Agenda

October 15, 2018
1:00 – 4:00 PM (EST)

Ramada Lansing Hotel and Conference Center
Regency Ballroom
7501 West Saginaw Highway
Lansing, Michigan 48917

1:00 – 1:05 PM **Welcome and Introductions**

1:05 – 1:10 PM **Meeting Minutes: August 6, 2018** (*Attachment A*)

1:10 – 1:15 PM **Correspondence Received** (*Attachment B*)
- Members
- Non-Members

1:15 – 2:15 PM **Enbridge Agreement** (*Attachment C*)

2:15 – 2:45 PM **Organizational Items** (*Attachment D*)
- Final Report Discussion
- Next Proposed Meeting – December 10, 2018
  - Time: 1:30 - 3:30 PM (EST)
  - Location: Lansing, TBD
- Board Member Comments

2:45 – 3:00 PM **Break**

3:00 – 4:00 PM **Public Participation**

4:00 PM **Adjourn**

MINUTES

MICHIGAN PIPELINE SAFETY ADVISORY BOARD

Ramada Lansing Hotel and Conference Center
Regency Ballroom
7501 West Saginaw Highway
Lansing, Michigan 48917

August 6, 2018
9:00 a.m. – 5:00 p.m.

Present: Keith Creagh, Co-Chair, Department of Natural Resources (DNR)
Heidi Grether, Co-Chair, Department of Environmental Quality (DEQ)
Anne Armstrong, Michigan Agency for Energy (MAE)
Inspector Chris Bush (Designee for Capt. Chris Kelenske), Michigan State Police (MSP)
David Chislea (Designee for Sally Talberg), Michigan Public Service Commission (MPSC)
Anthony England, University of Michigan-Dearborn
Craig Hupp, Public Member
Shawn Lyon, Marathon Petroleum
Homer Mandoka, Nottawaseppi Huron Band of the Potawatomi
Jennifer McKay, Tip of the Mitt
Laura Moody (*Designee for Attorney General Bill Schuette*), Department of Attorney General (DAG)
Jeffrey Pillon, National Association of State Energy Officials
Jerome Popiel, United States Coast Guard (*Coast Guard Liaison, non-voting*)
Brad Shamla, Enbridge Energy Company
Michael Shriberg, National Wildlife Federation

Absent: Chris Shepler, Shepler's Mackinac Island Ferry Service

Others: Mary Goodhall, DEQ
Joe Haas, DEQ
Reka Holley, MAE
Sarah Howes, DEQ
Alex Morese, MAE
Robert Reichel, DAG
Holly Simons, DEQ
Mark Sweatman, DNR
Travis Warner, MPSC

I. CALL TO ORDER
Keith Creagh, Director, DNR, called the meeting to order at 9:04 a.m.

II. WELCOME AND INTRODUCTIONS
Co-Chair Creagh welcomed everyone and asked board members to please speak into the provided microphones in order to be heard. Co-Chair Creagh reminded the board that Holly Simons, elected by the board to be Secretary, will take the minutes for today's

meeting and for members of the public wishing to speak to fill out a comment card and submit them to Holly. Co-Chair Creagh asked board members if there was any new business to add to the agenda. Homer Mandoka indicated he would like to provide a tribal update.

Anne Armstrong moved, seconded by Brad Shamla, that the agenda be amended to add a Tribal Update. The vote was taken on the motion. The motion carried.

III. MAY 14, 2018 MEETING MINUTES

Having reviewed the minutes from the May 14, 2018, meeting, Co-Chair Creagh asked for comments. Anne Armstrong indicated a discrepancy listing her as absent from the meeting. Craig Hupp indicated a discrepancy on his comment on page five and asked that the date be changed to October 15, 2018.

Co-Chair Grether moved, seconded by Homer Mandoka, that the amended minutes from the May 14, 2018, meeting be approved. The vote was taken on the motion. The motion carried.

IV. CORRESPONDENCE RECEIVED

Correspondence received on behalf of the Board since its last meeting was shared with the Board in the pre-meeting packet, including:

Non-Board Members

- Bob Learner
- Liz Kirkwood, FLOW
- Leonard Page, SACCPJE
- James Olson, FLOW
- Marion Mangi
- Jamie Winters
- Holly Berkowitz

V. ORGANIZATIONAL ITEMS

Co-Chair Creagh reminded the board that the next meeting will take place Monday, October 15, 2018 and that the state will announce the meeting location as soon as possible. Co-Chair Creagh informed the board that a presentation of the Independent Risk Analysis for the Straits Pipelines will be taking place Monday, August 13, 2018, at 6:00 p.m. in the Blue/Green Room at Boyne Highlands Resort in Harbor Springs.

VI. PETROLEUM PIPELINE TASK FORCCE RECOMMENDATIONS AND CHARGE TO BOARD

Co-Chair Creagh introduced Mary Goodhall from the DEQ who has been asked to facilitate the discussion.

A. House Bill 6201 – Oil Spill Response Plans and Reporting

Reka Holley, MAE, provided an introduction for the discussion.

Jennifer McKay referenced the Marshall line spill and lessons learned and questioned why the bill is limited to the Straits pipeline when the recommendation was statewide.

Jeffrey Pillon commented on the feasibility noting insufficient funds.

Homer Mandoka stated tribal government may not be aware and suggested assigning a liaison from the House or Senate and to send a memo to the tribes to inform them and to seek comment from them.

Craig Hupp inquired on the status of the bill.

Reka Holley informed the board that it has been assigned to the Competitiveness Committee and is currently awaiting scheduling.

Craig Hupp seconded Jennifer McKay's comments that it should be more inclusive.

Michael Shriberg added that scope-wise, this bill has the potential to pick upon the weakness of federal agencies proposed legislations and that Michigan could be an example.

Jeffery Pillon asked if board member comments will be shared with the legislature. Co-Chair Creagh indicated they would and written comments should be submitted to Holly for their inclusion. Since this is a time sensitive issue, having them separate would be helpful.

Shawn Lyon commented on the existence of an oil spill liability trust fund that oil and gas operators pay into.

Joe Haas indicated the bill is pretty narrowly defined.

Michael Shriberg noted that the bill requires sufficient personnel, materials, and time.

Jerome Popiel questioned whether the trust fund that Shawn mentioned could be used in such a manner, indicating that the fund is primarily used for spill responses.

Craig Hupp inquired if drafters of the bill had consultation with the state agencies.

Reka Holley indicated that none had taken place yet but will be.

Jennifer McKay indicated this is the second version of this bill. It was first introduced in 2015.

Robert Reichel asked the board to look at how the bill compared to previous legislation. HB 5198, for example, where staff from the DEQ and the DAG were involved. While substantial portions are similar, there are differences. For

example, HB 6201 focuses only on pipelines at the Straits while HB 5198 applied to oil pipelines throughout the state. Under HB 5198, civil fines for oil spills would consider the quantity of oil released.

Jennifer McKay indicated one difference in the bills is that response plans are not subject to FOIA.

Robert Reichel responded by saying the way the bill is presently written, that is correct. Under HB 6201, response plans would not be subject to FOIA.

B. Hazardous Liquids Pipeline Safety Program
Brian Sheldon, MAE, provided an introduction for the discussion.

Homer Madoka asked how consultation is going to include the tribes and indicated that under state law if human remains are uncovered, historic preservation must take place.

David Chislea indicated that the white paper does not specifically address that but is something that is done as a matter of practice with state archaeologists.

Michael Shriberg questioned the cost and funding.

Brian Sheldon indicated that the team looked at other states for reimbursement rates.

Michael Shriberg gave kudos to the team for their work in providing excellent analysis. He inquired about how big of an asset the information access is.

Brian Sheldon indicated that it is difficult to quantify.

Jennifer McKay commented that PHMSA indicated to the board last summer that it could participate informally.

Jeffery Pillon commented on the importance of open communication and the state having an active role.

Homer Mandoka commented on how the National Traffic Safety Board previously called out PHMSA on their lack of oversite.

Shawn Lyon indicated that since the Woverine incident, PHMSA has adjusted.

Michael Shriberg inquired where board comments should be directed.

Co-Chair Creagh indicated comments would be shared with the Governor and that responsible parties would be informed within the recommendations.

Craig Hupp inquired whether state agencies would develop an opinion on if it is advisable.

David Chislea responded by saying not beyond the white paper, however MPSC has a good relationship with PHMSA.

Co-Chair Grether indicated the DEQ will weigh it against other priorities and take MAE's lead.

Co-Chair Creagh indicated there is room for improvement and that today's comments will be very helpful in determining the outcome.

C. Pipeline Safety Best Practices and Pipeline Siting Subcommittee Recommendations

Travis Warner, MPSC, provided an introduction for the discussion.

Craig Hupp indicated the importance of including public need as it correlates to what product is being moved.

Jeffery Pillon commented on the importance of looking where we've been and what we've learned siting what happened in Wolverine; and the importance of educating the public so they can make informed decisions.

Michael Shriberg questioned whether there would be additional authority or resources.

Travis Warner indicated that they specifically stayed away from legislation from a resource perspective and that the state may need to look at how applications are reviewed and what it's really costing the state.

Shawn Lyon pointed out the bar graph on Page 2 showing that not many applications come through.

Siting Part 7 on Page 8, Michael Shriberg stated that most applications fall well under, however, he believes some go way over. Tracking time would help.

Jennifer McKay stated a recent case that modified fees which generated a lot of discussion on what was appropriate.

Jeffery Pillon indicated it would depend on other cases before the Commission.

Seeing more of an intersect now that it has been established, Co-Chair Creagh suggested taking a look at the executive order that established the Governor's Infrastructure Commission and seeing if there are opportunities to integrate management of aging infrastructure.

Sarah Howes stated that water assessment is house within the Department of Treasury.

Co-Chair Creagh recommended sharing the report with the Commission.

Jeffery Pillon suggested looking at the interdependencies of infrastructure and minimizing future risk stating people don't always see the connection.

Michael Shriberg asked to hear more about the environmental justice piece, specifically, the reasoning beyond time.

Travis Warner noted a lack of personal context on where the recommendations came from and what they were trying to achieve with them.

Jennifer McKay expressed hesitation on how it would be implemented.

Shawn Lyon expressed concern with the scope being beyond what the board was asked to do but realized the learning opportunity that would be missed if a process weren't implemented.

David Chislea indicated the importance of consulting with other agencies on applications received as a matter of practice.

VII. BREAK

The board adjourned for a break at 10:30 a.m. and reconvened at 10:49 a.m.

D. State Policies on Emergency Response and Planning for Pipelines

Chris Bush, MSP; and Jerome Popiel, USCG, provided an introduction for the discussion.

Jennifer McKay asked if there would be funding for locals to attend the training and workshop.

Chris Bush indicated there would be.

Jerome Popiel recommended additional funding and looking at current state procedure because responses start local and end local.

Jeffery Pillon indicated it would be useful to incorporate detail when addressing plans. Impact on petroleum products, air quality requirements, etc.

Chris Bush agreed stating they are working with MAE to do so.

Michael Shriberg asked if these are changes to procedure or if there are already in place.

Chris Bush indicated they are always working on the process to do a better job.

Jeffery Pillon suggested looking at the Risk Analysis to better define and understand the consequence of events.

Joe Haas shared that Shoreline Cleanup and Assessment Technique training will be taking place this week with state agencies and local officials.

E. Miscellaneous Recommendations and Advice to Governor
Co-Chair Creagh provided an introduction for the discussion.

Jerome Popiel talked about the Federal Register Notice for the Regulated Navigation Area in the Straits and the need for communication and support.

Co-Chair Creagh stated Holly will provide the link to the Federal Register from Jerome Popiel to the board after the meeting.

Anthony England discussed alternatives opportunities such as a tunnel or partially buried pipeline that he wouldn't want to see lost and suggested providing an incentive to Enbridge.

Jennifer McKay stated the need to look beyond the Straits and address inland threats.

Homer Mandoka suggested that local officials and pipeline owners and operators be involved in every county where the pipeline exists and by doing so could help with stewardship so that the boots on the ground have the same information as those in higher places.

Chris Bush suggested that part of the emergency response should be sharing information with local level emergency managers.

Co-Chair Grether added that it should be a shared responsibility to create a relationship with pipeline owners.

Homer Mandoka added that it would be important for pipeline owners to attend local members regular meetings.

Chris Bush added that it would certainly be helpful to have those contacts.

Brad Shamla agreed and shared the importance of best practices when looking at long term viability.

Anthony England indicated the need to move forward and not wait for a disaster to happen echoing the importance of an incentive to Enbridge.

Jerome Popiel agreed that the response effort is better prepared in the Straits and not as coordinated inland.

Jeffery Pillon stated that the Risk Analysis is an excellent resource to inform local responders what we've learned in the past.

Joe Haas sited a National Transportation Safety Board report that recommended outreach beyond the local emergency officials to neighbors who are our first line of response.

Craig Hupp expressed the importance of keeping the public informed and engaged beyond installation.

Shawn Lyon and Brad Shamla agreed stating it is a continual process and always room for improvement.

Jennifer McKay expressed the need for allocated funds for the website to continue in a meaningful way. She also discussed transparency with operators by continuing to obtain and provide reports on the website.

Michael Shriberg asked what the role of the board is with the Risk Analysis.

Co-Chair Creagh responded by asking the Board to share their recommendations in their comments.

Jeffery Pillon echoed the Co-Chair's response and expressed his disappointment in the price tag and timeframe of the tunnel.

Michael Shriberg sited a London Economics International report that he believes expands on the Dynamic Risk report and provides best options.

Craig Hupp expressed the importance of learning from the near-sighted vison of the 1950's and look ahead 65-100 years at what might be possible and where we want to be.

Joe Haas shared that at a public hearing for the additional support anchors for Line 5, he learned that a large portion of funding for Mackinac Schools is provided by taxes from Enbridge and expressed the need to look at this from all perspectives.

Co-Chair Creagh thanked the board for their comments and reminded them that it was requested their written comments be no longer than five pages and are due to Holly by August 27, 2018.

VIII. BREAK FOR LUNCH
The board adjourned for lunch at 11:58 a.m. And reconvened at 12:56 p.m.

IX. STRAITS INCIDENT PROGRESS
Joe Haas, DEQ, provided an update. Discussion took place.

X. ENBRIDGE AGREEMENT
Robert Reichel, DAG, provided an update. Discussion took place.

XI. TRIBAL UPDATE
Homer Mandoka provided an update. Discussion took place.

XII. PUBLIC PARTICIPATION

- John Machowicz shared verbal comments.
- Vince Lumetta shared verbal comments.
- Dale Giddings shared verbal comments.
- Terri Wilkerson shared verbal comments.
- Allison LaPlatt shared verbal comments.
- Linda Singer shared verbal comments.
- Anne Woiwode, Sierra Club of Michigan, shared verbal comments.
- Sean McBrearty, Clean Water Action/Oil and Water Don't Mix, shared verbal comments.

XIII. BREAK

The board adjourned for a break at 1:50 p.m. and reconvened at 3:00 p.m.

XIV. PUBLIC PARTICIPATION

- John Machowicz shared additional comments.

XV. ADJOURN

Co-Chair Creagh called the meeting to adjourn at 3:07 p.m.

NEXT MEETING Monday, October 15, 2018
Time: 10:30 a.m. – 3:30 p.m.
Location: TBA

Simons, Holly (DEQ)

From: noreply@engagingplans.org on behalf of MI Petroleum Pipelines <noreply@engagingplans.org>
Sent: Wednesday, August 15, 2018 10:57 AM
To: MiPetroleumPipelines
Subject: Form submission from: Contact Us

Submitted on Wednesday, August 15, 2018 - 10:57am
Submitted by anonymous user: 107.77.195.186
Submitted values are:

Your Name: Stephanie Grozner
Your Email Address: sgrozner@northernhealth.org
Your Phone Number: 231-357-6727
Subject: Questions
Attachment:
Your Message: Now that the risk analysts have revealed their findings, who has the power to shut down line 5? While we are all talking and writing and following political protocols, a spill could occur any minute of any day. Please ACT on these terrifying results BEFORE ITS TOO LATE : SHUT IT DOWN.

The results of this submission may be viewed at:
https://mipetroleumpipelines.com/node/5/submission/394

Simons, Holly (DEQ)

From: noreply@engagingplans.org on behalf of MI Petroleum Pipelines <noreply@engagingplans.org>
Sent: Monday, August 20, 2018 12:03 AM
To: MiPetroleumPipelines
Subject: Form submission from: Contact Us

Submitted on Monday, August 20, 2018 - 12:03am
Submitted by anonymous user: 99.8.85.86
Submitted values are:

Your Name: Rita Mitchell
Your Email Address: ritalmitchell@gmail.com
Your Phone Number: 723 272-5194
Subject: Submit Information/Comments
Attachment:
Your Message:
I find that the report to the PSAB does not adequately address the risk to the people and natural areas of the State of Michigan. A leak in the fresh waters of the Straits of Mackinac or anywhere along the route of LIne 5 is unacceptable. Our air and water will be fouled with pollution. Our wildlife will be killed and habitat destroyed. The variable conditions under which oil recovery would be attempted are daunting. Please take all steps to shut down Line 5 immediately, and remove the risk of oil leaks along the entire course of the pipeline.

The results of this submission may be viewed at:
https://mipetroleumpipelines.com/node/5/submission/395

SECOND AGREEMENT BETWEEN THE STATE OF MICHIGAN, MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, AND MICHIGAN DEPARTMENT OF NATURAL RESOURCES AND ENBRIDGE ENERGY, LIMITED PARTNERSHIP, ENBRIDGE ENERGY COMPANY, INC., AND ENBRIDGE ENERGY PARTNERS, L.P.

This Second Agreement is entered between the State of Michigan, the Michigan Department of Environmental Quality, and the Michigan Department of Natural Resources (collectively referred to herein as "the State"), AND Enbridge Energy, Limited Partnership, Enbridge Energy Company, Inc., formerly known as Lakehead Pipe Line Company, Inc., and Enbridge Energy Partners, L.P. (collectively referred to herein as "Enbridge") concerning those segments of Enbridge's Line 5 pipeline ("Line 5") that are located within the State of Michigan. This Second Agreement results from, and is intended to fulfill, the parties' obligations under Paragraph I.H. of the first Agreement between the State and Enbridge, entered November 27, 2017 ("First Agreement"), in which the parties agreed to pursue a further agreement to address Line 5's crossing of the Straits of Mackinac ("Straits").

