Quarterly Project Portfolio FY2024 – Quarter 2

U.S. Coast Guard
Great Lakes Oil Spill Center of Expertise

Table of Contents – GLCOE Project Portfolios

Great Lakes Modeling

FY22 - 1

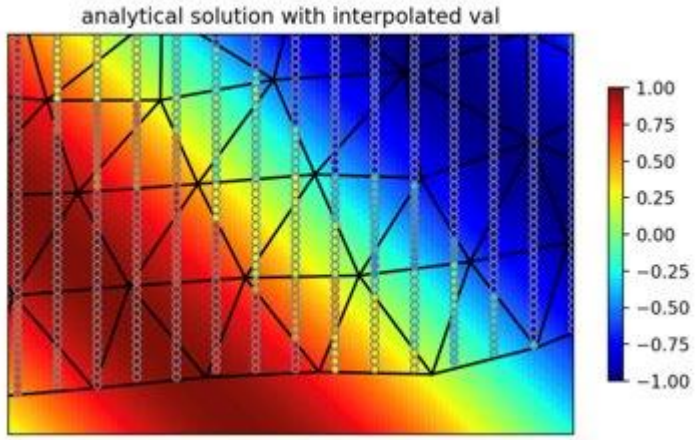
Theme Alignment: Preparedness

Objectives

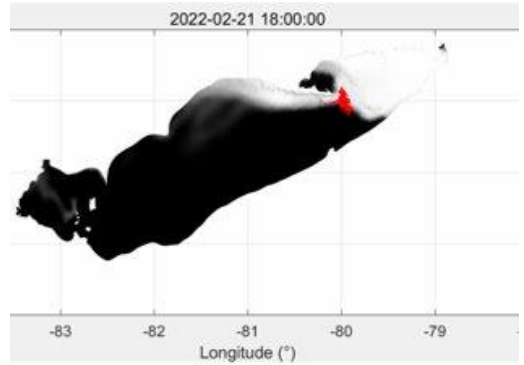
- Evaluate General NOAA Operational Modeling Environment's (GNOME) performance as an oil spill trajectory model in the Great Lakes.
- Incorporate the high-resolution Great Lakes Coastal Forecasting System into GNOME.
- Convene workshop to discuss Great Lakes freshwater gaps.
- Determine remedies for areas of GNOME underperformance.

Notes

- Project initiation delayed until FY23.
- Time step analysis conducted using experimental version Great Lakes Operational Forecasting System to inform time steps that are appropriate for GNOME simulations.
- Submitted a manuscript to Journal of Environmental Management. - Song Y. et al. “Modeling study on oil spill transport in the Great Lakes: Significant ice cover”.
- Another manuscript on model calibration in preparation – Song Y. et al. “Introducing a convex hull method to calibrate Lagrangian oil spill models using drifter trajectories”.



Below: Simulated Oil Spill Particles (red dots) in a hypothetical spill event in the ice-covered Lake Erie.



GLCOE Lead:	**PI:**	**Partners:**
Dr. Matt Alloy	Dr. Ayumi Fujisaki-Manome	GLERL/CIGLR

Anticipated Outcome/Transition: GNOME improvements using Lake Erie as a validation area. Continuation and iteration with the other Great Lakes.

Project Timeline/Key Milestones

Period of Performance: 09 SEP 2021 - 31 MAR 2024	
Identified GNOME underperformance area: shorelines and other edge/border areas.	
Initiated efforts to remedy the above: Investigation and testing of new interpolation algorithm.	
Initiated investigation to diffusion and uncertainty coefficients that match drifter data for Lake Erie.	
Initiated metrics of measuring GNOME performance with drifter data for validation.	
Presented preliminary oil in ice simulations at International Association for Great Lakes Research 2023 conference titled "*Modeling Study on Oil Spill Transport in the Great Lakes: Significant Ice Cover”*.	
Manuscript in preparation for peer-reviewed journal. – Song et al. “Modeling study on oil spill transport in the Great Lakes: Significant ice cover”.	
Drafted Great Lakes Modeling Summary of Effort Report.	
Attend and present a poster at the IOSC in New Orleans, LA, 13-16MAY2024.	
Project Completion Date: 31 MAR 2024	**Percent Complete:** 90%

