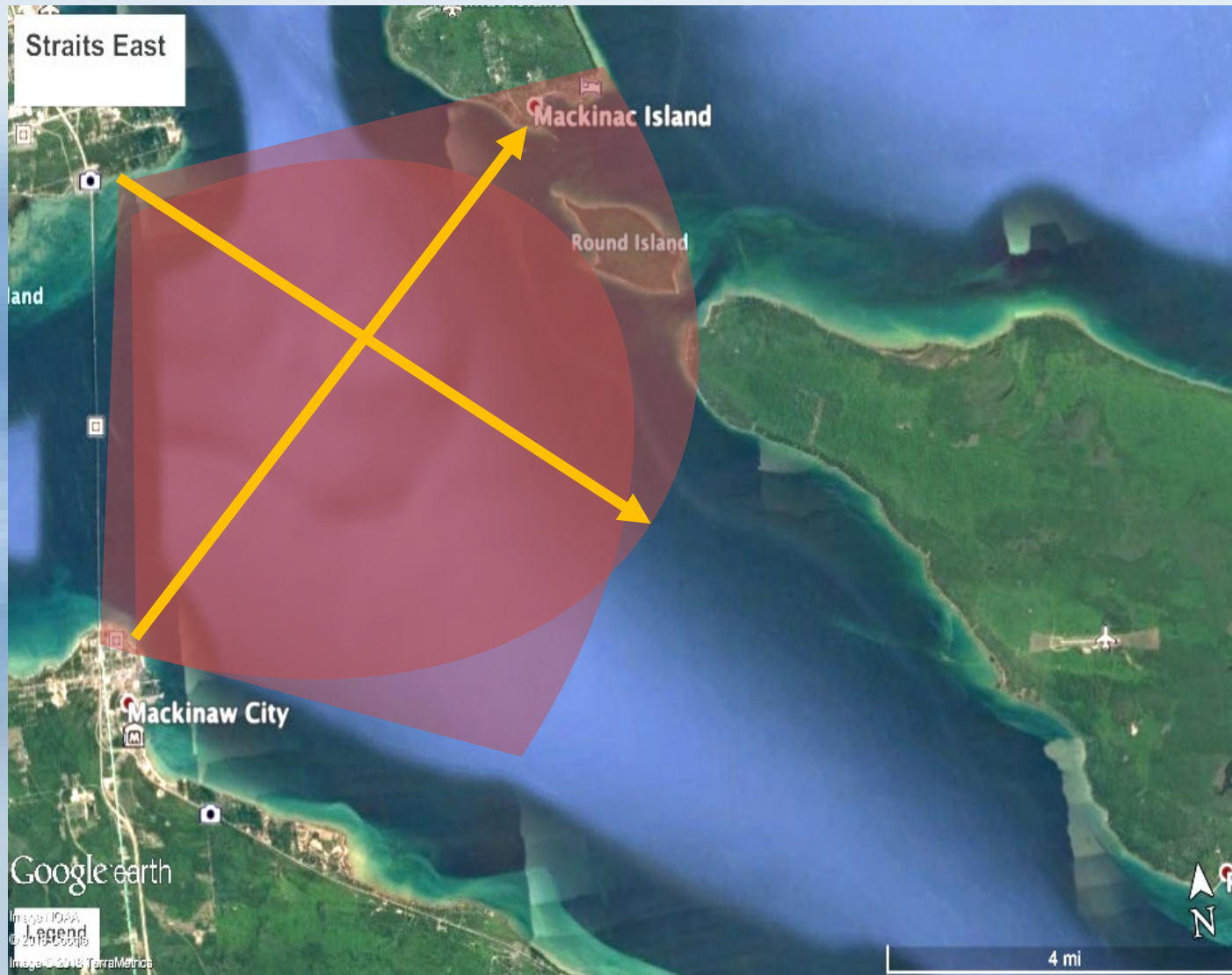


**Thank you for your interest!**  
**Questions?**





- Has requested cost estimates for a second set of Freshwater HF Radars for the Straits of Mackinac ~\$600K





# Briefing of CIGLR Under-ice oil spill working group meeting

Center for Freshwater Education and Research  
Lake Superior State University  
Sault Ste. Marie  
March 9-11, 2022



Vlad Tarabara , Edoardo Sarda, Ayumi Fujisaki-Manome, Doug Bessette, John Lenters  
Brian Streichert, Steve Ruberg, David Baumann, Robert Hildebrand, Phanikumar Mantha  
Pengfei Xue, Grant Gunn, Michelle Ruty, Caroline Moellering, Guy A Meadows, Trista Vick-  
Majors, Bill Hazel, Robert Richardson, Rachel Pryor, Melissa Baird

# CIGLR under-ice oil spill working group: Timeline

- Formed in early 2020, funded by the partners program of Cooperative Institute for Great Lakes Research (CIGLR).
- Initiated by Vlad Tarabara (Michigan State U.) and Edorado Sarda (Lake Superior State U.)
  - 5 steering committee members. Total 20 working group members.
- In person meeting planned in spring 2020 but has been postponed due to the pandemic.
- Virtual pre-plan meeting in May 2020
  - The group is working on a review paper



# Working group: Objectives

- 1) Identify the **current state of preparation, response strategies, and the state of technologies** available for detecting and remediating oil spills under ice.
- 2) Identify **knowledge gaps and technologies** critical for designing a robust strategy to respond to potential spills.
- 3) Identify **research needs** and rank them in the order of priority
- 4) **Assess current research capacity within the workgroup**, identify expertise strengths and gaps, gauge them against research needs, engage external experts if warranted, and **develop one or more research proposals** to address research needs
- 5) Explore **broader implications** of challenges and solutions specific to the Great Lakes region for other areas and scenarios (e. g. Arctic region) and identify **broader networking opportunities** for the proposed CIGLR workgroup.
- 6) Integrate the challenges posed by oil spills under ice in the Great Lakes into **curricula**



- Hybrid Meeting March 9 – 11, 2022
- Center for Freshwater Research and Education at Lake Superior State University, Sault Ste. Marie, MI.