WHEREAS, the segments of Line 5 located within Michigan extend 547 miles, from the border of Wisconsin near Ironwood, Michigan to Marysville, Michigan, where it crosses the St. Clair River to the border with Sarnia, Ontario ("St. Clair River Crossing");

WHEREAS, the segments of Line 5 located within Michigan must be operated and maintained in compliance with all applicable laws that are intended to protect the public health, safety, and welfare and prevent pollution, impairment, or destruction of the natural resources of the State of Michigan, including the unique resources of the Great Lakes;

WHEREAS, the continued operation of Line 5 through the State of Michigan serves important public needs by providing substantial volumes of propane to meet the needs of Michigan citizens, supporting businesses in Michigan, and transporting essential hydrocarbon products, including Michigan-produced oil to Michigan and regional refineries and manufacturers;

WHEREAS, the State issued an "Easement" to Lakehead Pipeline Company, Inc. ("Lakehead"), subsequently renamed Enbridge Energy Company, Inc., on April 23, 1953 pursuant to Act No. 10, PA 1953 "for the purpose of erecting, laying, maintaining and operating" an approximate 4-mile segment of Line 5 across the Straits upon determining that such crossing would "be of benefit to all of the people of the State of Michigan and in furtherance of the public welfare";

WHEREAS, in accordance with the Easement, Enbridge constructed two parallel pipelines, each 4.09-miles long (referred to herein as the "Dual Pipelines") across the Straits in

1953 (referred to as the "Straits Crossing"), and since that time continues to operate and maintain such pipelines consistent with the terms of the Easement as part of Line 5 to transport light crude oil, synthetic crude oil, and natural gas liquids;

WHEREAS, on September 3, 2015, Enbridge and the State entered an agreement under which Enbridge affirmed that it does not and will not transport heavy crude oil through the Dual Pipelines;

WHEREAS, the State and Enbridge recognize that the Straits Crossing and the St. Clair River Crossing (collectively "Crossings") are located in the Great Lakes and connecting waters that include and are in proximity to unique ecological and natural resources that are of vital significance to the State and its residents, to tribal governments and their members, to public water supplies, and to the regional economy, and the Crossings are also present in important infrastructure corridors;

WHEREAS, the State and Enbridge recognize that other important ecological and natural resources are located near other segments of Line 5 that cross or approach other waters of the State that are also of vital significance to the State and its residents, to tribal governments and their members, to public water supplies, and to the regional economy;

WHEREAS, in the First Agreement, the State and Enbridge established additional measures with respect to certain matters related to Enbridge's stewardship of Line 5 within Michigan and the transparency of its operation;

WHEREAS, in accordance with Paragraph I.A. of the First Agreement, Enbridge has enhanced its coordination with the State concerning the operation and maintenance of Line 5 located in the State of Michigan;

WHEREAS, in accordance with Paragraph I.B. of the First Agreement, Enbridge timely requested pre-application consultations and applied for all US and Canadian authorizations and approvals necessary to replace Line 5's crossing of the St. Clair River by the use of a horizontal directional drill method;

WHEREAS, under the circumstances specified in Paragraph I.C. and Appendix 1 to the First Agreement, Enbridge has discontinued Line 5 operations in the Straits during sustained adverse weather conditions;

WHEREAS, Enbridge has completed its evaluation of underwater technologies to enhance leak detection and technologies to assess coating condition of the Dual Pipelines and has

submitted the results of such evaluations to the State, in accordance with Paragraph I.D. of the First Agreement;

WHEREAS, Enbridge has submitted to the State an evaluation of measures to mitigate potential vessel anchor strike, in accordance with Paragraph I.E. of the First Agreement;

WHEREAS, Enbridge has submitted to the State an evaluation of alternatives to replace the Dual Pipelines, in accordance with Paragraph I.F. of the First Agreement;

WHEREAS, Enbridge has worked in coordination with the State to identify and evaluate water crossings by Line 5 and to assess measures to minimize the likelihood and/or consequences of a release at each water crossing location, in accordance with Paragraph I.G. of the First Agreement;

WHEREAS, the evaluations carried out pursuant to the First Agreement have identified near-term measures to enhance the safety of Line 5, and a longer-term measure – the replacement of the Dual Pipelines – that can essentially eliminate the risk of adverse impacts that may result from a potential release from Line 5 at the Straits;

WHEREAS Enbridge has recently implemented and committed to continue additional measures to enhance the safety of Line 5; and

WHEREAS, the State acknowledges that the stipulations specified in this Second Agreement are intended to further protect ecological and natural resources held in public trust by the State of Michigan, and that the terms of this Second Agreement will both protect the ecological and natural resources held in public trust by the State and provide clarity as to State's expectations concerning the safety, integrity, and operation of Line 5.

NOW, THEREFORE, the parties agree as set forth below.

I. STIPULATIONS

Enbridge and the State agree to the following measures, which are designed, among other things, to increase coordination between the State and Enbridge concerning the operation and maintenance of Enbridge's Line 5 pipeline located in the State of Michigan, including further enhancing the safety of its operation and reducing the risk of adverse impacts that may result from a potential release from Line 5 at the Straits in the interest of the citizens of Michigan.

A. Continued Coordination Between the State and Enbridge: In order to continue coordination with the State concerning the operation and maintenance of Line 5 located in the

State of Michigan, and to facilitate the implementation of the measures described at Paragraphs B-K below, the parties agree as follows:

1. The State will further provide designated representatives to participate in the stewardship and transparency consultations and communications to be carried out under this Second Agreement.

2. Enbridge will work cooperatively with the State to: (a) make available to the State's representative data and other materials generated under this Second Agreement, including but not limited to geologic, engineering, or other technological information concerning Line 5 located in the State of Michigan and Enbridge's implementation of the measures described herein; and (b) all requested information in Enbridge's possession concerning the operation, integrity management, leak detection, and emergency preparedness for Enbridge's Line 5 pipeline located in the State of Michigan. The State recognizes, and to the extent provided by applicable law will accommodate, Enbridge's interest in protecting from disclosure critical energy infrastructure and other confidential information protected from disclosure by law.

3. Enbridge and representatives designated by the State agree to meet semi-annually to discuss any changes to engineering parameters, risks, new technologies, and innovations pertaining to the operation and maintenance of Line 5 located within the State of Michigan. One such semi-annual meeting shall include subject matter experts from Enbridge and the State to review matters relating to pipeline integrity, emergency response and preparedness for Line 5 located within the State of Michigan.

B. Replacement of Line 5 St. Clair River Crossing: Consistent with Paragraph I.B. of the First Agreement, Enbridge timely met its obligations under the First Agreement by filing applications seeking all state, US federal and Canadian authorizations and approvals necessary for the replacement of the St. Clair River Crossing by use of a horizontal directional drill ("HDD") method. No later than 180 days after obtaining all state, US federal, and Canadian authorizations and approvals necessary to replace Line 5's crossing of the St. Clair River by the use of a HDD method, Enbridge will initiate the work identified in the applications necessary to replace that segment of Line 5.

C. Discontinuation of Line 5 Operations in the Straits During Sustained Adverse Weather Conditions: Until such time that the Dual Pipelines are replaced, Enbridge has and will continue to temporarily shut-down the operation of the Dual Pipelines while "Sustained Adverse

Weather Conditions," as that term is defined in Appendix 1 to this Second Agreement, remain in effect in the Straits, using the procedure set forth in Appendix 1. Additionally, should median wave heights in the Straits over a continuous 60-minute period exceed 6.5 feet in height based upon "Near-real time Data" or in its absence, "Modeled Data," as those terms are defined in Appendix 1, Enbridge shall ensure that at least one Enbridge employee is available and capable of traveling to the Line 5 North Straits valve station in less than 15 minutes. Enbridge will notify the State when the Line 5 Dual Pipelines have been shut down due to "Sustained Adverse Weather Conditions" and again when the Line 5 Dual Pipelines are restarted. Further, the State is planning to install radar technology that will provide additional near real-time data regarding wave height at the Straits. The State and Enbridge agree that when those data become available, they will be shared with Enbridge and applied to the procedures set forth in Appendix 1and this Paragraph. Any modification to Appendix 1 to account for the use of radar technology data shall not require a written Amendment to this Second Agreement under Section II below.

D. Underwater Technologies to Enhance Leak Detection and Technologies to Assess Coating Condition of the Dual Pipelines: Based upon the evaluation performed pursuant to Paragraph I.D. of the First Agreement, Enbridge will conduct a Close Interval Survey ("CIS") of the Dual Pipelines every two years, so long as the Dual Pipelines remain in operation. Enbridge plans to conduct a CIS on the Dual Pipelines in 2018, and shall complete the next CIS within two calendar years from the date on which that CIS is conducted by Enbridge, and then every two calendar years thereafter.

E. Implementation of Measures to Mitigate Potential Vessel Anchor Strike: The United States Coast Guard ("Coast Guard") has proposed the establishment of a Regulated Navigation Area pursuant to 33 CFR 165 in the Straits of Mackinac that would prohibit vessels from anchoring or loitering within that Area without Coast Guard authorization. 83 Federal Register 37780 (August 2, 2018). In order to assist the Coast Guard in monitoring compliance with that regulation, Enbridge agrees to provide one-time funding of up to $200,000 to be used for the acquisition and installation of video cameras at the Straits.

F. Replacement of Dual Pipelines in a Straits Tunnel: Pursuant to Paragraph I.F. of the First Agreement, Enbridge prepared and submitted to the State the report entitled *Alternatives for replacing Enbridge's dual Line 5 pipelines crossing the Straits of Mackinac* (June 15, 2018) ("Alternatives Analysis"). That Alternatives Analysis concluded that construction of a tunnel beneath the lakebed of the Straits connecting the upper and lower peninsulas of Michigan, and the placement in the tunnel of a new oil pipeline, is a feasible alternative for replacing the Dual Pipelines, and that alternative would essentially eliminate the risk of adverse impacts that may result from a potential oil spill in the Straits (hereinafter "Straits Tunnel"). The State and Enbridge agree to promptly pursue further agreements discussed under Paragraph I.G below for

the design, construction, operation, management, and maintenance of the Straits Tunnel in which a replacement for the Dual Pipelines could be located ("Line 5 Straits Replacement Segment").

G. Further Agreements for a Straits Tunnel: The State has proposed that, together with housing the Line 5 Straits Replacement Segment, the Straits Tunnel could accommodate multiple utilities, including but not necessarily limited to: electric transmission lines, and facilities for transmitting data and telecommunications (collectively "Utilities"). The State and Enbridge agree to initiate discussions, as soon as practicable, to negotiate a public-private partnership agreement with the Mackinac Bridge Authority ("Authority") with respect to the Straits Tunnel for the purpose of locating the Line 5 Straits Replacement Segment and, to the extent practicable, Utilities in that Tunnel (hereinafter "Tunnel Project Agreement"). The Tunnel Project Agreement shall include provisions under which the Authority will provide property necessary for the construction of the Straits Tunnel, in return for which Enbridge would: (a) fund the design and construction of the Straits Tunnel; (b) construct the Straits Tunnel; and (c) construct the Line 5 Straits Replacement Segment to be located within the Tunnel. Such agreement shall also provide that the Authority shall: (a) obtain or support Enbridge in obtaining the necessary permits, authorizations, or approvals necessary for the construction and operation of the Tunnel and the Line 5 Straits Replacement Segment; and (b) upon completion of the construction of the Straits Tunnel, the Authority shall assume ownership of the Straits Tunnel. Simultaneous with the execution of such agreement, the Authority would execute a lease or other agreements to: (a) authorize Enbridge's use of the Straits Tunnel for the purpose of locating the Line 5 Straits Replacement Segment for as long as the Line 5 Straits Replacement Segment shall be in operation by Enbridge; (b) provide that Enbridge will operate and maintain the Straits Tunnel during the term of the lease on terms to be agreed; and (c) specify the conditions under which Utilities may gain access to the Straits Tunnel. Provided that the agreements discussed in this Paragraph I.G. are executed by the Authority and Enbridge, the State and Enbridge would simultaneously enter into an agreement expressly confirming Enbridge's rights to operate the Dual Pipelines under the terms of the Easement during the construction of the Straits Tunnel and Line 5 Replacement Straits Segment, subject to compliance with the terms of the agreements described in Paragraph I.G. and applicable laws. Any failure to reach the further agreements contemplated by this Paragraph I.G. shall not alter any existing rights Enbridge has under the Easement.

H. Permanent Deactivation of the Dual Pipelines: Enbridge agrees that following completion of the Straits Tunnel and after the Line 5 Straits Replacement Segment is constructed and placed into service by Enbridge within the Straits Tunnel, Enbridge will permanently deactivate the Dual Pipelines. Consistent with Paragraphs E, H, and Q of the Easement, the procedures, methods, and materials for replacement, relocation, and deactivation of the Dual Pipelines are subject to the written approval of the State, which the State agrees shall not be unreasonably withheld. At a minimum, any portion of the Dual Pipelines that remains in place

after deactivation shall be thoroughly cleaned of any product or residue thereof and the ends shall be permanently capped to the satisfaction of the State, which shall not be unreasonably withheld. The State and Enbridge agree that decisions regarding the method of deactivation, including potential removal of the Dual Pipelines should take into account short- and long-term effects of the deactivation method options and associated sediment and water quality disturbance on natural resources, particularly fishery resources, in proximity to the Straits. The options include: (a) abandoning in place the entire length of each of the Dual Pipelines; or (b) removing from the Straits the submerged portions of each of the Dual Pipelines that were not fully buried in a ditch and placed under cover near the shoreline of the Straits at the time of initial construction.

I. Line 5 Water Crossings Other Than the Straits: Pursuant to Paragraph I.C. of the First Agreement, Enbridge prepared and submitted to the State the Report entitled *Enhancing Safety and Reducing Potential Impacts at Line 5 Water Crossings* (June 30, 2018) ("Water Crossing Report). As described in the Water Crossing Report, Enbridge and representatives of the State jointly identified and prioritized a total of 74 Line 5 water crossings in Michigan other than the Straits and organized them into 11 area groupings, detailed in Tables 1 and 2 in Appendix A to the Report. The Water Crossing Report assessed available mitigation measures to: (a) minimize the likelihood of potential releases (leak prevention); and (b) reduce the consequences of potential releases if they were to occur. Based on that assessment, the Report identified a series of specific Action Items to address both of those objectives and proposed time frames for their implementation (Report, pp 18- 24). They include measures related to: (a) Enbridge's Mainline Integrity program; (b) Enbridge's Geohazard Management Program; (c) Pipeline Damage Prevention; (d) Emergency Response; and (e) Environmental Management. As reflected in the Water Crossing Report, the Action Items include, among other things, measures that are intended to increase by an order of magnitude Enbridge's leak prevention safety targets for certain water crossings.

In addition to completing all of the Action Items identified in the Report, the parties have agreed upon two projects at water crossings on which preparatory work shall immediately begin. These specific mitigation measures to be implemented in the near term at certain locations as are specified in Appendix 2 of this Second Agreement.

Enbridge shall implement the Action Items as described in the Report, and as supplemented in this Second Agreement and the Summary contained in Appendix 2 to this Second Agreement, provided that the State and Enbridge may mutually agree in writing to modify Action Items, as well as any tangible follow-up actions, tasks, or mitigation measures associated with the Action Items, as necessary to accommodate site conditions and industry best practices. Any such modifications do not require a written Amendment to this Second Agreement under Section II below. To the extent they differ: (i) the terms of any modification

to the Action Items takes precedence over this Second Agreement; (ii) the terms of this Second Agreement takes precedence over those of Appendix 2; and (iii) those terms of Appendix 2 take precedence over those of the Report.

J. Financial Assurance: The State commissioned the final *Independent Risk Analysis for the Straits Pipelines* (Meadows, et al., September 15, 2018) (hereinafter "Independent Risk Analysis") to assess a worst-case discharge from the Dual Pipelines, including the cost of responding to that worst-case discharge. Enbridge strongly disagrees with the methods and conclusions of the Independent Risk Analysis report, and nothing in this Second Agreement shall be construed to constitute Enbridge's acceptance of those methods and conclusions. Enbridge nonetheless agrees that, so long as it continues to operate the Dual Pipelines, the Enbridge entity or entities that own and operate Line 5, or the parent companies of such Enbridge entity(ies), will maintain in force financial assurance mechanisms that meet or exceed the $1,878,000,000 estimate of Enbridge's potential total quantifiable response liability for a worst-case discharge from the Dual Pipelines that is identified in the Independent Risk Analysis. To demonstrate compliance with this requirement, on an annual basis Enbridge will file with the State updated financial assurance information in a format similar to that provided in Appendix 3. Enbridge further agrees that, upon the request by the State, it will on an annual basis, make available to the State for inspection and review information regarding the amount, availability, and changes to liability insurance that it maintains. The State agrees that Enbridge's compliance with the requirements under this Paragraph I.J. satisfies its financial assurance obligations specified under Paragraph J of the Easement.

K. Continuation of Additional Measures to Enhance the Safety of Line 5 in Michigan: Enbridge has in recent years undertaken a variety of additional measures to enhance the safety of Line 5 in Michigan and to improve its emergency preparedness and response capabilities. Such measures, as listed in Appendix 4 to this Agreement, include but are not limited to: (i) the purchase and placement of additional emergency response equipment; (ii) the positioning of permanent personnel in proximity to the Straits; and (iii) improvements to personnel response times to manually close valves in proximity to the Straits. Enbridge agrees that it will continue to implement the measures listed in Appendix 4 so long as it continues to operate the portions of Line 5 to which they apply.

II. AMENDMENT

The State or Enbridge may propose in writing that this Second Agreement be amended. The State and Enbridge agree to consult in good faith in an effort to reach agreement on any proposed amendment. Except as provided in Paragraph I.G., any amendment agreed to by the State and Enbridge shall be effective on the date that any written amendment is executed by the State and Enbridge.

III. DISPUTE RESOLUTION

The State and Enbridge agree that, should any dispute arise under this Second Agreement, the State and Enbridge shall in good faith attempt to resolve the dispute through informal negotiations. If the parties are unable to informally resolve such a dispute, either party may initiate proceedings in a court of competent jurisdiction to resolve the dispute.

IV. TERM AND TERMINATION

The terms of this Second Agreement shall remain in effect until the commitments in Paragraphs I.B., I.E. - I.I. above are fulfilled, except that the obligations in Paragraphs I.A., I.C., I.D., I.J., and I.K. shall continue, subject to the terms set forth in those Paragraphs, unless and until the Second Agreement terminates automatically. This Second Agreement shall terminate automatically upon the voluntary discontinuation of service by Enbridge of Line 5 through the State of Michigan.

V. COMPLIANCE WITH APPLICABLE LAW

The State and Enbridge acknowledge and agree that Enbridge's operation of Line 5 remains subject to the requirements of all applicable state and federal law, the Easement, the September 3, 2015 Agreement with the State that prohibits Enbridge from transporting heavy crude oil on Line 5 within the State of Michigan, and the terms of any easement granted by the State for Line 5 and agree that nothing in this Second Agreement is intended to relieve Enbridge of its obligation to comply with or waive any rights that Enbridge and the State may have under such laws or to supersede or displace applicable state law, regulation or requirement, or any federal law, regulation, or requirement that is applicable to the operation or maintenance of Line 5, including but not limited to the Pipeline Safety Act (including its preemption provisions); the Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2016 (Public Law 114-183); any regulation or order issued by PHMSA or any other federal agency; or the Consent Decree entered into between Enbridge and the United States in *United States v. Enbridge Energy, Limited Partnership, et al.*, No. 1:16-cv-914, ECF No. 14 (E.D. Mich., entered May 23, 2017), which specifies certain investigation, integrity management, leak detection, valve placement, and emergency response measures to prevent discharges of oil or hazardous substances into or upon the waters of the United States or adjoining shorelines.

VI. ENTIRE AGREEMENT

This Second Agreement constitutes the whole of the Agreement between the parties concerning those portions of Enbridge's Line 5 located in the State of Michigan. This Second Agreement supersedes in its entirety the First Agreement.

VII. EXECUTION

This Second Agreement may be executed in counterparts without the necessity that the Parties execute the same counterpart, each of which will be deemed an original, but which together will constitute one and the same agreement. The exchange of copies of this Second Agreement by electronic or hard-copy means shall constitute effective execution and delivery thereof and may be used in lieu of the original for all purposes.

VIII. NO THIRD PARTY BENEFICIARIES

This Second Agreement is intended for the exclusive benefit of the parties hereto and their respective successors. Nothing contained in this Second Agreement shall be construed as creating any rights or benefits in or to any third party. This Second Agreement does not give rise to a private right of action for any person other than the parties to this Second Agreement.

FOR THE STATE OF MICHIGAN

_____

Name: Rick Snyder
Title: Governor
Dated: 10/3/18

_____

Name: Keith Creagh
Title: Director, Michigan Department of Natural Resources
Dated: _____

_____

Name: Heidi Grether
Title: Director, Michigan Department of Environmental Quality
Dated: _____

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FOR THE STATE OF MICHIGAN

Name: Rick Snyder
Title: Governor
Dated: _____

Name: Keith Creagh
Title: Director, Michigan Department of Natural Resources
Dated: 10/3/2018

Name: Heidi Grether
Title: Director, Michigan Department of Environmental Quality
Dated: 10/3/18

FOR ENBRIDGE ENERGY, LIMITED PARTNERSHIP
BY: ENBRIDGE PIPELINES (LAKEHEAD) L.L.C. AS GENERAL PARTNER

Name: Bradley F. Shamla
Title: Vice President, U.S. Operations
Dated: 10/2/2018

Name: Al Monaco
Title: Authorized Signatory for Enbridge Pipelines (Lakehead) L.L.C.
Dated: 10/2/2018

FOR ENBRIDGE ENERGY COMPANY, INC.