Environmental Response Management Application (ERMA) Enhancements

FY22 - 1
FY23 - 2

Theme Alignment: Preparedness

Objectives

- FY22 – 1: Support Environmental Sensitivity Index (ESI) efforts in the Great Lakes region by adding two new atlases; the St. Mary's River and the St. Lawrence River. Integrated into ERMA TOC and Query tools. Update EPA Inland Sensitivity Atlases in ERMA.
- FY23 – 2: Support the identification and creation of a set of sensitive habitats/species layers in the ERMA Common Operating Picture (COP) throughout the Great Lakes. Expand the use of UAS and other remote sensing technologies (enhanced image support, upload and download). Bookmarks, Dashboard, and Security.

Notes

- FY22 - DRAFT ICS 232 report generated by ERMA available now, functionality will be in production end of March 2024.
- ERMA 5.3 Release - [ERMA Update Blog Feb 2024]
- FY23 – Improved data search functionality.
- New filter tool for user customization and immediate filter display on maps and dashboards.
- Zoom to data that has been selected.
- Consolidated Table of Contents functionality and implemented human readable names for attachments.
- Improvements to easily jump into bookmark views and see table of contents.
- Continued leverage DIVER/ERMA interoperability for upload/download/package creation.


1. Incident Name | 2. Operational Period (Date/Time) From To | RESOURCES AT RISK SUMMARY ICS-232-OS

3. Environmentally Sensitive Areas and Wildlife Issues

Site Name and/or Physical Location | Site Considerations

Narrative:

ESA Listed Species (E = endangered; T = threatened)

Type | Name | T&E | Concentration | Stage Periods

Birds | Least tern | State Threatened | Federal: not listed | 15 PAIRS | Nesting: May-Aug

Birds | Peregrine Falcon | State: not listed | Federal: Threatened | - | Nesting Feb-Jun | Hatching Sep-Oct

Fish Habitat | Atlantic Sturgeon | State -E | Federal E | - | Adults Jan-Dec

Fish Habitat | Shortnose sturgeon | State E/E | Federal E | WEAK RUN | Juveniles Jan-Dec | Adults Jan-Dec

Shoreline (general types)	Miles
1) Armored	69.2
2) Rocky and Steep Shorelines	8.2
3) Beaches (sand/gravel)	1.1
4) Flats (mud/sand)	1.3
5) Vegetated	28.3

Full shoreline class lengths are in the appendix

4. Archaeo-cultural and Socio-economic Issues

Historical sites are present in the area. See the appendix for the full list. Contact the state historic preservation office for exact locations

Project Timeline/Key Milestones

Period of Performance: 03 FEB 2022 – 31 MAY 2024

- FY22 – Draft ICS 232 report generated by ERMA available now, functionality will be in production end of March 2024.
- ERMA Application version 5.2 released September 2023.
- Finalize ERMA application testing (NOAA).
- FY23 – DRAFT ICS 232 will be available for review by the USCG GLCOE and designated partners.
- Improved ESI data presentation (Threatened & Endangered species).
- Implement dashboard tabs – allow users to view map/charts by different metrics.
- ERMA application version 5.4 release scheduled for June 2024.

Project Completion Date: 31 MAY 2024 | **Percent Complete:** 85%

GLCOE Lead:	**PI:**	**Partners:**
CWO Joe Torcivia	George Graettinger	NOAA OR&R

Anticipated Outcome/Transition:
Advancing ERMA

Pyxis Oil Spill Detection System (PODS)

FY22 - 2

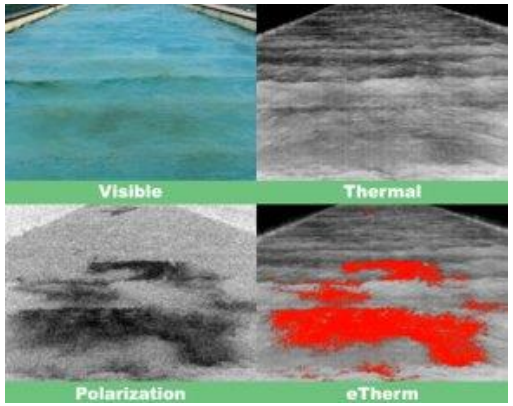
Theme Alignment: Response

Objectives

- Assess oil detection technology: Purchased Pyxis camera and data analysis software.