# Meeting Participants

## Working Group Members

Edoardo Sarda	LSSU
John Lenters	MTU
Vlad Tarabara	MSU
Brian Streichert	USCG
Steve Ruberg	NOAA/ GLERL
David Baumann	LSSU
Robert Hildebrand	LSSU
Phanikumar Mantha	MSU
Pengfei Xue	MTU
Ayumi Fujisaki-Manome	CIGLR
Grant Gunn	University of Waterloo
Michelle Rutty	University of Waterloo
Caroline Moellering	Little Traverse Bay Bands of Odawa Indians
Doug Bessette	MSU
Guy A Meadows	MTU
Trista Vick-Majors	MTU
Bill Hazel	Marine Pollution Control
Robert Richardson	MSU
Rachel Pryor	NOAA OR&R
Melissa Baird	MTU

## Meeting Guests

Joshua Fowler	USCG
Jerry Popiel	USCG
Anthony Jones	USCG
Alex Balsley	USCG
Christopher Pace	USCG
Kathleen Brosemer	Sault Ste. Marie Tribe of Chippewa Indians & MTU
Grant Gunn	University of Waterloo
Kelsey Prihoda	Minnesota Sea Grant
Bob Lehto	Enbridge
Mike Davanzo	Enbridge
Rachel Wellman	Enbridge



# March 9 (Day 1): Tour of Enbridge Mackinaw Pump Station & Straits Maritime Operations Center





# March 10 (Day 2): Invited Talks & Technical Presentations

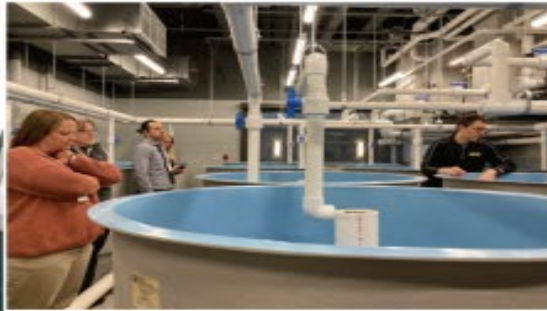


## Agenda snippet

11:00 – noon	(Zoom) Invited speaker: Kelsey Prihoda (University of Minnesota Sea Grant Program). <i>Great Lakes Crude Oil Transport Team: Past, Present, and Future.</i>
noon – 1:00 pm	Lunch break (LSSU food service)
1:00 – 5:00 pm	Review talks with Q/A
1:00 – 1:20	Large scale oil spill transport modeling in ice-covered waters. The status quo and uniqueness in the Great Lakes. (Ayumi Fujisaki-Manome)
1:20 – 1:40	First U.S. Operational Freshwater HF Radar System (Guy Meadows)
1:40 - 2:00	Oil spill fate and transport under integral ice caps (Vlad Tarabara)
2:00 – 2:30	Oil detection under ice (Edoardo Sarda, David Baumann, Robert Hildebrand)
2:30 – 2:45	Refreshment break (LSSU food service)
2:45 – 3:00	Joshua Fowler, JD LT (USCG) Brief on the Great Lakes Center of Expertise (current state, functions, staffing, etc)
3:00 – 3:20	(Zoom) "USCG RDC/NOAA Project - UAS Characterization of Oil in Ice". Alex Balsley (USCG Research and Development Center)
3:20 – 3:40	(Zoom) Great Lakes Oil-in-Ice Response Update. Jerry Popiel (USCG Great Lakes district office)
3:45 – 4:15	Oil Spill Risk Perceptions and Communication (Doug Bessette)
4:15 - 4:45	(TBC) Oil spill remediation in icy waters (Bill Hazel)
4:45— 5:30pm	Discussion of schedules for Day 3 and 4. Schedule adjustments if needed.

# March 11 (Day 3): More talks, CFRE Tour, Discussion on Review Paper & Proposals

*Mesocosm lab at CFRE*



*Sea Lamprey  
Discovery Center at CFRE*





# Meeting Outcome

- Joint publication
  - Title: *Oil in Ice – Challenges in Freshwater Seas*
  - Summarize the current state of knowledge and practice. and identify research needs.
  - Manuscript preparation in progress.
- Expert Network
  - A network of experts committed to developing scientifically sound and effective solutions to the challenge of oil spills under ice
- Grant proposal(s)
  - A sub team led by Michigan Tech U. is collaborating on a competitive grant proposal to Great Lakes Observing System funding opportunity.
  - Future targets:
    - NSF Dynamics of Integrated Socio-Environmental Systems (CNH2)
    - NSF Navigating New Arctic (NAA)
    - NSF Coastlines and People (CoPe)

***Thank you! .... Questions?***



# Questions/add 'l feedback/new topics?