Name: Bradley F. Shamla
Title: Vice President, U.S. Operations
Dated: 10/2/2018

Name: Guy Jarvis
Title: Executive Vice President – Liquids Pipelines
Dated: 10/2/2018

FOR ENBRIDGE ENERGY PARTNERS, L.P.
BY: ENBRIDGE ENERGY MANAGEMENT, L.L.C. AS DELEGATE OF ITS GENERAL PARTNER

Name: Bradley F. Shamla
Title: Vice President, U.S. Operations
Dated: 10/2/2018

Appendix 1

Enbridge Line 5 – Sustained Adverse Weather Conditions Procedure

This Appendix is designed to facilitate an effective emergency response to a potential release incident by specifying procedures for a systematic approach by Enbridge to temporarily shut down Line 5 in the Straits of Mackinac during Sustained Adverse Weather Conditions. Enbridge shall maintain a record of its use of the procedure and make it available to the State. If an alternate source of near-real time wave height data such as the radar system planned by the State becomes available following the execution of this agreement, Enbridge and the State will work cooperatively to revise this Appendix to account for the alternative data source.

Definitions:

Sustained Adverse Weather Conditions: Conditions in which median wave heights in the Straits of Mackinac over a continuous 60-minute period are greater than 8 feet based on "Near-real Time Data," or in its absence "Modeled Data."

Near-real Time Data: The wave height data derived from Buoy 45175 (Mackinac Straits West) of the Great Lakes Research Center of Michigan Technological University's Upper-Great Lakes Observing System (UGLOS) and/or alternate data sources such as radar data, as mutually agreed by the State and Enbridge through a modification of this Appendix.

Modeled Data: Modeled wave height data based on real-time data inputs that is available on the NOAA Great Lakes Coastal Forecasting System (GLCFS) Nowcast model at a representative point in the Straits.

Forecasted Data: Data available on the NOAA Great Lakes Coastal Forecasting System Forecast model at a representative point in the Straits.

Enbridge Line 5 Procedures – Sustained Adverse Weather Conditions

Step #	Action
1	Enbridge or Enbridge Consultant (collectively "Enbridge Monitor") will continuously monitor Near-real Time Data, or in its absence Modeled Data, to identify Sustained Adverse Weather Conditions at the Straits.
2	When Sustained Adverse Weather Conditions are forecasted based on Forecasted Data, the Enbridge Monitor will inform the Control Center Operations Shift Supervisor, at which point the Control Center Operations will prepare for the potential that an unplanned shut down of Line 5 at the Straits may be required.
3	When Near-real Time Data, or in its absence Modeled Data, indicate that Sustained Adverse Weather Conditions are occurring at the Straits, the Enbridge Monitor will immediately contact the Control Center Operations Shift Supervisor.

Step #	Action
4	The Control Center Operations Shift Supervisor will promptly call the Enbridge Great Lakes On-Call Manager to advise them that Sustained Adverse Weather Conditions exist at the Straits.
5	The Enbridge Great Lakes On-Call Manager will request, no later than 15 minutes after being notified in Step 4 above, that the Control Center Operations shutdown Line 5. If real time conditions in the Straits determined by the Enbridge Great Lakes On-Call Manager indicate Sustained Adverse Weather Conditions do not exist, the Great Lakes On-Call Manager will advise the Control Center Operations Shift Supervisor that Line 5 should not be shutdown. In that event, the Enbridge Monitor will continue to monitor conditions as per Step 1 for changes that indicate that Sustained Adverse Weather conditions may be present and the other Steps in this Appendix shall be followed should the Enbridge Monitor determine that such conditions are present.
6	Unless advised otherwise by the Enbridge Great Lakes On-Call Manager as per Step 5 above, Control Center Operations will perform a controlled emergency shut down of Line 5 and isolate the segment across the Straits.
7	While shut down, the Enbridge Monitor will continuously monitor Near-real Time Data, or in its absence Modeled Data, to identify the continuance of Sustained Adverse Weather Conditions at the Straits.
8	When Near-real Time Data, or in its absence Modeled Data, indicates the Sustained Adverse Weather Conditions no longer exist at the Straits, the Enbridge Great Lakes On Call Manager and Control Center Operations Admin On Call will authorize the restart of Line 5.
9	Control Center Operations will safely restart Line 5.

Communications Protocol:

Enbridge shall immediately notify the State of Michigan as follows: (i) when median wave heights in the Straits over a continuous 60-minute period exceed 6.5 feet in height based upon "Near-real time Data" or in its absence, "Modeled Data," as those terms are defined in Appendix 1, and Enbridge has acted to ensure that at least one Enbridge employee is available and capable of traveling to the Line 5 North Straits valve station in less than 15 minutes; (ii) when Line 5 has been temporarily shut down in the Straits of Mackinac due to Sustained Adverse Weather Conditions, as per Step 6 above; and (iii) when Line 5 has been safely restarted in the Straits of Mackinac, as per Step 9 above. Any notification required under this provision shall be made by email to a specified email address provided to Enbridge by the State of Michigan.

Appendix 2

Action Items for Water Crossings Other than the Straits

A. Additional Near-Term Items

1. Mitigate potential geohazard at the following water crossings:
    a. Point Aux Chenes (3)-restore depth of cover and stabilize bank to prevent further erosion:
        i. Work with State Technical Team to select method, design and schedule within 3 months from the effective date of this Agreement.
        ii. Apply for all necessary permits within 6 months from the effective date of this Agreement.
        iii. Complete construction of mitigation measures within 12 months after receipt of permits.
    b. Tributary to Paint River – Address exposed section of pipeline:
        i. Work with State Technical Team to select method, design and schedule within 3 months of the effective date of this Agreement.
        ii. Apply for all necessary permits within 6 months from the effective date of this Agreement.
        iii. Complete construction of mitigation measures within 12 months after receipt of permits.
2. Accelerated field work to evaluate crossings with potential need for geohazard remediation. Additional information to be gathered for the following crossings within 6 months from the effective date of this Agreement:

    a. Whitefish River - MP 1358
    b. Rapid River – MP 1356
    c. Tributary to Southwest Branch Fishdam River – MP 1373
    d. Elm Creek – MP 1691
    e. East Branch Black River – MP 1442
    f. East Mile Creek – MP 1436
    g. Paquin Creek – MP 1448
    h. Pointe Aux Chenes River (1) – MP 1466
    i. West Branch Paquin Creek – MP 1447
    j. West Mile Creek – MP 1436
    k. Red Creek – MP 1563

Based on evaluations, remedial measures, if needed, may include: depth of cover restoration; bank and bed armoring; or pipeline lowering or replacement. These remedial measures will be implemented as follows:

i. Work with State Technical Team for method selection, design and schedule within 6 months from the effective date of this Agreement.
ii. Apply for all necessary permits within 12 months from the effective date of this Agreement.
iii. Complete construction of remedial measures within 12 months after receipt of permits.

B. Action Items in Report

Preventive and Mitigative Measures	Time to Complete (months)	Number of locations
Leak Prevention Measures		
1. Increase Safety Targets Within Grouping Areas	6	All
2. Engineering Assessment	12	4
3. Baseline Geohazard Assessment	18	17
4. Depth of Cover/Bathymetric Survey	18	31
5. Perform Detailed Scour Study	18	7
6. Replacement/Lowering	TBD	TBD
7. Outreach to local government officials involved in construction activities near waterbodies	6	All

Consequence Mitigation Measures

8.	Review Emergency Response Training and Exercise Communication Plan	6	All
9.	Establish Additional Emergency Response Tactical Control Points	12	10
10.	Collaborative Review of Emergency Response Tactical Control Points	9	All
11.	Update Environmental Sensitivity Maps with State Sensitivity Data	12	All
12.	Review Emergency Response Aquatic Invasive Species Inspection Procedure	12	All
13.	Conduct Baseline Environmental Studies - Rare Wetland Communities	18	20

Biology Mitigation Studies

14.	Fisheries	18	12
15.	Freshwater Mussels	18	31
16.	Biological Integrity	18	11

Appendix 3
Enbridge Financial Assurance Verification Form for Calendar Year [Insert]

	Enbridge Inc. (EI)	Enbridge Energy Partners, L.P. (EEP)	Total	Timing of Access (business days - estimate)
Cash	$ (as per EI's consolidated Q_ 20__ balance sheet– cash & cash equivalents		$	1 day
Credit Facility (available liquidity as at [date]) Note 1	$	$	$	1-3 days
Other Resources Available in 30-60 Days (explain)	$ (as per EI's consolidated Q_ 20__ balance sheet – accounts receivable and other)		$	30-60 days
Total Short-Term	$	$	$	
Insurance	General Liability Insurance, includes Time Element Reporting Pollution (sudden and accidental) coverage currently US$[Insert] Note 2			Note 3
Surety Bonds				
Parent/Affiliate Guarantees (from Parent Co. to Authorization Holder)				
Other Financial Resources (explain)				
Total Other				

Notes:

1. Enbridge utilizes the commercial paper markets in both Canada and the US as a cost effective source of short term liquidity. The commercial paper programs are fully backstopped by the Credit Facilities and the availability of such is reflected net of any commercial paper outstanding.

2. The reflected insurance amount represents the limit for coverage that is maintained by EI for the specified calendar year, and for which EEP is named as an insured under that policy, thereby enabling EEP to obtain insurance recoveries for events covered under the policy. The insurance amount is reviewed and renewed on an annual basis and is subject to insurance market conditions and experience that may impact the breadth and limit of coverage available.

3. The insurance coverage maintained by EI provides any Enbridge entity covered under that policy, such as EEP, with eventual recovery of monies which that Enbridge entity has paid because of its legal liability for direct third- party bodily injury and property damage caused by the release and that financial recovery can extend over a period of months and years.

Appendix 4

Enhanced Safety and Emergency Response Capabilities

Enbridge has, in recent years, undertaken a variety of additional measures to enhance the safety of Line 5 and to improve its emergency preparedness and response capability at the Straits of Mackinac, in the Great Lakes, and throughout Michigan. Enbridge agrees that it will continue these measures so long as it continues to operate the portions of Line 5 to which they apply. These measures include, but are not limited to:

Equipment:

a. Enbridge recently strengthened its already robust emergency response capabilities for the Great Lakes by adding more than $7 million of emergency response equipment to be staged at the Straits of Mackinac. This equipment can be deployed in the Straits and throughout the Great Lakes as necessary. The new equipment includes, but is not limited to:
    - 10,000 feet of Sea Sentry Boom - heavy duty open water containment boom which is fit for service in the presence of ice and rough waters. This boom can withstand wave action to eight feet.
    - 1,000 feet of Fire Boom, necessary for an in situ burning response.
    - Lamor Ice Skimmers (the first deployment in North America)
    - Nofi Current Busters
b. The company holds annual boom deployment exercises in the Great Lakes.
c. Valve Closure Gang boxes, which includes the necessary equipment to execute a manual valve closure, have been located at North Straits valve site and pre-located at each pump station along Line 5.

Personnel:

d. Enbridge established a Pipeline Maintenance (PLM) Crew at St. Ignace adding five employees in addition to the Enbridge employee permanently based in the Straits of Mackinac area. This crew augments crews already stationed along Line 5 in Ironwood, Escanaba, Indian River, and Bay City.
e. Enbridge recently agreed to purchase a building in St. Ignace that will house its local operations employees. The new facility is less than 10 minutes from the North Straits valve site.
f. Enbridge has implemented Incident Command System (ICS) role specific training for its Regional team and Operations Leadership individuals.

Response time:

g. The company improved personnel response time for manual closing of valves at the North Straits valve site to under an hour, and with a target time of no more than 45 minutes – no matter what time of day or weather condition. Manual closing of the valves would be necessary only if all other redundant systems on Line 5 at the Straits would fail. The redundant systems include:
    1) Dedicated 24/7 remote operational control of the pipelines from the Enbridge Control Center. All valves can be remotely opened and closed by the Control Center.

- If there is a power failure at the North Straits site resulting in communications loss with the Control Center, an automatic back-up generator on-site will restore power and allow communications with the Control Center.

2) The pipelines at the Straits are equipped with automatic shut-off valves which will close within three minutes should a threshold pressure loss occur in the pipelines. These closures would be independent of and could not be overridden by any Control Center action. In the unlikely event that communications with the Control Center is lost due to a power outage and the backup generator fails, and the automatic valves fail to operate properly, valves can be closed manually.

Governor Rick Snyder
REINVENTING MICHIGAN
Getting It Right. Getting It Done.

News Release

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FOR IMMEDIATE RELEASE
Wednesday, Oct. 3, 2018

Agreement paves way for Enbridge to permanently shut down, replace Line 5 in Straits of Mackinac

Accord between the state and company requires Enbridge to pay all costs for a multi-use tunnel beneath the Straits, compels safety improvements on other water crossings

LANSING, Mich. – The state of Michigan and Enbridge Energy today announced an agreement that will lead to major safety enhancements along the entire length of the Line 5 petroleum pipeline crossing the state, permanently shut down the current segment that crosses the Straits of Mackinac, and construct a multi-use utility tunnel beneath the Straits. All costs for the tunnel will be paid by Enbridge.

Under the agreement signed today Enbridge would pay for all design, construction, operation and maintenance of the tunnel for up to 99 years, subject to approvals by the Mackinac Bridge Authority. Tunnel construction is estimated to cost between $350 million to $500 million over the 7- to 10-year duration of the project. This major infrastructure initiative for northern Michigan, which would be owned by the Mackinac Bridge Authority and in which Enbridge would lease space, also could house additional infrastructure, such as broadband and electrical lines.

"This common-sense solution offers the greatest possible safeguards to Michigan's waters while maintaining critical connections to ensure Michigan residents have the energy resources they need," said Gov. Rick Snyder. "The historic agreement will result in eliminating nearly every risk of an oil leak in the Straits and provide added protections

to the Great Lakes. It also will allow for multiple utilities to be housed and protected, better connecting our peninsulas, improving energy security and supporting economic development. The taxpayers of Michigan will benefit greatly from this project but won't have to pay for it."

The new accord, which builds on a November 2017 agreement between the state and Enbridge, also demands specific actions at sensitive Line 5 water crossings other than the Straits, expanding protections along the length of the pipeline in Michigan.

"Pipeline safety has always been a top priority for me," said U.S. Rep. Fred Upton, chair of the House Subcommittee on Energy. "I led the bipartisan effort on two major pipeline safety and accountability bills in the last several years. Getting Enbridge to pay for 100 percent of the Line 5 replacement tunnel is the right approach and one I've sought since day one. I want to thank the State of Michigan, and Governor Snyder, for their clear-headed leadership on this issue. This agreement needs to get done as quickly as possible for the protection of our Great Lakes."

"Since taking office 20 months ago, I've worked closely with Gov. Snyder to ensure our Straits remain safe while maintaining the flow of pipeline commerce," said U.S. Rep. Jack Bergman. "The proposed tunnel is a forward-thinking, innovative approach ensuring safety and continued economic stability. Michigan's First District is long overdue to benefit financially from the continuous flow of products transiting our area. I will work tirelessly to ensure that the economic advantages from our energy infrastructure directly benefit the constituents of the First District."

Assessments to date of the Line 5 Straits crossing confirm the pipeline's integrity. However, the agreement will demand additional measures to reduce risk during tunnel construction. Those safety measures will:

- Assure the Straits pipeline is not operating when high waves would severely hamper response to a potential oil spill. The agreement requires that Enbridge staff be present at the Straits to be able to shut down the line within 15 minutes – even if power is lost – when wave heights hit 6.5 feet for at least an hour. Enbridge must continue to shut down the Straits pipeline when wave heights hit 8 feet for at least an hour.
- Provide a new radar system to supply improved, real-time wave-height data at the Straits.
- Assure at least $1.8 billion in available funds be provided by Enbridge to respond to a potential oil spill in the Straits or anywhere on Line 5 in Michigan, providing added protections as tunnel construction is completed.
- Provide consistent state supervision of Line 5 through regular meetings between Enbridge and the state.
- Install cameras in the Straits, paid for by Enbridge, to support new regulations from the U.S. Coast Guard prohibiting ships in the area from dropping their anchors. This has been identified as one of the most serious threats to Line 5 and other utility lines on the bottom of the Straits. The cameras will allow the

Coast Guard to monitor vessels entering the waterways and immediately communicate with those that are operating dangerously.

The new agreement would also:

- Require immediate additional safety measures at 13 priority Line 5 water crossings, in addition to requiring actions at 68 other crossings as identified in a previous report.
- Prohibit heavy crude oil from ever traveling through Line 5.

A previous report conducted by Enbridge and overseen by the state identified a tunnel beneath the Straits as a feasible replacement alternative to the existing Line 5 Straits crossing.

In compliance with the 2017 agreement, Enbridge has already applied for authorizations and approvals to replace the Line 5 crossing at the St. Clair River, a key water body that provides drinking water to a large population in southeast Michigan. That work will begin upon the receipt of those authorizations and approvals.

Line 5 is 645 miles long and transports up to 540,000 barrels a day of light crude oil and natural gas liquids, including propane. Below the Straits of Mackinac, the pipeline splits into two lines that lie on the lake bottom within an easement issued by the state of Michigan. A new pipeline in the tunnel would not increase volumes or alter the types of products transported through the existing Line 5.

###

Safeguarding the Great Lakes

A new agreement between the State of Michigan and Enbridge Energy will:

- Permanently shut down and replace Line 5 in the Straits of Mackinac.
- Build a tunnel beneath the Straits to house Line 5 and require Enbridge to pay all the costs.
- Allow the new tunnel to be used for other utilities.
- Add protections in the Straits while the tunnel is being built.

In addition the agreement will demand immediate safeguards at 13 other places where Line 5 crosses bodies of water- indicated here- with planned safety actions at an additional 68 water crossings in Michigan.

Indicates a single point of crossing

Indicates multiple points of crossing

10/5/2018 Draft Outline of PSAB Report

Letter to the Governor from co-chairs

Statement of values and commitment to protecting the Great Lakes while safeguarding the health and wellness of Michigan residents.

Table of Contents

PSAB Members

PSAB Staff

Executive Order

Charges from the Pipeline Safety Taskforce

Introduction:

- Context
- History
- Process

Summary of Charges and Tasks

Introduction - This section provides an update of each recommendation as well as a compilation of the board members' comments and recommendations for each charge.

Chart of Recommendations and Status

Executive Order 2015-14 Charges of the Pipeline Safety Advisory Board

1. ***Review and make recommendations for statutory, regulatory, and contractual implementation of the Michigan Petroleum Pipeline Task Force Report***

2. ***Identify areas of best practice in pipeline safety and siting across the United States that could be implemented in Michigan***

   The Siting Subcommittee's recommendations include areas of best practice that could be implemented from a regulatory standpoint. The MAE's whitepaper on liquid pipeline safety authority further addresses this charge.

3. ***Review and make recommendations on state policies and procedures regarding emergency response and planning for pipelines.***

   The MSP/EMHSD reviews state level guidance for emergency response as the state of Michigan's Emergency Management Program. The US Coast Guard, Area Contingency Plans and US EPA Inland Response Tactics Manual are reviewed routinely. Area specific contingency plans will be reviewed by state agencies to provide comment and review to these documents.

4. ***Review and make recommendations on state policies and procedures regarding pipeline siting.***
   The Siting Subcommittee introduced its recommendations to the PSAB at the May 14, 2018 meeting. The document includes seven consensus recommendations and two additional non-consensus recommendations

5. ***Review information submitted to the state in response to the Michigan Petroleum Pipeline Task Force Report***
   All information submitted to the State has been reviewed by PSAB members and State staff and has been made publicly available to the extent practicable. *Will be accessible by link in appendix*

6. ***Provide recommendations to increase transparency and public engagement on pipelines.***
   Several recommendations made by the Siting Subcommittee, if implemented, would increase transparency and public engagement. Additionally, long term plans for the petroleum pipeline website will further address this charge.