Notes

- Indoor facilities will not work due to thermal shadows; looking to use Lake Superior State University's outdoors tank in both warm and cold conditions with ice.
- Currently working on testing scenarios and mounting design for the Pyxis, so evaluation can begin as soon as camera is in hand and personnel are fully trained in its operation and data analysis.



GLCOE Lead:	**PI:**	**Partners:**
Dr. Allie Snider	Dr. David Wright	Heidi Purcell

Anticipated Outcome/Transition: Evaluate the Pyxis Long Wavelength Infrared High Definition (LWIR HD) 30Hz camera system's ability to detect oil in freshwater and ice-affected waters.

Project Timeline/Key Milestones

Period of Performance: 16 SEP 2022 – 31 MAR 2024

- Literature review of additional types of oil detection technology, including Costal Dynamics Experiment (CODE) drifters to mimic oil transport for modeling applications. Provide report.
- Determine best management practices for using Pyxis and conduct USCG field-based training.
- Exploring gimbal options for deployment on a drone for further testing.
- Attending MPRI conference to begin planning tests that will include the Pyxis test.

Project Completion Date: 31 MAR 2024 | **Percent Complete:** 60%

Info Portal

FY22 - 3

Theme Alignment: NA

Objectives

- Assess the GLCOE needs for a public-facing website for the public, stakeholders, USCG, GLCOE partners, and for general information dissemination.
- Interview possible users and assess similar websites to determine the functionalities desired.
- Produce a report of recommendations given several different scopes to the GLCOE.

Notes

- Two engagement specialists have been hired.
- Exploratory literature review has been conducted.
- Identified potential end-users to interview and created guidelines for the interviews.
- In the process of conducting internal and external interviews.
- Once completed, recordings will be transcribed and coded.

Engage

Co-Design

Translate

Research

GLCOE Lead:	PI:	Partners:
LTJG Ali Gates	Dr. Riley Ravary	Dr. Ayumi Fujisaki-Manome

Anticipated Outcome/Transition: End-User surveys and interviews to produce base level website

Project Timeline/Key Milestones

Period of Performance: 12 SEP 2022 – 31 MAR 2024	
Project reallocation of effort. The focus is to generate a Report of Info Portal Recommendations.	
Initial draft of work plan revised to reflect refocusing of the project.	
Initial draft of user needs assessment interviewee list and interview questions.	
Finalized list of interview questions.	
Executive summary on current state of project & work plan addressing remaining project timeline.	
Produce a report of potential website upgrade functionalities by SEPT 2024.	
Project Completion Date: 31 MAR 2024	**Percent Complete:** 30%

Federal On-Scene Coordinator (FOSC) Ice Guide

FY22 - 4

Theme Alignment: Response

Objectives

- Consolidate key scientific elements into a report or guide for response to oil under ice.
- Research the differences in oil behavior in freshwater ice as opposed to saltwater ice.
- Identify local Oil Spill Removal Organizations (OSRO) to create a line of communication between GLCOE and local responders.
- Produce a printable FOSC job aid.

Notes

- Research Planning Inc. (RPI) will be joining the project and will be producing the FOSC Guide.
- Performing literature search on the differences between oil behavior in freshwater ice and marine ice.
- Next steps: Meet regularly with RPI for coordination meetings & finalize list of local OSROs and their contact information.
- Key words for literature review have been reviewed by GLCOE.

GLCOE Lead:	**PI:**	**Partners:**
CWO Joe Torcivia	Dr. David Wright	Heidi Purcell

Anticipated Outcome/Transition: RPI will produce a field guide for responses to oil under ice.

RPI RESEARCH PLANNING, INC.

Project Timeline/Key Milestones

Period of Performance: 22 SEP 2022 – 31 MAR 2024
Project has been initiated, several meetings with Subject Matter Experts (SMEs) and NOAA Scientific Support Coordinator (SSC) to give input into the guide's structure and content.
Steps have been taken by CIGLR to subcontract the guide to RPI (discussion held 12 Oct 2023)
RPI will come onboard in January w/ Kickoff Meeting in February.
Meet regularly with RPI to stay on track with the project deadline.
Provide literature review to GLCOE as final deliverable.

