



Worst Case Oil Spill: High Risk Areas Near the Straits of Mackinac

A new U-M Water Center report highlights the use of a computer model to predict the fate of a hypothetical oil spill in the Straits of Mackinac. The report, entitled “Statistical Analysis of Straits of Mackinac Line 5 Worst Case Spill Scenarios,” pinpoints areas at highest risk along the Lake Huron-Michigan shoreline and presents quantitative information about the level of risk to both island and coastal communities.

In creating the report, research scientist David Schwab simulated 840 hypothetical spill cases, all with the same initial release point just south of the center of the Line 5 pipeline. These cases provide a wide range of possible spill impacts during the ice-free season. The methods used in this model are equivalent to those used in the operational NOAA oil spill model. The model covers a wide variety of weather conditions, from the spring to the fall, but does not address ice conditions in the winter.

HIGHEST RISK

Areas at highest risk include Mackinac and Bois Blanc Islands, Mackinaw City, and the shorelines east and west of the city, and areas on the north shore of the Straits near the Mackinac Bridge. Communities at risk also include Beaver Island, Cross Village, Harbor Springs, Cheboygan, and other areas of Lake Huron-Michigan shoreline.

This is the most comprehensive study of Line 5 oil spill impacts publicly available. Schwab presents compelling results. Three potential levels of oil discharge (measured in barrels, each containing 42 gallons of US oil) including 5,000 bbl, 10,000 bbl, and 25,000 bbl are considered in the report. Schwab's model accounts for the particular characteristics of light crude oil (specific gravity and evaporation rate), which is typically carried through the pipeline, and the associated oil spill dispersion properties.

KEY FINDINGS

- More than 700 miles of shoreline in Lakes Michigan and Huron and on their islands are potentially vulnerable to an oil spill in the Straits (to the extent that cleanup would be required).
- In a single case (worst case), more than 150 miles of shoreline could be impacted with a spill amount of 25,000 bbl. The maximum amount of shoreline impacted for a 10,000 bbl spill is more than 100 miles and for a 5,000 bbl spill is more than 70 miles.
- More than 15% of Lake Michigan's open water (3,528 square miles), and nearly 60% of Lake Huron's open water (13,611 square miles) could be affected by a spill in the Straits.

OFFSHORE AREA AFFECTED

PERCENT OF CASES	TOTAL AREA (mi ²)	LAKE MICHIGAN AREA (mi ²)	LAKE HURON AREA (mi ²)
> 0%	17,142	3,530	13,630
> 20%	4,980	652	4,325
> 40%	2,200	200	2,000
> 60%	834	80	753
> 80%	245	25	220

Shown here, the percentage (left column) range of cases impacting an area, in square miles (mi²) for both lakes (total) and each lake.

LENGTH OF IMPACTED SHORELINE

INITIAL RELEASE VOLUME	ALL CASES	SINGLE CASE	MEDIAN CASE
25,000 bbl	722 mi	152 mi	74 mi
10,000 bbl	518 mi	105 mi	53 mi
5,000 bbl	440 mi	71 mi	37 mi

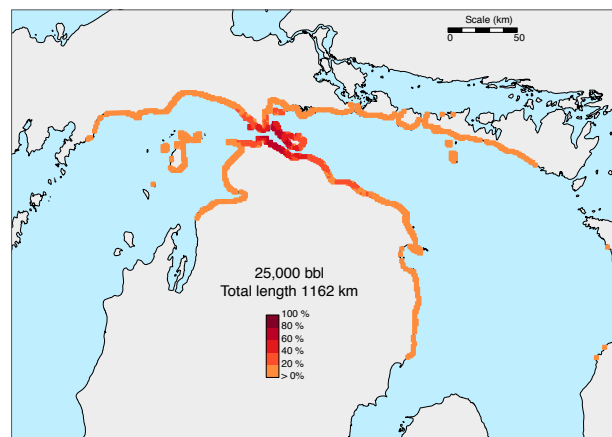
Summary of the length (miles) of impacted shoreline for three different initial oil spill release volumes showing: 1) length of shoreline that could be impacted by any spill, 2) maximum length of impacted shoreline in a single case, and 3) median (average) length of impacted shoreline from all cases.

LINE FIVE PIPELINE

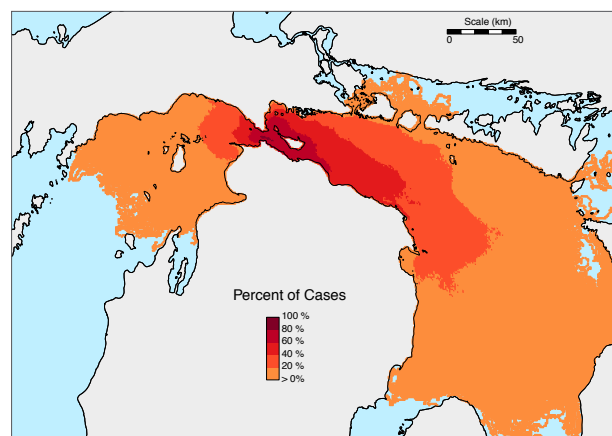
West of the Mackinac Bridge is a submerged section of the Enbridge, Inc. Line 5 oil pipeline.

- Line 5 carries up to 20 million gallons of light crude oil, light synthetic crude oil, and natural gas liquids across the Straits each day.
- The Straits of Mackinac is approximately a 6-mile long section of waterway that joins Lakes Huron and Michigan.
- At the narrowest point, the Straits are spanned by the 5-mile long Mackinac Bridge connecting Michigan's upper and lower peninsulas.
- The full report: *Statistical Analysis of Straits of Mackinac Line 5 Worst Case Spill Scenarios*, and the animations of several spill cases can be found online: <http://graham.umich.edu/water/project/mackinac-oil-spill>

This study addresses the "fate and transport of worst-case scenario," identified by the Michigan Pipeline Safety Advisory Board. Specifically, this analysis addresses the following recommendation, from the Michigan Petroleum Pipeline Task Force: Require an Independent Risk Analysis and Adequate Financial Assurance for the Straits Pipelines.



Probability of sufficient beached oil to require cleanup



Probability of visible oil up to 60 days after the oil spill

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The U-M Water Center addresses critical and emerging water resource challenges through collaborative research projects. The Center is part of the Graham Sustainability Institute, which integrates faculty and student talent across the University of Michigan, and partners with external stakeholders, to foster collaborative sustainability solutions at all scales.

See: graham.umich.edu/water The U-M Water Center