2015 Michigan Petroleum Pipeline Task Force Report Recommendations

Straits-Specific Recommendations

1. ***Prevent the Transportation of Heavy Crude Oil through the Straits Pipelines.***
   September 3, 2015 agreement prevents Enbridge from transporting heavy crude through the Straits Pipelines in the future (unless the pipeline is re-engineered). Transportation of heavy crude oil would present an unreasonable risk of ecological and economic harm.
   Attach agreement PDF

2. ***Require an Independent Risk Analysis and Adequate Financial Assurance for the Straits Pipelines.***
   A team led by Michigan Technological University was contracted to complete the Risk Analysis study in January 2018. The final report was delivered to the State on September 15, 2018.
   Will be accessible by link in appendix

3. ***Require an Independent Analysis of Alternatives to the Existing Straits Pipelines.***
   The Line 5 Independent Alternatives Analysis Final Report was completed in November 2017.
   Will be accessible by link in appendix

4. ***Obtain Additional Information from Enbridge.***
   The State of Michigan has and continues to request and obtain information from Enbridge on the Straits pipelines. The November 27th agreement requires ongoing semi-annual meetings between the State and Enbridge to further satisfy this recommendation.

Statewide Recommendations

1. ***Coordinate Mapping of Existing Pipelines among State Agencies.***
   Pipeline mapping data is compiled and maintained by the National Pipeline Mapping System (NPMS). The data is available to the states under requirements that it can only be shared publicly on a limited basis. Currently, Michigan's Freedom of Information Act disallows the State from agreeing to the NPMS' terms to obtain the data.

2. ***Ensure State Agencies Collaborate on Emergency Planning and Spill Response.***
   Include DEQ/MSP document here

3. ***Ensure Coordinated Emergency Response Training Exercises and Drills.***
   All state agencies collaborate on updating the all-hazards Michigan Emergency Management Plan (MEMP) annually. State and local agencies will work with US Coast Guard on reviewing Area Contingency Plans as they are updated. In addition, routine drills and exercises are conducted around the state for state and local agency participation as well as in the State Emergency Operations Center. State and local organizations are encouraged to attend a yearly coordination workshop for training that occurs around the state.

4. ***Ensure Regular State Consultation with the Federal Pipeline and Hazardous Materials Safety Administration (PHMSA) on Hazardous Liquid (including Petroleum) Pipelines.***
   Michigan Public Service Commission (MPSC) Staff maintain a working relationship with PHMSA Staff and continue to consult with PHMSA on significant matters relating to hazardous liquid pipelines.

5. ***Consider Legislation Requiring State Review and Approval of Oil Spill Response Plans, Improved Spill Reporting, and More Robust Civil Fines.***
   HB 6201 was introduced on June 12, 2018.

6. ***Evaluate Whether to Establish a Hazardous Liquids Pipeline Safety Program in Michigan***
   Attach white paper in appendix
   The MAE Staff submitted a whitepaper to the PSAB in July of 2018 which assesses the considerations relating to a potential Hazardous Liquids Pipeline Safety Program in Michigan.

7. ***Consider Legislation or Rulemaking to Improve Siting Process for New Petroleum Pipelines.***
   Attach subcommittee report in appendix
   The Siting Subcommittee introduced its recommendations to the board at the May 14, 2018 meeting. The document includes seven consensus recommendations and two additional non-consensus recommendations.

8. ***Consider Issuing an Executive Order Creating an Advisory Committee on Pipeline Safety.***
   Executive Order No. 2015-14 created the Pipeline Safety Advisory Board consisting of 16 members.

9. ***Create a Continuing Petroleum Pipeline Information Website.***
   A website was created to make PSAB and relevant petroleum pipeline information available to the public. The State plans to maintain this website in some form for the foreseeable future. Website content will include information relating to: current pipelines in Michigan, new pipeline applications, major pipeline incidents, changes to regulation, etc. Link: https://mipetroleumpipelines.com/

The Future of Line 5

- Introduction: This section will describe the PSAB discussions related to Line 5.
    - Pipeline Safety Advisory Board complete comments on the future of the Line 5 dual pipelines in the Straits of Mackinac
        Attach PDF of comments to the Governor

Final Thoughts

Discussion: on board members mutual desire to be good stewards of the Great Lakes, protect the health and safety of the citizens, and to face and tackle difficult public policy decisions related to pipeline safety and resource protection.

Next Steps

Appendices

1. Link to mipetroleumpipelines.com
2. Link to Michigan Petroleum Pipeline Task Force Report
3. Timeline of meetings, including listening sessions and attendance numbers – *attach PDF*
4. Link to PSAB agendas, correspondence and meeting packets
5. Link to Independent Risk Analysis for the Straits Pipelines – Final Report
6. Independent Risk Analysis for the Straits Pipelines Executive Summary – *attach PDF*
7. Link to The Line 5 Independent Alternatives Analysis Final Report
8. Liquid Pipeline Safety whitepaper – *attach PDF*
9. Subcommittee pipeline siting report and recommendations – *attach PDF*
10. September 3, 2015 agreement – *attach PDF*
11. Link to Michigan's Emergency Management Program https://www.michigan.gov/documents/msp/MEMP_portfolio_for_web_383520_7.pdf
12. Link to the United States Coast Guard Area Contingency Plans –
13. Link to the United States Environmental Protection Agency Inland Response Tactics Manual
14. Pipeline Safety Advisory Board complete comments on Board charges – *attach PDF*
15. First Enbridge Agreement – *attach PDF*
16. Second Enbridge Agreement – *attach PDF*
17. *Other?*

State Agency Comments on the Requested Pipeline Safety Advisory Board Charges and Pipeline Petroleum Task Force Report Recommendations.

Agencies include:

- Michigan Agency for Energy (MAE)
- Michigan Department of Environmental Quality (MDEQ)
- Michigan Department of Natural Resources (MDNR)
- Michigan Public Service Commission (MPSC)
- Michigan State Police (MSP)

Executive Order 2015-14, Charge #1:

Review and make recommendations for statutory, regulatory, and contractual implementation of the Michigan Petroleum Pipeline Task Force Report.

2015 Michigan Petroleum Pipeline Task Force Report, Statewide Recommendation #6:

Evaluate Whether to Establish a Hazardous Liquids Pipeline Safety Program in Michigan.

Staff from the Michigan Agency for Energy (MAE), in consultation with staff from the Michigan Public Service Commission (MPSC), conducted an analysis of this issue and delivered a whitepaper of its findings to the Pipeline Safety Advisory Board (PSAB) in July 2018. The whitepaper discusses the various forms a liquids pipeline safety program might take, along with the key advantages and drawbacks of the various options. MAE staff presented its findings to the Board at its August 2018 Meeting, where the issue was discussed in detail by Board members.

After due consideration of the information provided to the State and the discussions held by the Board, the Agencies recommend the following:

- The State should continue to seek ways to improve access to information about liquids pipelines in Michigan and to ensure the State remains connected to the decision-making processes surrounding such pipelines.
- The State should participate with PHMSA (Pipeline and Hazardous Materials Safety Administration) in the joint inspection of liquids pipelines in Michigan that pose the highest threat to public safety and to Michigan's natural resources.
- The State should consult with PHMSA and liquids pipeline operators to seek ways to increase the State's involvement in liquids pipeline-related exercises and drills.

Executive Order 2015-14, Charge #3:

Review and make recommendations on state policies and procedures regarding emergency response and planning for pipelines.

2015 Michigan Petroleum Pipeline Task Force Report, Statewide Recommendations #2 and #3:

 # 2 Ensure State Agencies Collaborate on Emergency Planning and Spill Response.

 # 3 Ensure Coordinated Emergency Response Training Exercises and Drills.

Staff from the Michigan State Police (MSP) and the Michigan Department of Environmental Quality (MDEQ) made recommendations on enhancing policies and procedures regarding coordination of emergency response and planning for pipelines and presented these to the PSAB at the August 2018 meeting. The MDNR, MAE and MPSC support the MPS and MDEQ in adopting these recommendations.

In review, the MSP/EMHSD (Emergency Management Homeland Security Division) reviews state level guidance for emergency response as the state of Michigan's Emergency Management Program. The US Coast Guard, Area Contingency Plans and US Environmental Protection Agency Inland Response Tactics Manual are reviewed routinely. Area specific contingency plans will be reviewed by state agencies to provide comment and review to these documents.

Executive Order 2015-14, Charge #4:

Review and make recommendations on State policies and procedures regarding pipeline siting.

A subcommittee was formed within the PSAB to address this topic. The subcommittee presented its recommendations in a report to the PSAB at the May 2018 meeting. The report outlines seven consensus recommendations and two additional topics for discussion. The Agencies recommend that the seven consensus recommendations outlined in this report should be reviewed and strongly considered for incorporation into the MPSC's procedures for siting liquid pipelines in Michigan. Further, the MPSC should pursue rulemaking and/or legislative action to the extent necessary for implementing these recommendations. The Agencies will address the two additional topics outlined in the report separately.

1) *Require an Environmental Justice Analysis for liquid pipeline applications as part of the MPSC's siting process*

The Environmental Justice Interagency Work Group (EJIWG) was created July of 2018 under Executive Directive 2018-3. A broad goal of the EJIWG is to identify state departments that could benefit from environmental justice policies and procedures and to assist these departments in developing such policies and procedures. The Agencies recommend that the MPSC consult with the recently created EJIWG to review the current pipeline siting process and determine if an Environmental Justice review is appropriate and how this concern might be best addressed in the future.

2) *Siting of crude oil and petroleum product pipelines in or beneath the Great Lakes*

For the purpose of discussion, the subcommittee put forth the option of prohibiting the siting of future pipelines in or beneath the Great Lakes. Due to uncertainty relating to future supply needs, construction techniques, safety measures and other components of pipeline siting, the Agencies do not recommend a prohibition of pipelines in or beneath the Great Lakes at this time. Instead, the Agencies recommend continued focus on a robust siting process that ensures protection of Michigan's natural resources as well as the safety and well-being of Michigan's citizens.

2015 Michigan Petroleum Pipeline Task Force Report, Statewide Recommendation #5

Consider Legislation Requiring State Review and Approval of Oil Spill Response Plans, Improved Spill Reporting, and More Robust Civil Fines.

HB 6201, introduced in July 2018, requires straits pipeline operators to submit spill prevention and contingency plans to the DEQ for review and approval and is part of a package of legislation related to creating and enforcing a no anchor zone in the Straits. A presentation on the content of original bill was made to the PSAB at the August 6, 2018 meeting. On October 3, 2018, the Michigan House of Representatives approved a substitute version of HB 6201 (HB 6201 (H-5)). House Bill 6201 now moves to the Senate for consideration. The agencies do not have a position on the legislation at this time.

Executive Order 2015-14, Charge #6:

Provide recommendations to increase transparency and public engagement on pipelines.

2015 Michigan Petroleum Pipeline Task Force Report, Statewide Recommendation #9:

Create a website related to petroleum pipelines that would provide a continuing repository for relevant information and links to provide the public with information.

The Michigan Petroleum Pipelines website (https://mipetroleumpipelines.com/) has been a useful tool in disseminating information about the Petroleum Safety Advisory Board (PSAB) and various reports associated with Enbridge's Line 5 and the Strait's crossing. It is the intention of the State of Michigan to continue supporting this website and redefine the content to a broader focus on liquid petroleum pipelines throughout the state, not just Line 5.

Based on feedback from PSAB members and internal knowledge of available resources, additional information that may be added to the site includes, but is not limited to:

- Maps of petroleum (liquid) pipelines in Michigan
- Laws, rules, and guidelines regarding liquid pipelines
- Public information and education primers
- Links to major pipeline cases before Michigan Public Service Commission (MPSC)
- Updates on future of Line 5

The update and maintenance of this website will be coordinated by the Michigan Agency for Energy, with cooperation from the Department of Environmental Quality (DEQ) and Department of Natural Resources (DNR). The State has recently updated their contract with the website host through 2020.

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Re: Concise Advice to Governor Snyder on Some of the Matters Before the Pipeline Safety Advisory Board
August 27, 2018

Dear Co-Chairs Keith and Heidi:

As Chairs of the Pipeline Safety Advisory Board, you have asked members to provide a concise 5-page summary of advice with regard to pipeline safety in the State of Michigan. This document is my response as the General Public representative appointed to the Board by the Governor. Because of the concise format requested, most of my advice is stated in conclusory terms, without extensive reference to specific information provided to the Board by the State, its consultants and the general public.

Overview

The issue how to develop a policy for Line 5 and similar pipelines in Michigan should be considered from three different time perspectives:

- The long term (the next 50 to 100 years), that is, the lifetime of the next three generations of Michiganders and the lifetime of pipeline infrastructure.
- The short term (roughly the next 5 to 10years), the period in which we may adopt policies for the medium and long term but major social, energy and infrastructure changes cannot be completed.
- The medium term is that period of time in which major social and structural changes can and will take place.

My comments are made in terms of those time perspectives.

Line 5

All decisions regarding Line 5 should be taken with a long-term view because they will have long-term consequences.

Line 5 at the Straits

Pipelines should not be located on the bottomlands of the Great Lakes or significant waterways leading to the Great Lakes, or other environmentally important and sensitive areas. In the short term, permits should not be issued that allow location on the bottomlands. In the medium to long term, the State should adopt and pursue policies likely to result in relocation of pipelines from those bottomlands.

Line 5 plays an important role in the regional energy supply network serving Midwest states and Canadian provinces. In the short term, it is needed to serve intrastate energy needs to supply propane to the UP and to deliver ever Michigan crude to market in the UP. There are not good alternatives available in the short term.

In the short term, because of Line 5's role in the regional energy supply network and in meeting our intra-state needs, shutting down Line 5 is not a practicable option.[1] But, in the short term, steps are needed to reduce the risks Line 5 poses. Several are discussed below.

[1] Because Michigan is dependent for its petroleum-based energy supply on petroleum pipelines passing through other states and provinces, it is in no position to argue, as some commenters have, that other states and provinces should not satisfy their energy needs using pipelines passing through Michigan.

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In the short, medium and long term, as long as Line 5 is in proximity of the Straits, its financial assurance requirement should be at least as great as the worst-case scenario in the recently completed Michigan Tech Risk Analysis – on the order of $2 billion. Likewise, the State should consider expanding the financial assurance requirement to cover releases from all of Line 5. There are too many locations, particularly along US 2 in the UP, where a release would reach Lake Michigan quickly.

In the medium term, while it is conceivable that Line 5 could be closed at the Straits and across the State, it does not seem likely for several reasons. Absent a voluntary business decision by Enbridge, termination of Line 5 will likely require condemnation by the State or a disaster in the Straits. Litigation to terminate the lease based on existing facts is likely to require an expensive legal battle taking many years with no certainty the State will win. In the meantime, other options to reduce the medium and long terms risks in the Straits will be on hold or deferred.

Both consulting teams retained by the State have concluded that in the short term there is not sufficient excess capacity in the regional pipeline network to absorb the volume presently carried by Line 5 without significant adverse impacts on price and availability of supply.

As soon as possible the State and Enbridge must reach a decision how to relocate Line 5 from the Straits' bottom lands because it is imperative that it be relocated given the enormous environmental risks Line 5 poses in its present configuration.

The alternatives to Line 5's present alignment at the Straits at their simplest are either develop alternative pipeline capacity that does not cross the Great Lakes, or cross the Great Lakes underneath the bottom lands (i.e., in a tunnel).

In the medium term, additional pipeline capacity may become available elsewhere but major pipelines have become difficult to approve and construct and are subject to vigorous legal challenge. The obstacles facing pipeline proposals are likely to increase with time. Accordingly, there is some risk in adopting a medium-term alternative premised on alternate pipeline capacity constructed within the time and with a cost to the consumer that will be a feasible substitute for Line 5. None of the factors affecting the construction of alternative pipeline supply are under the State's control.

A pipeline in a tunnel under the Straits is likely the most feasible and practicable approach to eliminating the current risks. A properly designed tunnel will eliminate most of the present risk. Most of the factors affecting construction of the tunnel are within the purview of the State and or Enbridge. A tunnel appears feasible from an engineering point of view. It offers the opportunity to co-locate other infrastructure like power lines and communication cable as well. Most important, if promptly commenced, a tunnel could be constructed in the short term (within 7 to 10 years), with the total elapsed time probably dependent on the amount of litigation opposing it.

Line 5 Elsewhere in Michigan

Any decision that permits Line 5 to continue to cross Michigan must address the entire length of the right of way, not just the Straits. The existing pipeline is 65 years old. It is not good for another 50 years. The entire pipeline should be replaced and all safety equipment modernized.

If a decision is reached between the State and Enbridge to construct a tunnel at the Straits or any other decision that permits Enbridge to continue to cross the Straits, then in the short term, Enbridge should begin to replace sections of the entire pipeline located in environmentally sensitive areas (like waterways leading to the Great Lakes) and relocate the pipeline to tunnels beneath waterways. This work can be completed in the short term, as demonstrated by Enbridge's

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replacement of Line 6/76 (several hundred miles) in a matter of about 3 years. In the short to medium term, the remainder of the pipeline should be replaced.

However, the process of replacing and modernizing Line 5 must not become an avenue to increase the capacity of Line 5. Ideally, Line 5's throughput capacity should be decreased toward the capacity originally approved.

In the short term, the present agreement between the State and Enbridge barring the transport of dibit in Line 5 should be made permanent.

In the medium term, the State would be wise to reduce or eliminate reliance on Line 5 for intrastate energy needs. That will simplify political considerations affecting future decision-making with regard to Line 5. In the medium term, it is likely feasible to reduce or eliminate dependence on Line 5 for propane in the UP and crude oil transport in the LP. Steady conversion from propane to alternative energy sources for heat in the UP coupled with development of alternate sources of propane supply should make that possible. In the LP, crude oil production in northern Michigan is declining and becoming less profitable. Reduced production may permit rail or truck to substitute for Line 5.

In the long term, shifts away from petroleum may reduce or eliminate the need for Line 5 in its entirety. Accordingly, the life of any future agreement with Enbridge should be limited to 50 years or less with no automatic right of renewal or extension.

Emergency Response

Everything I have seen supports the conclusion that there is not adequate response equipment or resources in or near the Straits for a quick and successful response to a major release from Line 5. While I have heard assurances that there are response plans and equipment in place, I have not heard any assurances from responders (other than Enbridge) that there are adequate resources available, particularly in adverse conditions.

In the short term, emergency response plans and equipment should be increased to respond to worst case scenarios east and west of the Mackinac Bridge. There are $2 billion in potential adverse consequences to be avoided or mitigated. Increasing response equipment will cost a tiny fraction of the damages we wish to avoid.

So long as Line 5 is on the bottomlands, a small (in percentage) annual expenditure by Enbridge in emergency preparedness equipment and training reserve would accomplish more than a $2 billion reserve for after-the-fact clean up. I defer to the experts to advise just what that increased expenditure should be to provide for a response to a worst-case release. Even 0.2% of $2 billion is $4 million per year for improved preparedness.

State/Enbridge Agreement, November 2017

The Michigan Tech Risk Analysis confirms that the adverse condition pipeline shutdown criteria in the Agreement are completely inadequate as previously pointed out by me and others at the December 11, 2017 Board meeting. Material presenting in Risk Analysis Appendix A-C4 shows that during 6 months of the year, about 25% of the hours have "Very High" wind conditions and during at least half the hours in the year wind conditions are High to Very High. The emergency response equipment now in the Straits is ineffective during those conditions. The Appendix states Very High wind conditions create wave heights over 6 feet which, according to the Appendix, agencies responsible for spill response in the Straits consider unsafe for on-the-water response efforts. In the short term, the pipeline adverse condition shut down criteria should be amended to include

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occurrence of High and Very High wind conditions (as those terms are defined in the Appendix.) **I regard that as perhaps the single most important action the State should take in the short term.**

Recommendations on Pipeline Siting

I strongly support the "Recommendations for Liquid Pipeline Siting" presented to the Board. In the short term, these recommendations should be implemented as a matter of priority. They will help assure in the medium to long term that permitted pipelines serve the State's long-term interests. They should apply to all pipeline applications that come before the MPSC.