Project Completion Date: 31 MAR 2024	**Percent Complete:** 30%

Optimizing Unmanned Aircraft Systems (UAS)

FY22 - 5

Theme Alignment: Response

Objectives

- Advance the capabilities to develop and test oil spill response equipment, techniques and technologies to better respond o and evaluate impacts of oil spills in freshwater environments
- Draft written procedures for using USCG UAS systems
- Conduct USCG Pilot & responder field training

Notes

- Add addendum to USCGs small UAS Flight Operations Standard Operating Procedures – "Marine Environmental Response Oil Mission Guidelines"
- Course training materials are finalized and ready for delivery.
- Comparative analysis of Commercial Off The Shelf orthomosaic software packages.
- Final meetings held with USCG UAS pilots to discuss feedback and future recommendations.
- Final project meeting completed.

GLCOE Lead:	**PI:**	**Partners:**
LTJG Ali Gates	Dr. Lisa DiPinto	NOAA OR&R, WaterMapping Inc.

Anticipated Outcome/Transition: Consistent data collection that can be easily uploaded into DIVER/ERMA for supporting environmental response.

Project Timeline/Key Milestones

Period of Performance: 20 JUN 2022 – 29 SEP 2023	
Develop draft written procedures for using USCG UAS to collect data in support of oil pollution events in the Great Lakes	
Conduct USCG pilot and responder field-based training: Conducted July 2023	
Develop final, detailed written procedures	
Evaluate options for orthomosaic mapping offshore	
Recommendations for moving forward for future USCG investments in uncrewed systems, including sensor/sampler/accessories for Remotely Operated Vehicles	
Final report delivered.	
Project Completion Date: COMPLETE	**Percent Complete:** 100%

Great Lakes Oil in Ice

FY22 - 6

Theme Alignment: Response

Objectives

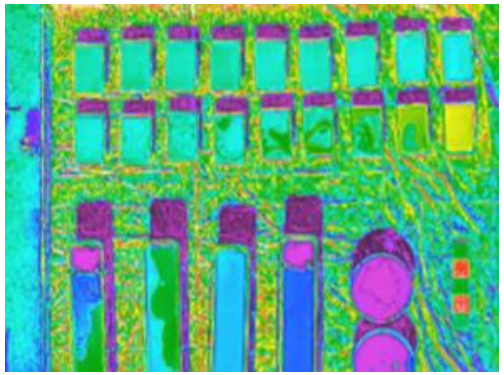
- Refine detection limits based on actual time in field.
- Advance our understanding of the relationship between percentage of ice cover and thermal sensor-based oil thickness characterization.
- Develop faster workflows to allow for production of mapping.

Notes

- Preliminary results presented at 24 AUG 2023 quarterly meeting.
- Conducted additional testing and analyses to determine "container effect" on test results.
- Developed technique to overlay sensor, photographic, and UV oil images to determine sensor capabilities.
- Determined impact of ice on oil thermal characteristics is limited to small area adjacent to ice.
- Final report delivered.

GLCOE Lead:	**PI:**	**Partners:**
LTJG Ali Gates	Dr. Lisa DiPinto	NOAA OR&R, WaterMapping Inc.

Anticipated Outcome/Transition: Improve UAS mapping workflows, understanding of relationship between ice cover/oil thickness characterization



Project Timeline/Key Milestones

Period of Performance: 20 JUN 2022 – 29 SEP 2023

- Completed shore-based field trials at Lake Superior State University (March 2023).
- Completed drill of UAS operations in ice from a USCG vessel (March 2023).
- Project report summarizing the testing and scientific findings, potentially suitable for peer reviewed publication is underway.
- Write up protocols for flying and characterizing ice cover for application during incidents, including data collection, intake and development of faster workflows.

Project Completion Date: COMPLETE	**Percent Complete:** 100%

RAND Gap Analysis

FY22 - 8

Theme Alignment: Preparedness

Objectives

- Analyze current capabilities and capacity to respond to oil spills in the Great Lakes, enabling assessment of gaps, risks, and ways to mitigate them.
- This work will enable the Coast Guard and other stakeholders to be able to improve responses to potential oil spills in the Great Lakes in ways that reduce health, environmental, and economic risks.

Notes

- The GLCOE reviewed the draft report and created a feedback form that was sent back to RAND Corporation.
- Mr. Aaron Davenport presented the draft report to CG-5RI, CG-MER, and the GLCOE.
- Final Report will be submitted prior to 22 DEC 2023.
- Publication is being reviewed and will be public soon.

GLCOE Lead:	**PI:**	**Partners:**
LTJG Ali Gates	Aaron Davenport	N/A

Anticipated Outcome/Transition: Gap Analysis Final Report

Project Timeline/Key Milestones

Period of Performance: 22 SEP 2022 – 22 DEC 2023

Task 1 - Describe the scale and scope of the problem.
Task 2 – Describe the oil-spill response capabilities and capacities of government agencies and private companies on both sides of the U.S. – Canadian border.
Task 3 – Develop and analyze a series of scenarios to assess gaps in response capabilities and capacities.
Task 4 – Analyze ways in which gaps can be mitigated.

Project Completion Date: COMPLETE	**Percent Complete:** 100%

Enhancing Great Lakes Modeling

FY23 - 1

Theme Alignment: Preparedness

Objectives

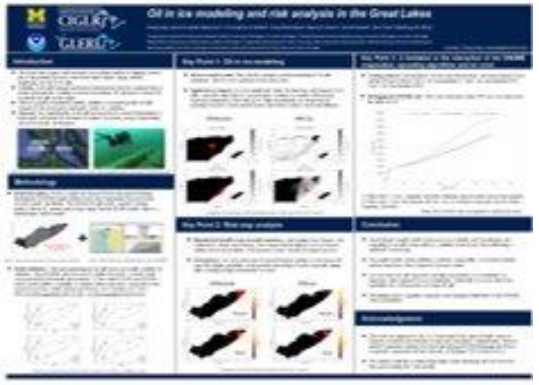
- Enhance Web General NOAA Operational Modeling Environment (GNOME) interconnectivity with Environmental Response Management Application Common Operating Picture (ERMA COP) improvements.
- Facilitate modeling working groups: Part 1 – Broad Working Group & Part 2 – GNOME Evaluation

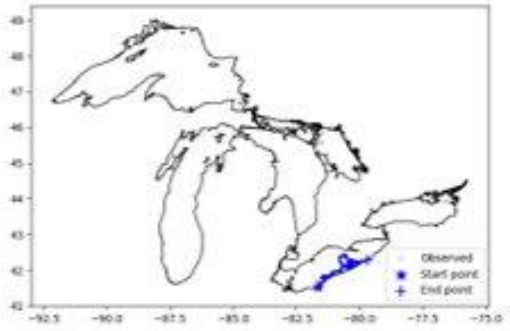
Notes

- Part 1: Cross program discussions of modeling capabilities, datasets, data formatting/delivery, modeling enhancement//identify issues//recommendations on enhancements.
- Part 2: Support GLERL's ongoing GNOME evaluation w/ Dr. Ayumi Fujisaki-Manome.

GLCOE Lead:	PI:	Partners:
Dr. Matt Alloy	Amy MacFadyen	Dr. Nancy Kinner

Anticipated Outcome/Transition: Enhance collaboration and communication on environmental and spill modeling efforts in the region.





Project Timeline/Key Milestones

Period of Performance: 01 JUN 2023 – 31 MAY 2024

- Monthly meetings with Yang Song updating the group and ending with action items for group members.
- Members asked to formalize the challenges, achievements, and deliverables of this effort. Then to provide a list of the prospective next steps/goals of the effort to follow.
- Bi-weekly meetings with oil spill modelers to discuss suggestions on potential modeling enhancements.
- Create spreadsheet of models for reference to quickly compare capabilities and approaches, algorithms, and needed inputs.

Project Completion Date: 31 MAY 2024 | **Percent Complete:** 40%

Great Lakes Trajectory Analysis Planner (TAP)

FY23 - 3

Theme Alignment: Preparedness

Objectives

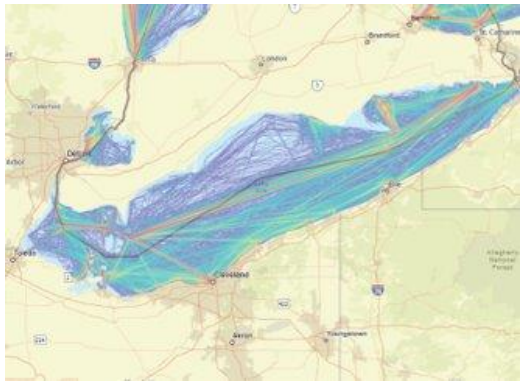
- Develop TAP for Lake Erie and further develop the online WebTAP viewer, including an option to output results in formats compatible with NOAA's ERMA (Environmental Response Management Application).