They can be improved by requiring disclosure of the applicant's long-range plans behind the action for which a permit is sought, in order to provide a context to the application. Over the years, Enbridge has successfully piecemealed the capacity expansion of Line 5, doubling its approved throughput through incremental requests to improve pump stations, etc. While perhaps a valid business strategy under the current rules, this practice is not in the public interest and must be stopped.

The siting guidelines should recommend MPSC consider the short, medium and long term public need for the pipeline; whether the route is reasonable in the short, medium and long term; and whether the pipeline will meet or exceed current or reasonably anticipated safety and engineering standards. This expands the language in the MPSC's order in docket no. U-17020. That order should be amended to focus not on "pubic need" for the pipeline but on the public need for the material in the pipeline. To state the obvious, the public needs what is transported in the pipeline, not the pipe itself.

The applicant should specify the materials to be transported and the throughput. If the Michigan public needs 1 million gallons of gasoline a day through the pipeline, there is no public need for a pipeline sized for 5 million gallons per day, absent a long-range plan from the applicant that makes clear the request over-sizing is reasonable at the time of the application.

The description of materials to be transported in the pipeline should be as specific as possible, recognizing that some petroleum liquids are very similar in terms of use, toxicity, environmental risk, etc. Thus, limited generic grouping of materials might be justified.

The finding of pubic need and the permit as issued should be specific and limited to specific materials and a maximum throughput.

Finally, the MPSC should grant permits for a specific term. Pipelines last a long time but during the passage or years, risks, design standards and public values and needs can change radically. Line 5 is an example. A lease of the bottom lands in the early 1950s was consistent with sensibilities and technologies at the time but no one in 2018 would approve a major pipeline on the bottom lands of the Straits. Looking ahead, it is a fair question (raised by a number of commenters) whether we will need a petroleum pipeline in the long-term future. A long-term time-limited permit gives the applicant time to fully amortize the pipeline improvement, coupled with the knowledge the public right granted by the permit expires absent approval of a new permit application.

Outside of the MPSC review of pipeline permit applications, I recommend that the appropriate state departments identify those locations in Michigan where a confluence of smaller intrastate pipelines represent a collective risk. I have in mind the pipelines transporting aviation fuel to Metro Airport. A former client discovered more that 4 active and abandoned pipelines crossing its property. These pipelines are short, a few miles or less, but they converge and may cross major

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roads and waterways. I expect this situation occurs at other major airports in the state and possibly at other locations. These situations merit study to see if they pose risks collectively they may not pose individually.

Straits Pipeline Legislation – H.B. 5198

So long as this legislation applies only to the Straits of Mackinac, it is failed legislation and I oppose it.

The bill should be amended to apply to any pipelines which cross significant waterbodies or areas of significant environmental interest. Line 5 at the Straits is not the only problematic pipeline in Michigan; it is the poster child for the risks that other pipelines in Michigan pose.

PSAB Process and Transparency

I support strongly the creation of the Pipeline Advisory Board and similar boards.

I remain impressed by each of the individuals on the Board, whether private members or state employees. However, the PSAB was considerably less effective than I expected it to be and did not take full advantage of the expertise of the individuals the Governor appointed. On only one occasion was a subcommittee appointed to address a particular topic as a working group. The excellent "Recommendations for Liquid Pipeline Siting" emerging from that effort is a credit to the thoughtful work of the three authors (Travis Warner, Jennifer McKay and Shawn Lyon) and an example of what have been achieved on other topics. The Alternatives Analysis and the rejected Risk Analysis suffered greatly from lack of Board insight and expertise.

I regret to say the State's commitment to make the PSAB process transparent was largely unsuccessful. The record created of PSAB meetings was completely inadequate to reflect the excellent advice and discussion occurring at the meetings or to inform the public of the Board's deliberations. To make sure my comments were of record, I was forced to provide them in writing in advance or after each meeting. There was an inadequate record made of the public comments received at meetings. Many commenters had written comments with them at the podium but, despite my twice-repeated request, these individuals were not encouraged to provide those comments to the meeting secretary where they could be incorporated in the minutes.

My biggest concern is the Michigan Petroleum Pipelines website fails to include copies of the many very thoughtful and substantive comments received. I do not see a need to "docket" comments of the "me to" or conclusory "shut the pipeline down now" variety. However, there is a very real need to make the public aware of the substantive comments received and to maintain them in a format readily accessible to state agencies and staff, future boards, and the public. Twenty years ago, courts struggled with operating efficient electronic dockets, that is no longer the case, as evidenced by MPSC's excellent docket for contested cases. I cannot understand why that was not achieved for the PSAB's website.

I strongly support continuing the Michigan Petroleum website but only if its docketing system is expanded to include all substantive comments, reports and submissions received.

I have previously submitted several letters with advice on related topics. I request those letters be considered as well.

Sincerely,

R. Craig Hupp

To: Michigan Pipeline Safety Advisory Co-Chairs Creagh and Grether

From: Jennifer McKay
Policy Director, Tip of the Mitt Watershed Council and Member, Michigan Pipeline Safety Advisory Board

Date: August 27, 2018

RE: Comment on Petroleum Pipeline Taskforce Report charges and the Pipeline Safety Advisory Board Charges

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1. Review and make recommendations for statutory, regulatory, and contractual implementation of the Michigan Petroleum Pipeline Task Force Report.

   Specific Recommendations regarding the Straits Pipelines

   1. Prevent the Transportation of Heavy Crude Oil through the Straits Pipelines.

   Action: Strengthen the 2015 agreement that prevents Enbridge from transporting heaving crude through the Straits Pipeline in the future.
   Numerous public statements from the Administration and State agency directors indicate that Line 5 will not remain in its current state. The 2015 agreement permits the transport of heavy crude should the pipeline be re-engineered. Because Enbridge is likely to change the current engineering configuration and/or operating parameters, the 2015 agreement needs to be strengthened to ensure that heavy crude will not be transported through the Straits of Mackinac. The National Academies report, *Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response,* concludes that "in comparison to other commonly transported crude oils, many of the chemical and physical properties of diluted bitumen, especially those relevant to environmental impacts, are found to differ substantially from those of the other crude oils." "For this reason, spills of diluted bitumen pose particular challenges when they reach water bodies." "In some cases, the residues can submerge or sink to the bottom of the water body. This situation is highly problematic for spill response because there are few effective techniques for detection, containment, and recovery of oil that is submerged in the water column." Therefore, regardless of any change to pipeline configuration or operating parameters, Enbridge should not be permitted to transport heavy crude due to the unreasonable risk of ecological and economic harm.

   2. Require an Independent Risk Analysis and Adequate Financial Assurance for the Straits Pipelines.

   Action: Require Enbridge to maintain insurance or other financial assurance based upon the estimated total potential liability from a worst-case scenario spill from the Straits Pipelines identified upon completion of the final Independent Risk Analysis for the Straits Pipelines, led by Michigan Technological University.
   The 1953 Straits Pipelines Easement makes Enbridge liable for all damages or losses to public or private property resulting from its operations at the Straits. The Risk Analysis is the best attempt to quantify the damages that may result from a worst-case spill at the Straits. However, the Watershed Council believes assumptions made resulted in conservative estimates. In addition, the cost estimate provided in the Risk Analysis Report will still not represent all damages or losses as there are costs of irreversible damage to resources for which valuation estimates are not available. Therefore, to meet condition J(1) of the 1953 Easement, it is imperative that the maximum total potential liability identified in the Final Risk Analysis Report be required from Enbridge.

3. Require an Independent Analysis of Alternatives to the Existing Straits Pipelines.

4. Obtain Additional Information from Enbridge.

Action: The State should continue to use its authority under the 1953 Easement to regularly obtain information from Enbridge about its continued operations in Michigan.
In an effort to improve communication and transparency, Enbridge should be required to submit comprehensive monthly, semiannual or annual reports to the State with of all inspections, repairs, updates, incidents or spills, commodities transported, and any other relevant information the State may request or require. Reports should be posted on the Petroleum Pipeline Information website to meet the charge of increasing transparency and public engagement on pipelines.

Statewide Recommendations

1. Coordinate mapping of existing pipelines among state agencies.

Action: Ensure the pipeline data is reviewed and updated at least annually.
Access to accurate and consistent information about the location of pipelines in relation to other geographic information such as water bodies, other sensitive environmental features, land uses, and other infrastructure is vital to ensuring State agencies are prepared in the event of an emergency.

2. Ensure that state agencies collaborate on emergency planning and spill response.
3. Ensure coordinated emergency response training exercises and drills.
4. Ensure regular state consultation with the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) on hazardous liquid (including petroleum) pipelines.

Action: Michigan Public Service Commission (MPSC) staff should observe and participate in interstate hazardous liquid pipeline inspections, at a minimum.
Because Michigan has a gas certification, the State is allowed by law to observe and participate in interstate pipeline inspections. The State should identify a dedicated funding mechanism to allow for MPSC to participate in joint inspections with PHMSA. In addition, the State should request participation in intrastate inspections and work with PHMSA to develop a program to accommodate such requests. It is further recommended that that the State have MPSC staff who will engage in the joint inspections go through the Hazardous Liquids Training Program. This would allow State staff to be better prepared to participate in interstate pipeline inspections with PHMSA and be ahead of the game should the State ever want to pursue establishing a Hazardous Liquids Pipeline Safety Program in Michigan in the future. According to PHMSA, the majority of the costs, approximately 70%, can be covered under the grant provided to the State. All of these actions would further Michigan's relationship with PHMSA, as well as pipeline operators within the State. This would allow for improved access to information, oversight, and increase state emergency preparedness.

5. Consider legislation requiring state review and approval of oil spill response plans, improved spill reporting, and more robust civil fines.

Action: Michigan's Governor needs to provide leadership and encourage the Legislature to enact strong legislation requiring state review and approval of oil spill prevention and response plans, improved spill reporting, and more robust civil fines.
House Bill 5198 was introduced in 2015 and House Bill 6201 was introduced in 2018 by Representative Chatfield to address the gaps identified in the Michigan Petroleum Pipeline Task Force

Report. However, the 2018 version of the bill is significantly weaker than the original 2015 bill. In particular, the provisions of the bill only apply to two pipelines in the State – Enbridge Energy's Line 5 and TransCanada's Great Lakes Gas Transmission Line – both located in the Straits of Mackinac rather than all pipeline infrastructure in Michigan. In addition, the 2018 bill does not include a per barrel fine and exempts prevention plans from the Freedom of Information Act. The changes in the 2018 version were made due to pushback by industry as well as a lack of leadership by the administration to advocate for the needed changes to Michigan's law.

To adequately address the gaps in Michigan law and achieve the goals put forth in the Michigan Petroleum Pipeline Task Force Report, House Bill 6201 should be modified accordingly:

- Provisions should be applicable to all transmission pipelines in Michigan.
- The spill prevention and response plans should be state-specific. PHMSA regulations allow pipeline operators to submit state-approved spill response plans to satisfy federal requirements. Michigan should improve the planning process by developing its own requirements taking into account Michigan's unique natural resources. The bill should also provide opportunities for public comment on plans to improve public engagement and transparency.
- Provide per barrel fines to serve as an incentive to prevent discharges and releases.
- Require notification of spills from pipelines to local response authorities, in addition to the Department.

In order for a strong pipeline bill to be enacted, the Governor and Administration will need to take an active role working with the Legislature and industry to support the necessary changes.

6. Evaluate whether to establish a Hazardous Liquids Pipeline Safety Program in Michigan.

Action: Michigan Public Service Commission (MPSC) staff should observe and participate in interstate pipeline inspections.

Michigan can achieve many of the benefits of a hazardous liquids programs, such as greater access to information and oversight, increased emergency preparedness, and building relationships with liquid pipeline operators in the State, by participating in joint inspections with PHMSA. Therefore, the State should have Michigan Public Service Commission (MPSC) staff observe and participate in interstate hazardous liquid pipeline inspections. See #4 above.

7. Consider legislation or rulemaking to improve siting process for new petroleum pipelines.

Action: Implement all of the consensus recommendations put forth in the report by the Liquid Pipeline Siting Subcommittee.

As a member of the Liquid Pipeline Siting Subcommittee, I support the consensus recommendations we worked hard to develop to improve pipeline siting in Michigan.

Action: Amend Act 16 to prohibit the authorization of pipelines on or beneath the lake bottomlands of the Great Lakes, per 325.

The overarching goal of Tip of the Mitt Watershed Council is no transportation of crude oil in, on, or under the Great Lakes. Whether by pipeline or vessel, a spill in the Great Lakes would be devastating to Michigan's natural resources, the health of our citizens and our economy. Therefore, we recommend that Act 16 be amended to prohibit the siting of crude oil pipelines on or beneath the bottomlands of the Great Lakes.

Action: Require the newly created Environmental Justice Interagency Work Group (EJIWG) to assist the MPSC in the development of environmental justice policies and procedures for pipeline projects.
The EJIWG, through its charge, can help the MPSC provide an environmental justice analysis that evaluates the impact, including any disproportionate impact, of a proposed pipeline project on environmental justice communities and steps that can be taken to reduce or eliminate such impacts, to further increase the quality of life for all Michiganders.

Action: Designate how Act 16 applies to pipeline maintenance activities and increases in capacity.
Act 16 only applies to new pipelines. There are many instances in which significant modifications are made to pipelines that can dramatically increase the risk to Michigan's environment and economy. Act 16 needs to be amended to account for activities that alter pipeline capacity or are significant enough to warrant review from MSPC.

Action: Require horizontal directional drilling for all new pipeline waterway crossings.
Horizontal directional drilling can minimize potential adverse impacts to Michigan's water resources and should be required for all future water crossings in Michigan.

Action: Develop procedure for how Tribal remains are addressed when found.
A process needs to be developed for the inadvertent discovery and return of human remains, valuable or sacred objects, and objects of cultural significance to Michigan's Native American Tribes.

8. Consider issuing an Executive Order creating an Advisory Committee on Pipeline Safety.

9. Create a continuing Petroleum Pipeline Information website.

Action: Provide a dedicated funding source to properly coordinate and maintain the Petroleum Pipeline Information website.

2. Identify areas of best practice in pipeline safety and siting across the United States that could be implemented in Michigan.

3. Review and make recommendations on state policies and procedures regarding emergency response and planning for pipelines.

Action: Amend laws as needed to allow to expedited approval of in situ burning as an emergency response tool.
In situ burning (ISB) may be able to remove large amounts of spilled oil before spreading and drifting of the spill fouls shorelines and threatens wildlife. In certain circumstances, such as oil spilled in ice conditions, burning may be the only viable response technique. Burn efficiencies of 50 to 90 percent can be expected, making this response method more efficient than other methods. In Region 5, the use of in situ burning as a response tool will always be within State waters and inland areas and consequently be subject to State law and policy. Currently, State law requires an emergency declaration from the State of Michigan Governor to use ISB. This could hinder, if not prevent, the use of ISB as an emergency response tool under the right environmental conditions at the time of the spill that would be acceptable to allow a burn.

Action: Require pipeline operators to attend Local Emergency Planning Committee (LEPC) and Regional Area Committee meeting at least once annually.
All emergencies start locally and end locally. Having operators attend LEPC and Regional Area Committee meetings serves as a link between the operator, the citizens and the government in emergency planning and preparedness for the community. It allows for vital relationships to be built and the opportunity for information exchange. It can serve to improve communication and collaboration which can ultimately enhance public safety and environmental protection.

Action: Require facility response plans to be reviewed and approved by State agencies.
Again, all emergencies start locally and end locally. By requiring State approval of facility response plans, the State can ensure Michigan's concerns are adequately addressed within each plan. In addition, the State could also require Geographic Response Plans (GRP) - pre-identified response strategies to protect sensitive, cultural and economic resources – such as the Straits of Mackinac or other waterways identified in the water crossing report for Line 5. This could also serve to improve public transparency and engagement by allowing for public comment on the response plans.

Action: Implement all recommendations put forth in July 23, 2018 memo provided to the PSAB members.

4. Review and make recommendations on state policies and procedures regarding pipeline siting.

   Action: See #7 above.

5. Review information submitted to the state in response to the Michigan Petroleum Pipeline Task Force Report.

   Action: The State should seek an agreement with TransCanada to prevent the conversion and transportation of crude oil and heavy oil in the Straits of Mackinac.
   The Advisory Board received correspondence from the Pipeline Safety Trust expressing concern about the potential for TransCanada to repurpose the Great Lakes Gas Transmission Line, located in the Straits of Mackinac, from natural gas to hazardous liquids that was not addressed. The agreement should prohibit TransCanada from converting the Great Lakes Gas Transmission Line to transport crude oil or hazardous liquids, including heavy oil, to prevent an unreasonable risk of harm to the environment and economy.

6. Provide recommendations to increase transparency and public engagement on pipelines.

   Action: Require information from major pipeline operators in the State regarding the continued operation of their pipeline systems.
   In an effort to improve communication and transparency, all transmission pipeline operators should be required to submit comprehensive annual reports to the State with of all inspections, repairs, updates, incidents or spills, commodities transported, and any other relevant information the State may request or require. Reports should be posted on the Petroleum Pipeline Information website to meet the charge of increasing transparency and public engagement on pipelines.

National Wildlife Federation
Great Lakes Regional Center
213 W. Liberty Street, Suite 200 • Ann Arbor, MI 48104-1398 • 734-769-3351

August 27, 2018

To: Governor Snyder, Michigan Pipeline Safety Advisory Co-Chairs Grether and Creagh

From: Mike Shriberg, Ph.D.
Great Lakes Regional Executive Director, National Wildlife Federation
Member, Michigan Pipeline Safety Advisory Board

Re: Response to Request for Final Recommendations

Thank you for the continuing privilege of serving as a member representing conservation organizations on the Michigan Pipeline Safety Advisory Board (PSAB). As per the request of co-chairs Grether and Creagh, this memo provides written recommendations on 5 items of business for the PSAB. While these comments are being submitted individually and on behalf of the National Wildlife Federation (NWF), I also support all the comments of PSAB members Jennifer McKay, Chris Shepler and Craig Hupp.

A. Consider Legislation Requiring State Review and Approval of Oil Spill Response Plans, Improved Spill Reporting, and More Robust Civil Fines.

HB 6201 has positive elements and could be a step in the right direction because of its focus on spill prevention, contingency plans and accountability. However, the legislation as presented to the PSAB in the July 20, 2018 Memorandum from Director Cusask needs to be improved in the following ways in order to be effective:

1) Scope: The original bill included all pipelines while the current version only includes "Straits gas or oil pipelines". The original scope should be restored. For example, the section of Line 5 that parallels Lake Michigan in the Upper Peninsula hold similar risks to the Great Lakes as the Straits. Given the uniqueness and fragility of habitats across Michigan, there is no justification provided for the more narrow scope.
2) Definition of "sufficient": Much of the legislation relies on the definition of "sufficient personnel, materials and equipment" yet "sufficient" is not defined. Clarity is needed.
3) Tribal consultation: As pointed out by PSAB member Homer Mendota at the last meeting, tribal consultation is critical and should be clearly required.
4) Tie spill volume with fines: The original bill tied fines to the size of a spill, which is logical and necessary. This should be restored.

5) Remove FOIA exemption: Spill prevention plans should not be exempt from FOIA by rule. There are already sufficient protections in place for security and business interest concerns. Therefore, the line about prevention from FOIA should be removed.