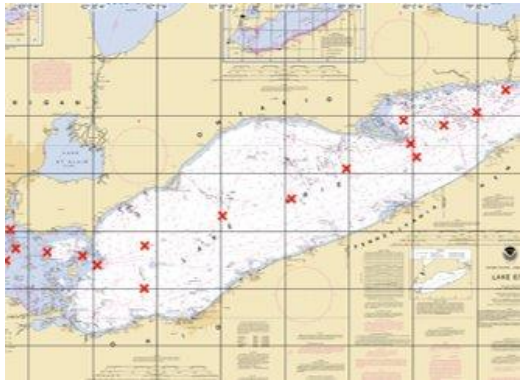
Notes

- Investigated options for long term archives of coupled ice-ocean hydrodynamic models as the Center for Operational Oceanographic Products and Services (CO-OPS) Lake Erie Operational Forecast System has not included a coupled ice model consistently.
- Model forcing data (winds, currents, ice) from CIGLR have been downloaded and prepared for GNOME model runs.
- Successful initial test runs and integration of a subset of Lake Erie sources into WebTAP viewer.
- Next Steps: Run hundreds of GNME model scenarios for each source.

GLCOE Lead:	**PI:**	**Partners:**
Dr. Matt Alloy	Amy MacFadyen, Chris Barker	NOAA POC: Lisa DiPinto

Anticipated Outcome/Transition: Completed Lake Erie TAP will be integrated into the NOAA WebTAP viewer.





Project Timeline/Key Milestones

Period of Performance: 01 JUN 2023 – 31 MAY 2024

- Gather and transform wind, currents and ice data using long term datasets to be obtained from members of the Great Lakes Modeling working groups (e.g. GLERL, CIGLR institutions) for Lake Erie and the Great Lakes.
- Research (with input from local sources) likely oil spill events in the area and use these to define spill sources and oil types for the GNOME trajectory runs.
- Input the transformed winds and currents data into the GNOME trajectory model for the TAP runs.
- Add code to TAP to output results in a GIS-compatible format (e.g. shapefiles) for ingest to ERMA or other Geographic Information Systems (GIS) (e.g. ArcPro).
- Add the completed Lake Erie TAP to the NOAA WebTAP viewer, which can be found at https://tap.orr.noaa.gov.

Project Completion Date: 31 MAY 2024 | **Percent Complete:** 30%

Great Lakes Uncrewed Aircraft Systems (GL UAS) Capacity Building

FY23 - 4

Theme Alignment: Response

Objectives

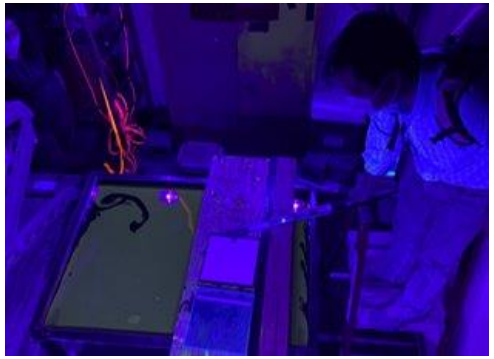
- Plan and conduct controlled testing for the development and validation of oil thickness algorithms.
  - This will be done with (1) GLERL's sensor and (2) up to 3 additional sensors at University of New Hampshire (UNH) in the high bay facility and an outdoor tank.
  - Multiple oil types will be tested in each experiment.
  - For the three additional sensors, other variables will be tested as well (temperature, thickness, etc.).

Notes

- USCG selected additional sensors to try to test (USCG small Unmanned Aerial Systems, Light Detection And Ranging (LiDAR), PODS, Polarimetric Imaging).
- LiDAR and hyperspectral sensor flown at outdoor facility in late March with marine diesel and MC 20 crude thicknesses from 100 to 2,000 um at different times of the day.
- Future: GLERL hyperspectral outdoor testing

GLCOE Lead:	**PI:**	**Partners:**
Dr. Allie Snider	Dr. Lisa DiPinto	NOAA GLERL POC: David Wright

Anticipated Outcome/Transition: Technical reports that detail utility of each tested sensor for detecting oil



Project Timeline/Key Milestones

Period of Performance: 01 JUN 2023 – 31 MAY 2024	
Bi-weekly or monthly virtual meetings with meeting notes and action items in a format to share with working group members.	
Test plan for GLERL for 2 separate weeks of testing sensors at UNH.	
Brief (2-4 pp) technical report highlighting findings from GLERL's 2 weeks of UNH high bay laboratory experiments.	
Test plans for 1 week of testing sensors and/or samplers at UNH for individual operators.	
Brief (2-4 pp) technical reports highlighting the findings from 1 week of testing individual operators (operators TBD by USCG) for up to 3 individual operators.	
Outdoor facility testing of USCG drones/pilots flights with RGB and thermal sensors.	
Polaris Pyxis polarized infrared sensor on site for testing of detection capabilities marine diesel & MC20 crude without ice.	
Final report evaluating efficacy of the sensors for detection of marine diesel and MC20 crude (precision, accuracy, detection limits, pros/cons for use) and submit manuscript for publication.	
Project Completion Date: 31 MAY 2024	**Percent Complete:** 60%

UAS Guidance & Training

FY23 - 5

Theme Alignment: Response

Objectives

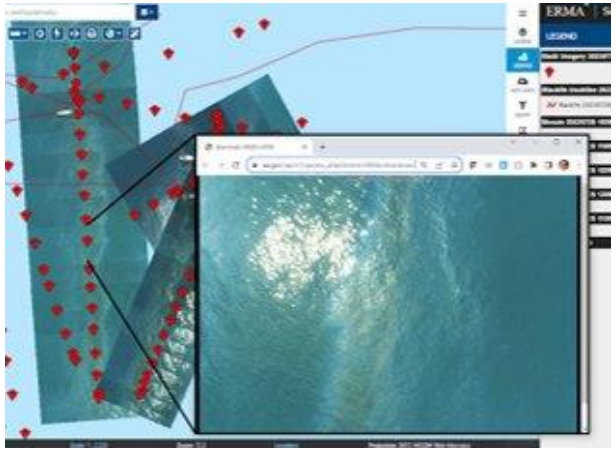
- Job Aid: How to use small UAS (sUAS) to collect imagery during emergency response on shorelines and on water
- Job Aid: Data management, storage, and delivery
- Integrate training materials will be developed for the use of both job aids.

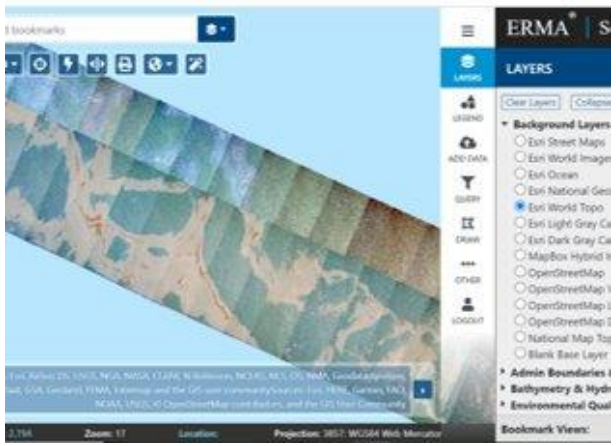
Notes

- Planning meeting on 10 OCT 2023 w/ participants from NOAA, USCG, and RPI.
- Conducted meeting at CLEANGULF regarding use of UAS at USCG and NOAA.
- Created detailed outline for 1st job aid that provides safety measures and guidance on how to use sUAS for specific response operations, including which sensors to use and when to use optional equipment.