With these changes, HB 6201 could be impactful for the state of Michigan and begin to set us on a better course in terms of regulatory structure and oversight.

B. Evaluate whether to establish a hazardous liquids pipeline safety program in Michigan.

The Michigan Agency for Energy whitepaper does an excellent job in laying out the scenarios and pros/cons for establishing a state hazardous liquids pipeline safety program. The bottom line is that, for a fairly limited investment by the state (approximately $70,000/year if the federal grant is at 80%), there is an opportunity to have more control over flow of information and establishing safe standards and practices, which the PSAB has learned has been a problem in evaluating Line 5 and other pipelines. Moreover, as PSAB member Jennifer McKay has pointed out, there is an opportunity for Michigan to observe and participate in interstate pipeline inspections, which the state should take advantage of immediately. The state should, at a minimum, utilize the observation role immediately while continuing to assess the benefits and costs of a full-scale program. One thing currently lacking in the federal regulatory regime is an assessment of end-of-life of pipelines.

C. Consider Legislation or Rulemaking to Improve Siting Process for New Petroleum Pipelines.

The PSAB siting subcommittee did an excellent and thorough job in laying out considerations to improve the siting process. Given the broad consensus on all but two recommendations, the state should move forward immediately to implement all of the consensus subcommittee recommendations, most of which do not require additional resources beyond existing staff time. In terms of the two recommendations "for further discussions":

1) *Siting of crude oil and petroleum product pipelines in or beneath the Great Lakes:* The state should opt for "variation 2" in the memo, which would prohibit exposed pipelines on the lake bottomlands of the Great Lakes but allow for potential construction beneath the Great Lakes bottomlands if certain criteria are met. Since oil drilling is prohibited on or under the Great Lakes, and since the Attorney General and others have said that Line 5 in the Straits could not be sited today, it makes sense to tighten down the regulatory framework.
2) *Environmental Justice Analysis:* The environmental justice analysis should be a required part of siting moving forward. This recommendation directly aligns with the Governor's Environmental Justice Working Group's recommendations and with following through on commitments that the state has made to treat people in a fair and just manner. Concerns about lack of a clear process should not stand in the way of progress – as mentioned at the last PSAB meeting, siting is a fairly infrequent yet important process and, therefore, can serve as a test case and learning opportunity without overwhelming state processes.

D. Review and make recommendations on state policies and procedures regarding emergency response and planning for pipelines. After review of the existing procedures and recommendations, please provide comments on the improving of policies and procedures regarding pipeline emergency response and planning.

The emergency response and planning procedure clarifications seem adequate although this is outside my area of expertise. As we learned from the April 1, 2018 anchor strike, there is much room for improvement in coordination and response times among the federal and state authorities as well as private entities. In particular, the "unified command" appeared to have significant communications challenges and may have, in fact, slowed down the assessment of Line 5's anchor strike, as was revealed in the U.S. Senate committee hearing on August 20. What is not clear from the report to the PSAB is the extent to which the "state policies on emergency response and planning for pipelines" are new, clarification of existing polices and/or SOPs, or codification of what is already in practice. This should be more clearly outlined and reported.

E. Recommendations on the future agreements with Enbridge on Line 5 – Straits Crossing

I appreciate that the state has solicited formal and informal input before making a "final" agreement with Enbridge Energy on the Line 5 Straits crossing. The process to derive the original agreement led to a lack of trust in the outcome given the closed door nature of the original agreement, consulting only one non-governmental member of the PSAB – Enbridge Energy.

The most important consideration in the future of Line 5 and in the future of any agreement is one which has not received attention thus far in a process where all of the information and reports have been funded by Enbridge Energy: What is in the best interests of the state of Michigan?

The risk analysis conducted by the consortium of universities did an outstanding job of modeling a range of scenarios. Even with unrealistically optimistic "worst case scenarios", the outcomes speak for themselves and equate to devastation for the Great Lakes, our economy and our way of life. These results should be weighed against the Coast Guard's admission during Congressional testimony that it is not "semper paratus" Moreover, as the PSAB process has unfolded, Enbridge has proven itself to not be a reliable and transparent partner, as the state pointed out specifically in multiple PSAB meetings. What we know is that the Straits section of Line 5 was designed for 50 years and is currently in its 65th year of operation. We also know that Line 5 has lacked the necessary structural supports for significant lengths of times, that coating has been damaged and still not repaired, that Line 5 has been hit by an anchor in just the past 4 months, that visual images show a rusty pipeline encrusted in biota, and that Line 5 has multiple incurable easement violations.

Unfortunately, the alternatives analysis by Dynamic Risk – which has been largely discredited by all parties – made major errors in perspective, assumptions, data acquisition and outcomes. As detailed in a letter to the PSAB at the time from 5 members (Shriberg, McKay, Hupp, Meadows and Shepler), Dynamic Risk's report had severe methodological flaws (such as miscalculation of "worst case spill" scenario and failure to accurately assess spill risk and impacts), lack key information and came to incorrect or inadequate solutions. However, the most significant error was one of perspective: Dynamic Risk assumed, for reasons that are not clear to me, that the state had a responsibility to ensure that all of Enbridge's product was still transported through Michigan even if Line 5 was no longer in the service. In other words, Dynamic Risk did

not assess what products and services of Line 5 are actually utilized in the state. Therefore, Dynamic Risk ignored alternatives that are beneficial for Michigan and provide substitutes for the services that Line 5 provides to the state if they were not scalable for all of Line 5's products.

The sum of the Enbridge-funded analyses are a low probability of a very high consequence event. The PSAB has debated the error bars around the probabilities and consequences but not the basic premise. The question that was never addressed by the Enbridge-funded reports are what are the benefits and costs of Line 5 to the state of Michigan. Therefore, NWF – with funding from the C.S. Mott Foundation – contracted with the leading independent experts (London Economics International) to analyze what the impacts to Michigan would be if Line 5 were to be decommissioned. These three reports are now submitted for the record and can be summarized as follows:

1) *Assessment of alternative methods of supplying propane to Michigan in the absence of Line 5*: LEI found that the lowest cost alternative to Line 5 to supply propane to the Upper Peninsula is to either truck product or utilize rail from Superior, WI to Rapid River, MI. The cost impacts to consumers would be "lost in the noise of typical propane price volatility" and would be in the range of $.05/gallon. The impact on the Lower Peninsula "may be negligible". There would be no likely risk to energy security or long-term propane supply as supply is growing faster than demand in the U.S. The potential small price increase for the Upper Peninsula could, in NWF's analysis, be easily made up for with a small increase in energy assistance dollars so that Michigan propane consumers wind up with a positive impact from Line 5 decommissioning. The LEI report is the detailed and authoritative source on propane, and directly questions the improper assumptions and calculations in Dynamic Risk's report, which did not focus on propane alternatives for Michigan.
2) *Michigan's crude oil production: Alternatives to Enbridge Line 5 for transportation:* LEI found that the small volume of Michigan crude oil production that utilizes Line 5 to get to market could utilize trucking directly to Marathon refinery instead. While this could increase costs by approximately $1.31/barrel for northern Michigan oil and less for central Michigan oil. This change is small compared to normal price volatility and "would be lost in the noise of typical crude oil price volatility". Moreover, if Line 5 were decommissioned, this oil would be in higher demand and, therefore, producers may be able to pass along the cost increase to refineries or other buyers.
3) *Michigan's refining sector: Alternatives to Enbridge Line 5 for transportation:* LEI found that there is enough excess capacity in other crude oil pipelines to make up for any losses at Detroit and Toledo-area refineries if Line 5 were to be decommissioned. However, downstream users have apportionment rights so the Detroit and Toledo-area refineries would need to supplement current supplies with Michigan-produced crude oil as well as Bakken crude oil delivered by rail. The total cost increase to customers would be a fraction of a cent/gallon for consumers, which would be "lost in the noise of typical weekly gasoline price volatility".

These new analyses come to an important conclusion: Michigan has substitutes for the services provided by Line 5. When compared with the $2 - $6 billion or more in costs plus inestimable cultural and aesthetic losses due to a spill, the choice is clear. There is no substitute for the Great Lakes and our way of life but there are clear and easy substitutes for the services that Line 5 provides to Michigan. Therefore, the state must begin the process of decommissioning Line 5. The Governor has the authority and responsibility to initiate this process immediately. NWF's recommends a phased approach:

Phase I – October 2018 – May 2019: Protect Michigan's interests while initiating decommissioning

The state immediately to begin the process to revoke the easement based on multiple incurable violations and lack of "due care". By beginning this process while preparing the alternatives outlined by LEI, the state would minimize any potential economic disruption. While initiating procedures to terminate the easement, the state could reach a stronger agreement with Enbridge for the next 8 months. As recommended by the majority of non-governmental stakeholders on the PSAB, the new agreement should:

1) Replace the definition of "Sustained Adverse Weather Conditions" with a new term "Significant Adverse Maritime Conditions" defined to include all maritime conditions based upon the identified sea state capabilities and operational limitations of watercraft and equipment that would prevent or significantly impair the effective containment and recovery of spilled oil or significantly exacerbate the spread of spilled oil. This should include "conditions in which median wave heights in the Straits of Mackinac over a continuous 60-minute period are greater than 3 feet based on 'Near-real Time Data' or in its absence 'Modeled Data,'" because this is the limit of emergency response equipment.
2) Add in a clause that Line 5 cannot operate until it is independently verified that all damage from the anchor strike has been repaired and that there are no remaining gaps in coating, including from new structural supports.

These changes need to be made under a revised agreement while proceeding with terminating the current easement. Under no circumstance should the state agree to a new easement.

Phase II – June 2019 – May 2024: Implement alternatives to Line 5 while continuing assessment of long-term solution to Enbridge's export desires

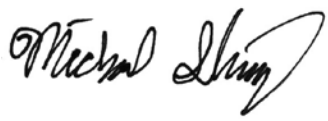
The substitutes for Line 5 should be in place by June 2019, thus allowing for a decommissioning prior to the winter of 2019/2020. During this next phase, the state should continue any finalization of plans for an alternative for Enbridge's export plans to transport oil and natural gas liquids through the state, including an assessment of a "utility tunnel". This assessment is best conducted when the state is already utilizing alternatives for state needs and, thus, is in a strong negotiating position with the utility companies for their non-Michigan needs.

Phase III – June 2024 – 2050: Implement long-term solution if needed

If the state and utility companies determine there is a public benefit and safe plan for a "utility tunnel" or other solution that does not cross the Great Lakes bottomlands, this is a reasonable timeframe for completion. Currently, the debate over a tunnel or trench is a diversion from the short-term and medium-term interests of the state, which are clearly not served by the Straits section of Line 5.

I look forward to a robust discussion of these recommendations. Thank you for your consideration.

Sincerely,



Mike Shriberg

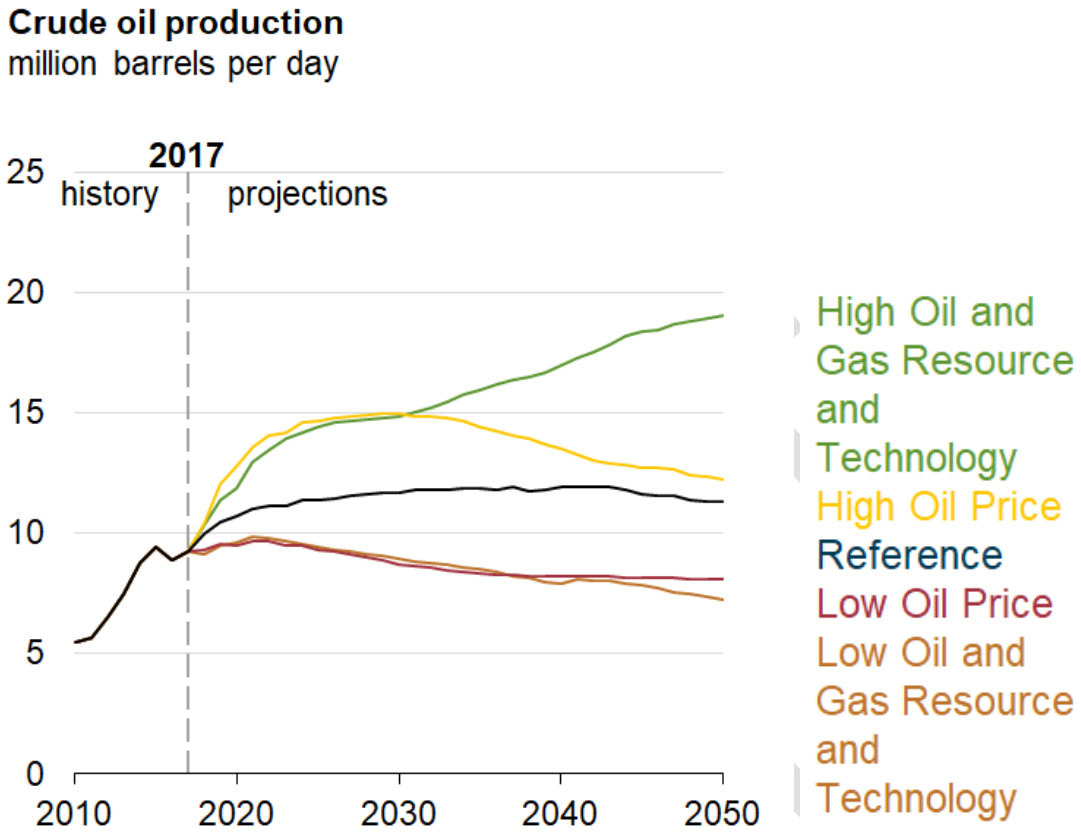
Comments from Jeffrey Pillon, Board member on Outstanding Petroleum Pipeline Task Force Reports/Pipeline Safety Advisory Board Charges
August 27, 2018

A. Consider Legislation Requiring State Review and Approval of Oil Spill Response Plans, Improved Spill Reporting, and More Robust Civil Fines.
    A. I have reviewed the summary of *HB 6201* *to amend 1994 PA 451, entitled "Natural Resources and Environmental Protection Act (NREPA)" addressed Oil Spill Response Plans. I have no position on the specific of the bill. However, this effort will explore and consider existing law and how it might be improved. Efforts to assure that the state of Michigan has an effective oil spill response plan are important and should be pursued.*
B. Evaluate whether to establish a hazardous liquids pipeline safety program in Michigan**.**
    A. *The last meeting of the Michigan Pipeline Safety Advisory Board I was in general agreement with Jennifer McKay's comments for Michigan to be more informally engaged in participating in inspections of pipelines with PHMSA and also allowing the state to observe and participate in interstate pipeline inspections. I also think it would be useful for Michigan staff to go through the hazardous liquids training program. I described this at the meeting as somewhat of a hybrid approach. After further consideration this approach would mean that the state of Michigan would have to bear the full cost of this activity whereas if it were to formally become responsible for an intrastate liquid pipelines safety program a significant portion of this cost would be reimbursed by the federal government. An informal approach would cost the state considerably more than formally engaging in the process. In addition the lead times for starting up the programs in either instance appear to be similar. Therefore I recommend the state establish an intrastate hazardous liquids pipeline safety program in Michigan to be funded by the federal government to the fullest extent possible. If the state of Michigan is truly concerned about the safety of liquid pipelines it should take over this responsibility which will also allow for a higher level of coordination with PHMSA with regards to interstate pipelines operating within Michigan.*
C. Consider Legislation or Rulemaking to Improve Siting Process for New Petroleum Pipelines.
    A. I have reviewed the "Recommendations for Liquid Pipeline Siting Pipeline Safety Advisory Board Subcommittee" The subcommittee did an excellent work and I support the Consensus Subcommittee Recommendations. This should be the focus of the MPSC efforts going forward. I do not support the "Recommendations for Further Discussion" at this time.
D. Review and make recommendations on state policies and procedures regarding emergency response and planning for pipelines.

A. *In the document titled "State Policies on Emergency Response and Planning for Pipelines" dated July 23, 2018 that was provided to the Board I suggest added further detail on planning for the response to energy supply disruptions. It should be expanded to include discussion of:*

1. *Information that describes the effects that should Line 5 be shut down due to any unanticipated reason for an extended period, it could have serious impact on petroleum product supply and prices in Michigan, Ontario and surrounding states. If this occurred during the winter months there is a significant potential for serious impact to propane supplies and prices that could impact residential customers and others. For further information see the July 20, 2018 draft "Independent Risk Analysis for the Straits Pipeline", Appendix GI-2 short-term impacts on petroleum supply from a line 5 disruption.*
2. *The Michigan Energy Assurance Plan and related support documents including the petroleum shortage response plans should be updated. An extensive review of this plan was prepared by ICF under contract to the State of Michigan and this information should be incorporated in the plan as appropriate. Following the update the plans should be the subject of an exercise to test the revised plan and further refined as may be needed.*
3. *Local Energy Assurance Planning should also be encourage by the states and provide and opportunity for further engagement at the local level that can enhance preparedness and awareness to the consequences of energy supply disruptions.*
4. *The Michigan Agency for Energy should continue its State Heating Oil and Propane Price Program in cooperation with the U. S. Energy Information Administration to monitor residential heating oil and propane prices and supply. This is a vital tool for monitoring these markets.*
5. *The Michigan Agency for Energy should continue its semi- annual Energy Appraisal. This provided important base line information as is extremely useful when energy supply disruptions occur. It also helps assure the retention of an analytical capability that is vitally important in assessing consequences.*
6. *Include a description of the Energy Emergency Assurance Coordinator program which provides for multistate coordination with other state energy agencies and which can assist in developing better situational awareness when events do disrupt energy supplies and can help for providing a more coordinated multistate response.*

Energy Information Administration Forecast, Annual Energy Outlook 2018 US Projections



News report on the prospects for new pipelines in Canada

OTTAWA (Reuters April 8, 2018 / 6:40 PM) - Kinder Morgan Canada (KML.TO) on Sunday suspended most work on a C$7.4 billion ($5.8 billion) oil pipeline expansion that has become the focus of protests, a move underscoring uncertainty over major energy projects in Canada.

Many in the energy industry are concerned about whether any new pipelines can be built in Canada, which sits on the world's third largest proven reserves of crude and is the single largest exporter of energy to the United States.

Although the federal government has the power to approve major pipelines, the 10 provinces enjoy broad responsibility for resource development. That can result in deadlock when a province opposes a decision made by Ottawa.

Relative capacity of Enbridge compared to other Canadian pipelines serving U.S. markets.

In table 6 Enbridge is identified as Lakehead the former name of the Enbridge line. This is from 'United States Fuel Resiliency" September 2014 prepared for the U.S. Department of Energy by Intek Inc. https://www.energy.gov/sites/prod/files/2015/04/f22/QER%20Analysis%20-%20United%20States%20Fuel%20Resiliency%20Volume%20I.pdf

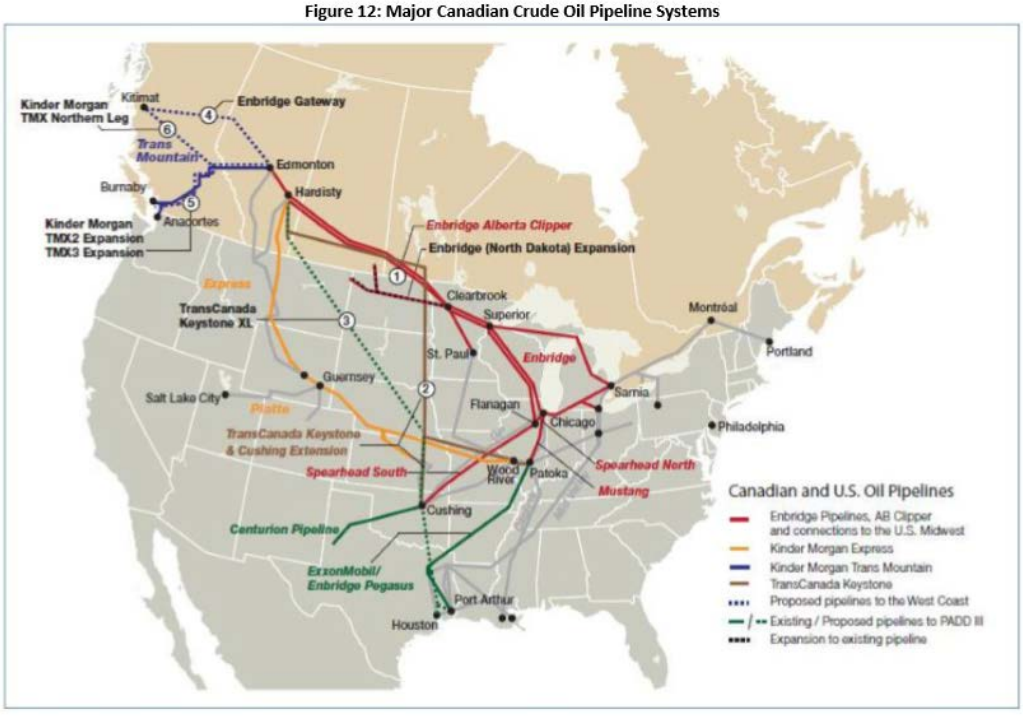
Canadian Crude Oil Pipelines

Four major Canadian pipelines connect the hubs in Alberta, Canada with markets in the northern United States (Figure 12). These are the Enbridge Mainline, the Kinder Morgan Trans Mountain pipeline, the Kinder Morgan Express pipeline, and the TransCanada Keystone Pipeline (which is distinct from the proposed TransCanada Keystone XL Pipeline) (Table 6). Two additional pipelines, Spearhead and Mustang, bring Canadian crude deeper into PADD II. These pipelines have a combined capacity of nearly 4.0 MMBbl/d with plans to expand to over 5.4 MMBbl/d by 2017.

Table 6: Major Canadian Crude Pipelines

Map Key	Crude Oil Pipeline	Origin		Destination		Max Flow Capacity (MBbl/d)
		City		City	State	
C1	Express	Hardisty	CAN	Caspar	WY	280
C2	Transmountain - Puget Sound System	Edmonton	CAN	Puget Sound	WA	300
C3	Lakehead	Edmonton	CAN	Detroit	MI	2,500
C5	Butte-Bridger-Plains	Regina	CAN	Guernsey	WY	118
C34	Keystone	Hardisty	CAN	Wood River, Patoka, Cushing	IL, Il, OK	591

Figure 12: Major Canadian Crude Oil Pipeline Systems



Source: Canadian Association of Petroleum Producers (CAPP) - CIM Magazine April 2013

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MEMO

To: Michigan Pipeline Safety Advisory Board (PSAB)
c/o Holly Simons (DEQ)

From: Tony England, PhD

Date: 9/03/2018

Subject: Comments on the future of Line 5

Having read all information available to me through the PSAB, my comments focus upon Dan Cooper of HT Engineering's review of Dr. Edward Timm's assessment that Enbridge's Line 5 in the Mackinac Straights is unfit for service. While I have not had access to Timm's original document, the defense of Line 5 operations by Cooper offers a summary of Timm's concerns.

As related by Cooper, Timm believes that fatigue and corrosion during 65 years of operation have rendered "Line 5 unfit for service." His concern is that Line 5 under the Mackinac Straights has experienced physical and chemical stresses expected during 65 years of service and, to some extent, beyond those anticipated in its design. Examples of unanticipated stresses might include the recent discovery of unsupported spans requiring additional supports and the recent damage by a dragging anchor requiring installation of a protective sleeve. Uncertainties in Line 5's condition arising from this history renders current margins of Line 5's safety too uncertain to permit continued operations.

Mr. Cooper argues that Line 5's conservative design; the toughness of seamless, heavy-walled, steel pipe as used in the Straights; pipe inspections using the best current technologies; corrosion control; failure to detect fatigue cracks at girth welds in unsupported spans due to lateral pipe movement; and experience with such pipelines in many settings over the half-century of Line 5's operations justify continued use of Line 5 even at pump pressures higher than those initially proposed. The counter argument is that, while testing and monitoring technologies have improved with time, they have both a limited sensitivity to small flaws and a limited ability to detect insipient failure.

I further note that the public's tolerance for an oil spill in the Great Lakes is considerably lower than it was more than a half century ago when Line 5 was designed. Even if a new Line 5 under the Straights could be permitted today, it would almost certainly require use of pipe-in-pipe technology and barriers against physical contact by dragging anchors.

Apprehension associated with concerns that Line 5 has exceeded its design life means both that there are increasing uncertainties about its condition and that its design is increasingly dated.

The proposed utility tunnel is the most and, perhaps, only acceptable alternative to the current Line 5. A tunnel avoids risks of damage from dragging anchors; offers other utilities safer, more convenient, and more reliable linkages between Michigan's upper and lower peninsulas; provides a controlled environment for all utilities; allows access for testing and replacement; and comprises a secondary containment for pipeline failures. The problem facing this solution is that waning political will in the absence of another Kalamazoo spill, the cost of the tunnel, and resistance by those who see it as an investment in a continuing carbon economy could easily delay tunnel construction indefinitely. To counter this indecision, I believe permitting a continuation of Line 5 operations must include incentives to build the utility tunnel. For example, such an agreement for continued operations might require restrictions on pipeline pressures that become increasingly severe with time. Without such incentives, indecision could easily extend until an almost inevitable Line 5 failure occurs.

MICHIGAN CRUDE OIL PRODUCTION: ALTERNATIVES TO ENBRIDGE LINE 5 FOR TRANSPORTATION

Prepared for

National Wildlife Federation

By

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August 23, 2018

Michigan crude oil production: Alternatives to Enbridge Line 5 for transportation

Prepared by London Economics International LLC

August 23, 2018

London Economics International LLC ("LEI") was retained by the National Wildlife Federation ("NWF") via a grant from the Charles Stewart Mott Foundation, to examine alternatives to Enbridge Energy, Limited Partnership ("Enbridge") Line 5 for crude oil producers in Michigan.

About sixty-five percent of the crude oil produced in Michigan currently uses Enbridge Line 5 to reach markets. This production is located in the Northern and Central regions of the Lower Peninsula. Oil production from the Southern region of the Lower Peninsula does not use Enbridge Line 5 to reach markets.

LEI's key findings are that the lowest-cost alternative to Enbridge Line 5 would be trucking from oil wells to the Marysville market area. LEI estimates that the increase in transportation cost to oil producers in the Northern region would be $1.31 per barrel based on recent oil production levels and recent trucking costs. For the Central region, the cost increase on average would be less, as these producers are located closer to markets. There would be no impact on Southern region producers. The $1.31 per barrel cost increase amounts to 2.6 percent of a crude oil price of $50 per barrel. It is much smaller than typical monthly swings in Michigan crude oil prices, which have ranged from $28 per barrel to over $100 per barrel from 2014 through 2017.

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1 Introduction and executive summary

1.1 Enbridge Line 5

Enbridge Line 5 begins in Superior, Wisconsin ("WI') and terminates in Sarnia, Ontario ("ON"). The pipeline's capacity is 540,000 barrels per day.[1] It transports light crude oil, light synthetic crude, and natural gas liquids ("NGLs").

Enbridge Line 5 was built in 1953. The pipeline runs for 645 miles from Wisconsin, at the bottom of the Straits of Mackinac, through Michigan to Sarnia. The 30-inch diameter pipeline splits into two 20-inch diameter lines where it crosses the Straits of Mackinac for 4.5 miles (see Figure 1).

Figure 1. Enbridge Line 5

Source: Enbridge[2]

LEI was engaged to assist in understanding the current and potential future role of Enbridge Line 5 from the perspective of Michigan crude oil producers. The CS Mott Foundation and NWF wished to understand the degree of reliance on Enbridge Line 5 by crude oil producers in Michigan, and if there are alternative options for transporting Michigan crude oil to markets.

[1] Enbridge. "The Straits of Mackinac crossing and Line 5." September 2015. <http://www.enbridge.com/~/media/Enb/Documents/Brochures/Brochure_Line5.pdf>

[2] Enbridge. "About Line 5." Accessed on April 2018. <https://www.enbridge.com/projects-and-infrastructure/public-awareness/line-5-michigan/about-line-5>

In this report, LEI provides an independent view of the extent to which Enbridge Line 5 is needed for Michigan crude oil producers, and what the cost impact on oil producers would be if Enbridge Line 5 through Michigan did not exist.

A report by Dynamic Risk Assessments, Inc ("Dynamic Risk")—funded by Enbridge Energy and overseen by the State of Michigan—also estimated the potential impact on transportation costs for Michigan crude oil producers. LEI did not perform a comprehensive critique of the Dynamic Risk report, which covers a wide variety of issues in addition to the impact on crude oil producers. However, Dynamic Risk provided specific assumptions about some elements of the pipeline, rail, and trucking costs, which LEI compared to publicly-available data and then used to evaluate the impact on the cost of transporting Michigan crude oil to market. Dynamic Risk's assumptions and their resulting estimates for the cost of alternatives to Enbridge Line 5 provide a useful comparison to LEI's, and this report refers to Dynamic Risk's assumptions and results.

1.2 LEI's approach

To provide a foundation for understanding the cost of alternatives to Enbridge Line 5, LEI began by laying out the facts that describe Michigan's upstream oil activity (see Section 2).[3] LEI examined the location of oil production compared to available transportation, including Enbridge Line 5. Then, LEI analyzed the cost of alternatives to Enbridge Line 5 for crude oil transportation for Michigan producers (see Section 3). These alternatives include trucking and rail shipment. First, LEI examined publicly-available data sources for published pipeline tariffs and public reports of current rail and truck shipment costs. Second, LEI re-produced the cost calculations provided by Dynamic Risk[4] to understand to what degree Dynamic Risk's cost results (in dollars per barrel) depended on their assumptions about key elements of cost. Third, LEI substituted publicly-available data for key cost elements, and applied the Dynamic Risk methodology, to arrive at new estimates of the additional cost per barrel to transport crude oil if Enbridge Line 5 did not exist. Finally, LEI examined two alternatives not considered by Dynamic Risk. These are discussed in detail in Section 3. These turned out to have lower incremental costs to producers than the alternative examined by Dynamic Risk.

1.3 Key findings and conclusions

LEI's key findings were:

1 Not all oil producers in Michigan would pay more to transport their crude oil if Enbridge Line 5 was not in service. LEI divided Michigan oil production, all of which is from the Lower Peninsula, into three major regions: Northern, Central, and Southern and analyzed the alternatives for each region.

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[3] "Upstream" oil activity refers to exploration, development, and production of crude oil; "midstream" refers to transportation of oil; "downstream" refers to refining and marketing.

[4] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." October 26, 2017. Prepared for the State of Michigan. October 26, 2017.

2 Production from the Northern region accounts for about 37 percent of Michigan crude oil production and has been flat for many years. In that region the least expensive transportation alternative to Line 5 is trucking from Northern oil wells to market (Marysville terminal) for an average cost of $2.81 per barrel (Option Three in Figure 2). This is $1.31 per barrel more than the cost of using Enbridge Line 5 (Option One). However, the trucking option is less expensive than the route examined by Dynamic Risk (Option Two) which relies on the MarkWest Michigan Pipeline and trucking from Lewiston to Marysville (which LEI estimates would cost $3.72 per barrel). LEI estimated that the cost of using a combination of trucking and rail (Option Four) would be more expensive than trucking alone, but less expensive than continuing to use MarkWest Michigan Pipeline and trucking from Lewiston to Marysville.

3 The Central region accounts for about 28 percent of Michigan crude oil production, and production has also remained flat for years. The cost increase to producers would depend on their location but would likely be lower than the cost for Northern region producers because the Central region is closer to markets.

4 The Southern region accounts for about 35 percent of Michigan crude oil production. This region has experienced declining production since 2013, but production remains higher than in the previous decade. These oil producers do not use Enbridge Line 5 to transport their crude oil to market, so they would not be impacted.

5 An increase of $1.31 per barrel is 2.6 percent of the value of a $50-barrel of crude oil (the average price in 2017). It is small compared with the volatility of monthly average oil prices in Michigan, which have ranged from $28 per barrel to over $100 per barrel since 2014. The cost increase from using alternatives to Enbridge Line 5 would be lost in the noise of typical crude oil price volatility.

6 Michigan crude oil producers may be able to pass along some of the cost increase to refineries or other buyers of crude oil. In the absence of Line 5, if the added cost to replace the large quantities of crude oil that are typically shipped on Line 5 are higher than the $1.31 per barrel which impacts the small volumes of Michigan crude oil, then the Michigan producers may be able to increase their prices and recover some of the increased shipping cost.

1.4 Roadmap to this report

This report begins with the basic facts which describe the upstream oil industry in Michigan and how the oil is transported to refineries; these are presented in Section 2. In Section 3, LEI examines the cost of different transportation alternatives. The conclusions and implications of LEI's analysis are in Section 4.

Figure 2. LEI's weighted average annual cost of crude transportation to Marysville ($ per barrel)

Option	Option 1: MI Pipeline and Enbridge Line 5	Option 2: MI Pipeline and trucking from Lewiston	Option 3: Trucking only	Option 4: Trucking plus rail
Mode of transportation	Michigan Pipeline	Michigan Pipeline		
Cost of transportation ($ per barrel)	$0.92	$0.92		
Terminal	Lewiston	Lewiston	Kalkaska	Kalkaska
Mode of transportation	Enbridge Line 5 Pipeline	Truck	Truck	Truck
Cost of transportation ($ per barrel)	$0.59	$2.80	$2.81	$0.55
Terminal				Gaylord
Mode of transportation				Rail
Cost of transportation ($ per barrel)				$2.54
Destination	**Marysville**			
Total cost ($ per barrel)	$1.51	$3.72	$2.81	$3.09
Difference compared to Option One		$2.22	$1.31	$1.59

Note: The transportation costs in this table are typical costs. They are neither averages, nor maximums, nor minimums. For example, the $0.92 per barrel cost for the Michigan Pipeline is the tariff for injection at Lewiston; which is the same as the incentive tariff rate at Michigan Pipeline's Kalkaska truck receipt point (see Section 3.1.1.1 for details). Thus, the $0.92 is typical of the rate a shipper on Michigan Pipeline would pay to access the Lewiston injection point for Enbridge Line 5. Totals are rounded independently.

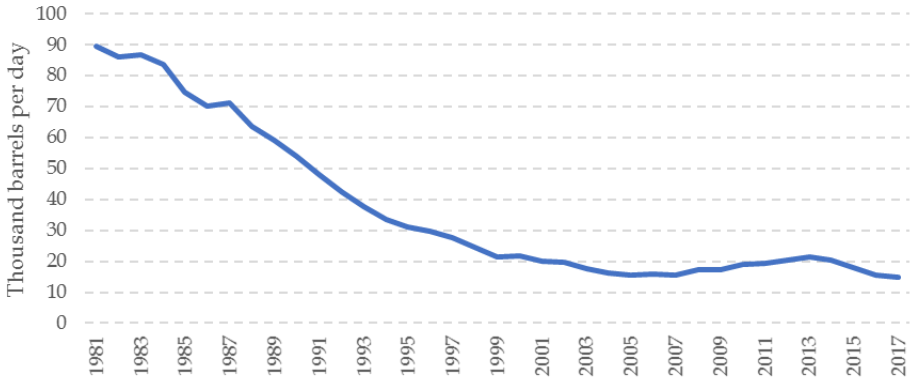
2 Michigan crude oil production

The state of Michigan is a small producer of crude oil, from wells dispersed across the Lower Peninsula. As discussed below, LEI estimates that 9,000 to 10,000 barrels per day (about two-thirds of total oil production in the state) uses Enbridge Line 5 to transport oil to market.

2.1 Oil production in Michigan has been flat for almost 20 years

Michigan is the 21st -largest oil producer in the United States, producing 15,000 barrels per day of crude oil in 2017. Production has declined significantly from early 1980s levels of about 90,000 barrels per day (see Figure 3). Production has been more-or-less flat for nearly 20 years.

Figure 3. Michigan field production of crude oil



Source: EIA[5]

Michigan's crude oil production amounts to a less than one percent of the over 400,000 barrels per day of refined products consumed in Michigan.[6]

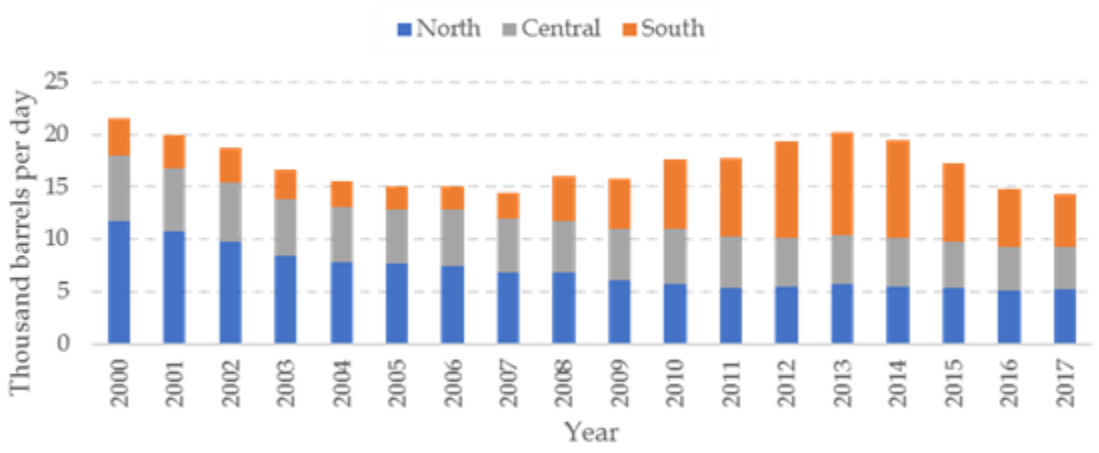
2.2 Oil production has shifted away from the Northern region

In 2017, 56 of Michigan's 83 counties produced oil. LEI grouped these counties into three geographic regions: Northern, Central, and Southern. The Northern region of the Lower Peninsula used to account for the largest portion of the state's total oil production. However, oil resources in that region are in decline and production levels are now more evenly spread across the state (see Figure 4). There is no crude oil production in Michigan's Upper Peninsula.

[5] EIA. Petroleum & other liquids. Crude oil production. Accessed on June 20, 2018. <https://www.eia.gov/dnav/pet/PET_CRD_CRPDN_ADC_MBBL_A.htm>

[6] Michigan Public Service Commission. "About Petroleum Industry." Accessed on July 2018. <https://www.michigan.gov/mpsc/0,4639,7-159-16389_59859---,00.html>

Figure 4. Michigan oil production by region



Source: Michigan DEQ[7] (North, Central, and South regional oil production was compiled by LEI based on county data)

2.3 Crude oil transportation in Michigan

The Michigan Pipeline, owned and operated by MarkWest, crosses the northern part of Michigan's Lower Peninsula. It is the largest crude oil gathering pipeline in Michigan, built in 1973, with a transportation capacity of 60,000 barrels per day[8] [9] (see Figure 5). It is about 250 miles long and connected to over 1,000 wells in the Northern region through 50 direct connects; the pipeline has four truck loading facilities and 15,000 barrels of storage.[10]

The Michigan Pipeline interconnects with Enbridge Line 5 at Lewiston, MI. From there, Enbridge Line 5 transports Michigan crude oil south to the Marysville terminal near Sarnia, Ontario. Sarnia provides an important market for crude oil as it is home to three refineries with about 280,000 barrels per day of capacity.[11] Marysville is interconnected to the Mid-Valley pipeline, which

[7] Michigan Department of Environmental Quality. "Oil & Gas Well Production Database." Accessed June 27, 2018.