GLCOE Lead:	**PI:**	**Partners:**
CWO Joe Torcivia	Dr. Lisa DiPinto	WaterMapping, Inc

Anticipated Outcome/Transition: Advance protocols and training for CG-7114 in oil response





Project Timeline/Key Milestones

Period of Performance: 01 JUN 2023 – 31 MAY 2024	
Conduct meeting at CLEANGULF for UAS projects.	
Create outline for Job Aid #1.	
Planning meetings in December, January, & February to discuss progress on the 1st Job Aid..	
First draft of Job Aid #1 by 15 MAR 2024.	
Project Completion Date: 31 MAY 2024	**Percent Complete:** 20%

GL Wave Tank & Storage Infrastructure

FY23 – 6
FY23 – 7

Theme Alignment: Preparedness, Response

Objectives

- Construction of a new storage facility to provide enhanced infrastructure and capabilities for US and Canadian researchers within the Great Lakes to support research and response.
- Creation of a new and custom wave tank system (designed by SeaView Systems). The tank will be modular and be portable so that it can be moved outdoors to simulate environmental conditions that will strongly influence oil dynamics (e.g., photo-oxidation, ice development)

Notes

- Construction began in the Fall on the storage building; work will continue into the Winter.
- Preliminary design for wave tank is in hand; adjustments will be made and production will begin when design is finalized.
- Building structure in place and internal workshop under construction.
- Tank contract finalized; final design and construction phase.
- Next Step: Pending weather – base brick work and concrete apron.

GLCOE Lead:	**PI:**	**Partners:**
Dr. Allie Snider	Dr. Ashley Moerke	NOAA: Dr. David Wright

Anticipated Outcome/Transition: Enhance infrastructure and capabilities within the Great Lakes to evaluate technological developments under controlled, yet real-world conditions.

Project Timeline/Key Milestones

Period of Performance: 01 JUL 2023 – 30 JUN 2024

- Design for wave tank has already been completed and secured from SeaView Systems.
- Construct facility to house wave tank (planning in progress with external funding).
- Purchase tank construction materials.
- Build tank, complete plumbing to draw river water into tank system and circulate into Center for Freshwater Research and Education's (CFRE) existing water outflow system (within 6 months of SOW finalization).
- Building structure in place and internal workshop under construction now.
- Finalize “add-on” designs for wave tank.

Project Completion Date: 30 JUN 2024 | **Percent Complete:** 50%

Detection of Submerged Oil - UV

FY24 - 5

Theme Alignment: Response

Objectives

- Develop a sensor that can detect the presence of spilled oil or oil products submerged in water or sitting on the lakebed using ultra-violet (UV) fluorescence technology.
- Conduct controlled laboratory bench tests using a variety of oils.
- Field demonstration of combined above and below water oil sensing with airborne and underwater UV fluorescence sensors.

Notes

- Conducted Post Award Brief in JAN24.
- Created Project Management Plan and Data Management Plan.
- Next step: Design laboratory study.

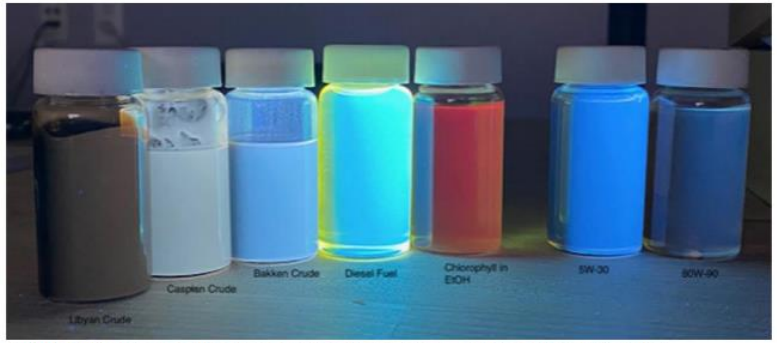


Figure 2: *Fluorescence of a variety of oil samples. Also present is a chlorophyll sample.*

Michigan Tech Research Institute

GLCOE Lead:	PI:	Partners:
Dr. Matt Alloy	Dr. Michael Sayers	Michigan Tech. Univ.

Anticipated Outcome/Transition: Adopt final sensor into practical platforms that can be deployed in the Great Lakes.

Project Timeline/Key Milestones

Period of Performance: 22 JAN 24 – 21 JAN 25	
Finalize project documents: Project Management Plan and Data Management Plan.	
Conduct a bench laboratory study and demonstrate robustness of the detection method under water conditions representative of the Great Lakes.	
Conduct field test for airborne and subsurface light-based active oil detection systems.	
Project Completion Date: 21 JAN 25	**Percent Complete:** 5%