[8] MarkWest. Northeast operations. Accessed on June 20, 2018. <http://www.markwest.com/operations/northeast>

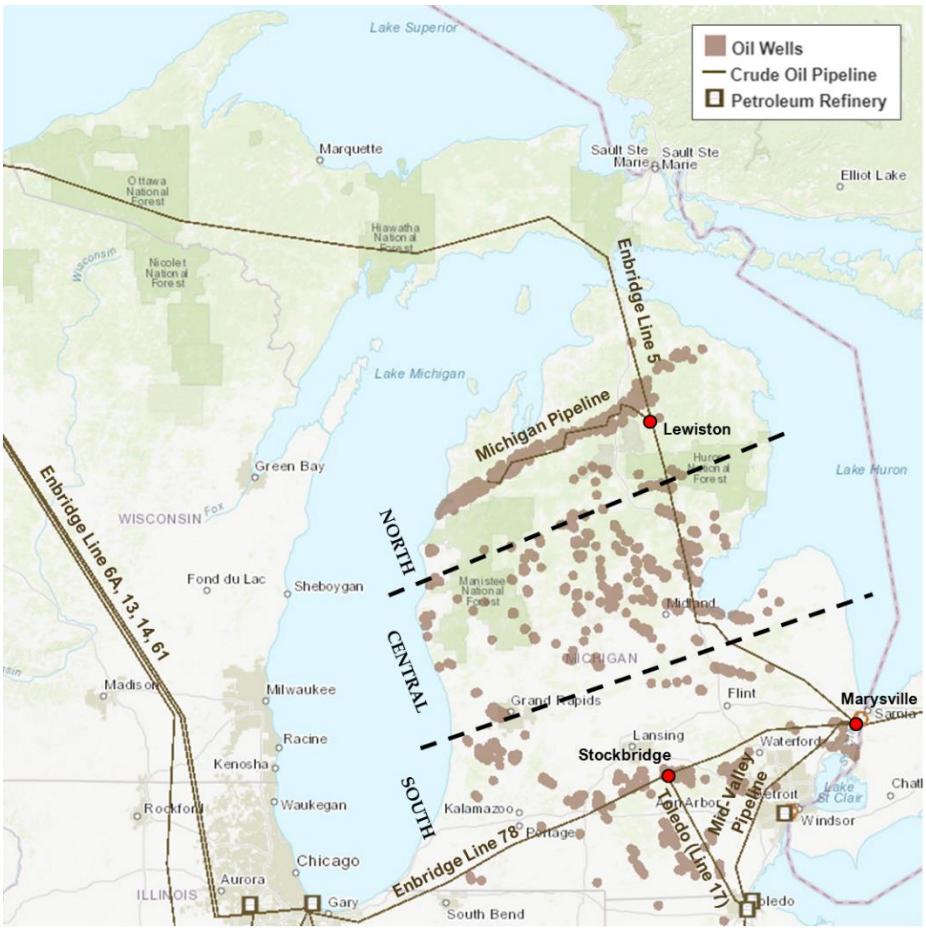
[9] MarkWest Energy Partners, L.P. Form 10-k. 2011.
https://www.sec.gov/Archives/edgar/data/1166036/000104746912001759/a2207469z10-k.htm

[10] MarkWest. http://www.markwest.com/operations/ferc-pipelines/michigan-crude-pipeline-markwest-michigan-pipeline-company-llc/

[11] Shell Canada, Imperial Oil, and Suncor Energy operate refineries in Sarnia. Company website accessed on July 13, 2018. <https://www.shell.ca/en_ca/about-us/projects-and-sites/sarnia-manufacturing-centre.html>; <http://www.imperialoil.ca/en-ca/company/operations/refining-and-supply/sarnia>; <http://www.suncor.com/about-us/refining/sarnia-refinery>

receives oil from the Enbridge system and ships it to refineries in Toledo and to a tank farm in Samaria, MI which supplies a refinery in Detroit.[12]

Figure 5. Michigan active oil wells and crude pipelines



Source: EIA[13]

2.3.1 Enbridge Line 5 serves Northern and Central producers

Crude oil injections at Lewiston into Enbridge Line 5 averaged 10,081 barrels per day in 2015 and 9,321 barrels per day in 2016 and (see Figure 6).[14] This is equivalent to capacity utilization of about 17 percent of the total 60,000 barrel-per-day capacity on the MarkWest Michigan Pipeline.

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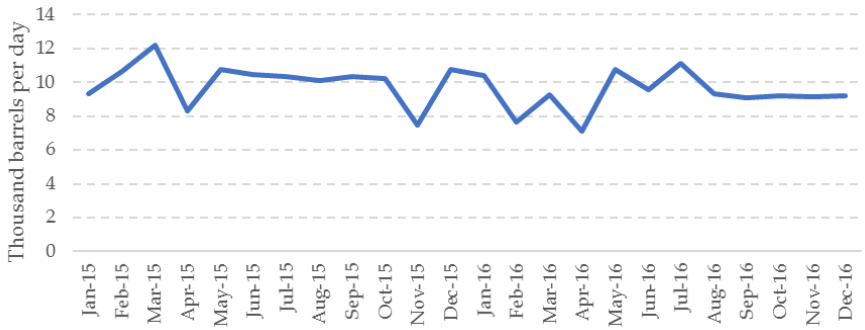
[12] Sunoco Logistics Partners, L.P. Form 10-k 2012. https://www.sec.gov/Archives/edgar/data/1161154/000119312513086930/d444720d10k.htm

[13] Source: EIA. U.S. Energy Mapping System. Accessed on June 20, 2018. <https://www.eia.gov/state/maps.php>

[14] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Prepared for the State of Michigan. October 26, 2017. Appendix C.

Figure 6. Monthly crude deliveries at Lewiston (2015-2016)



Source: Dynamic Risk[15]

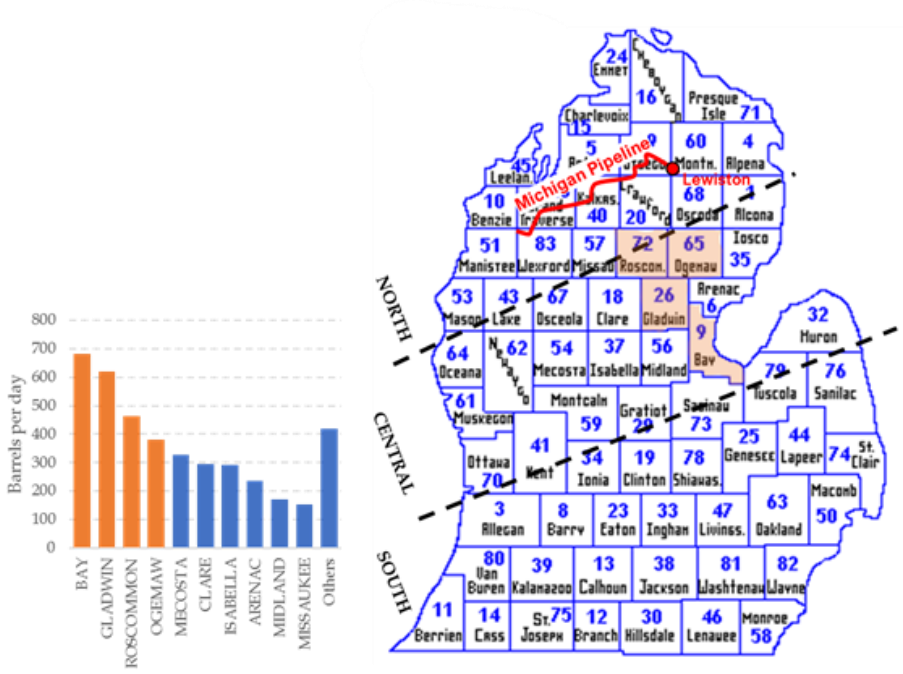
With throughput at Lewiston of 9,000-10,000 barrels per day, Enbridge Line 5 appears to be servicing most or all of the oil production in the Northern and Central regions. In 2016 when light crude injections at Lewiston were 9,321 barrels per day, production in the Northern and Central regions added up to 9,282 barrels per day.

Enbridge Line 5 does not appear to accept crude oil injections anywhere in Michigan except at Lewiston. Given the level of throughput at Lewiston relative to Northern and Central region production, and the lack of crude oil receipt points on Enbridge Line 5 other than at Lewiston, it appears that all oil production in the Northern and Central regions currently passes through the Lewiston terminal and into Enbridge Line 5.

Based on their location, producers in the four largest producing counties in the Central region (see orange bars in Figure 7) are most likely trucking crude oil to Enbridge Line 5 at the Lewiston injection point, or at the truck receipt point at Kalkaska, where the incentive rate is equal to the tariff rate at Lewiston. These are the lowest-cost receipt points on the MarkWest Michigan Pipeline, so they are the likely receipt points for trucked crude oil.

[15] Ibid.

Figure 7. Largest crude oil producers in Central region by county



Source: Michigan DEQ[16]

2.3.2 Southern region producers do not use Enbridge Line 5

The lack of receipt points between Lewiston and Marysville implies that Southern region crude oil (about 4,000 barrels per day) does not end up in Enbridge Line 5. Oil producers in the Southern region may be trucking crude oil to terminals interconnected with pipelines (Enbridge Line 17, Enbridge Line 78, or the Sunoco Mid-Valley pipeline) which transit the southern portion of the state (see Figure 5 above) or to terminals connected to nearby refineries.

2.3.3 Rail could be an option for crude oil transport in Michigan

Railroad transport is usually more expensive than pipelines, but it has some advantages over a pipeline: [17,18]

- rail offers more flexible destinations and shorter-term contracts;

[16] Michigan Department of Environmental Quality. "Oil & Gas Well Production Database." Accessed June 27, 2018.

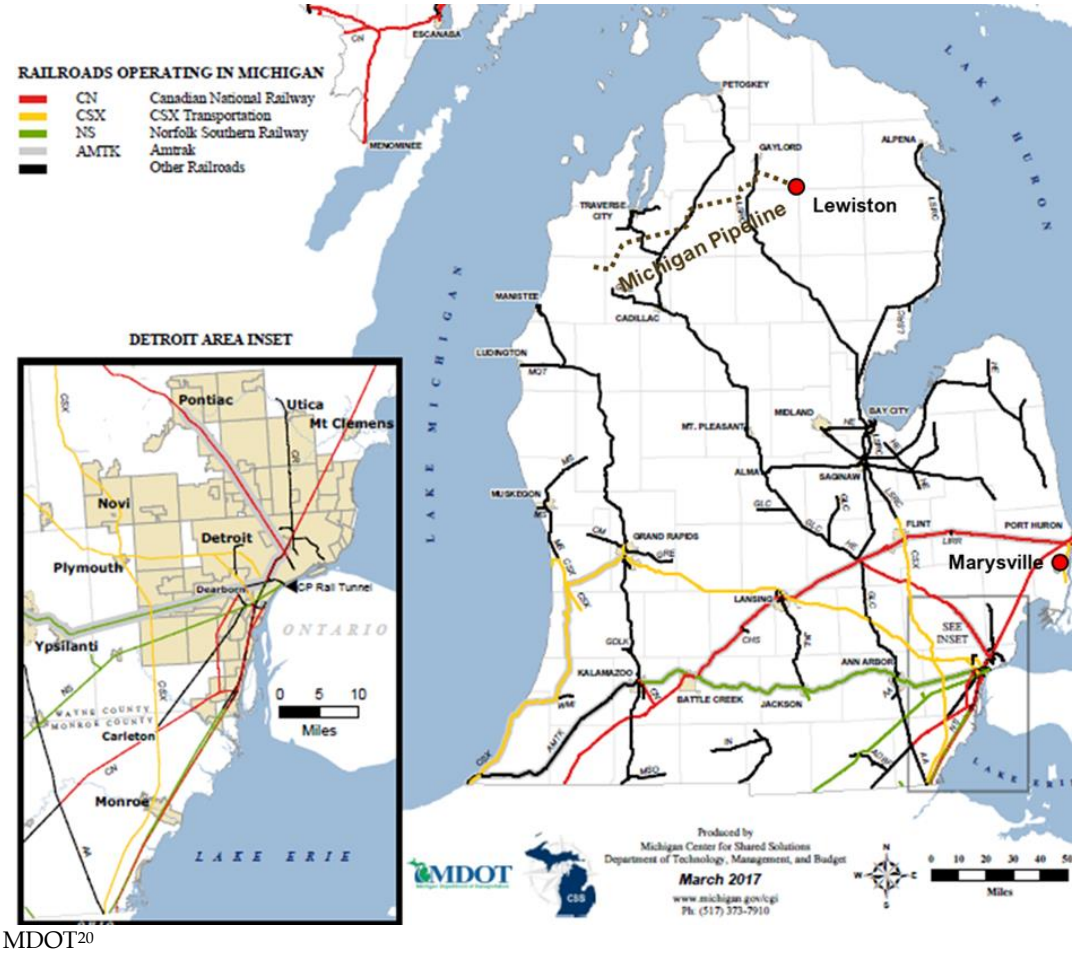
[17] Congressional Research Service. "U.S. Rail Transportation of Crude Oil: Background and Issues for Congress." December 4, 2014.

[18] Philips, M. "Amid U.S. Oil Boom, Railroads Are Beating Pipelines in Crude Transport." *Bloomberg*. June 13, 2013. <http://www.businessweek.com/articles/2013-06-13/amid-u-dot-s-dot-oil-boom-railroads-are-beating-pipelines-in-crude-transport>

- rail can respond more quickly to short-term changes in supply and demand; and
- rail infrastructure can quickly expand by extending track and building terminals.

Michigan has a robust railroad system with almost 4,000 miles of track.[19] Some rail lines are situated near oil production centers and refineries. The Lake State Railway Company ("LSRC") operates a line that interconnects to Gaylord in the northern part of the Lower Peninsula 30 miles away from the Lewiston crude facility (see Figure 8). It is equipped with truck to rail transloading services. LSRC interconnects at Flint with CSX transportation which can transport crude oil directly to refineries in Detroit and Toledo, or interconnect with Canadian National Railway ("CN") which has access to Marysville.

Figure 8. Michigan's railroad system



Source: MDOT[20]

[19] Michigan Department of Transportation. "Rail & Transit Facts." Accessed on July 2019. <https://www.michigan.gov/mdot/0,4616,7-151-9623_11154-129688--,00.html>

[20] Michigan Department of Transportation. "Michigan's Railroad System." March 2017. Accessed on July 2019. <https://www.michigan.gov/documents/mdot/MI_Rail_Map_Printable_553910_7.pdf>.

3 The Michigan upstream industry with and without Enbridge Line 5

LEI examined the cost of alternative transportation routes for oil producers in the Northern and Central regions of the Lower Peninsula. This section begins with LEI's three-step approach which examines the analysis of the transportation option provided by Dynamic Risk:

1 **LEI examined public supply and transportation cost data.** To the extent public data were available, LEI compared the data to the cost assumptions that underpinned Dynamic Risk's analysis of Option Two (trucking from Lewiston to Marysville). Section 3.1 provides a review of those costs.

2 **LEI replicated Dynamic Risk's computations.** Using Dynamic Risk's own assumptions and their cost model, LEI replicated Dynamic Risk's calculations of the cost of Option Two. This step ensured that LEI understood Dynamic Risk's methodology and used their model correctly but does not imply LEI agrees with their conclusions. This is presented in Section 3.2.

3 **LEI found Dynamic Risk's computations essentially correct, but their fundamental assumption about available alternatives was flawed.** LEI used the publicly-available data from Step 1 in the Dynamic Risk model and calculated the results. LEI concluded that Dynamic Risk's trucking cost estimates were consistent with public sources of data (Section 3.3). However, Option Two assumed both the Northern region and Central region oil producers would continue to use the MarkWest Michigan Pipeline to ship oil to Lewiston and then truck the oil from Lewiston to Marysville. This is a flaw in Dynamic Risk's analysis because crude oil producers have other options.

LEI examined two other options: i) trucking crude directly to Marysville (Option Three), and ii) trucking plus rail transport to Marysville (Option Four). These alternatives do not involve using the MarkWest Michigan Pipeline.

LEI's results, discussed in detail in this section, show that Option Two is not the lowest-cost alternative to Enbridge Line 5 available to Northern or Central region producers. Option Three is the lowest-cost alternative to Enbridge Line 5. LEI did not perform any analysis for Southern region crude oil producers because the region does not rely on Enbridge Line 5 for delivery of crude oil to markets.

3.1 Step one: LEI examined data from publicly-available sources

LEI examined a broad array of public data sources to collect information on the key components of transportation costs for Michigan crude oil.

3.1.1 Transportation cost data

Pipeline tariffs for crude oil transport are publicly available. Rail and trucking cost have many cost elements which are not publicly available and are not simple to estimate, but some cost information is available in the public domain. This section covers key elements of pipeline, trucking, and rail costs for crude oil transportation.

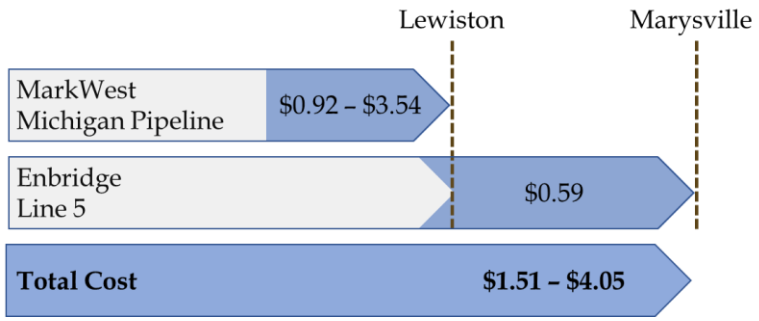
3.1.1.1 Costs by pipeline

Pipelines are the favored option for transporting large volumes of oil. Crude oil contracted for delivery via a pipeline usually pays for transportation costs at a published tariff for a specific route, with an injection point near where the oil is produced, to a delivery point near a refinery or interconnection to a terminal.

The tariff on Enbridge Line 5 effective July 1, 2018, is $0.59 per barrel for the 221 miles from Lewiston to Marysville.[21]

The tariff on the MarkWest Michigan Pipeline to Lewiston effective July 31, 2017 ranges from $0.9195 per barrel for injection at Lewiston to $3.54 per barrel for injection at Manistee.[22] The tariff currently offers an incentive rate for injection at the Kalkaska truck facility (more-or-less in the middle of the pipeline) for deliveries of at least 50 barrels. This rate is $0.9195 per barrel, the same as the Lewiston rate.[23] LEI assumed producers who are not directly interconnected with the pipeline would take advantage of this incentive tariff, as it would be a straightforward matter to ensure that any crude oil delivery truck (which can hold 250 barrels) would arrive with at least a 50-barrel cargo.

Figure 9. Pipeline tariffs for light crude oil (dollars per barrel)



Source: FERC[24]

[21] FERC. "ICA Oil Tariff No. 43.25.0." Issued May 30, 2018. Effective July 1, 2018.

[22] FERC. "Local Pipeline Tariff No. 8.20.0." Issued July 31, 2017. Effective July 31, 2017.

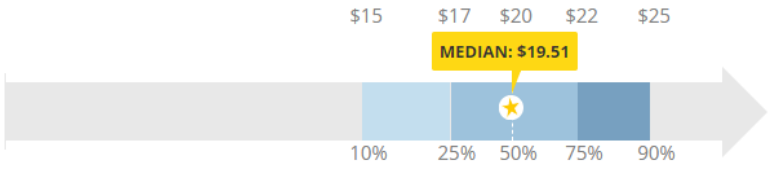
[23] This rate is set to expire at the end of July 2018. For the purposes of our analysis, LEI assumed it would be renewed at the same rate.

[24] MarkWest Michigan Pipeline FERC No. 8.20.0 and Enbridge Lines 5/78 FERC No. 43.25.0

3.1.1.2 Elements of trucking costs

Oil trucking has two major cost components: driver's salary and the cost of diesel fuel. The hourly pay for a fuel tanker driver is reported to range from about $15 per hour to about $25 per hour, not including benefits, bonuses, or commissions (see Figure 10).[25]

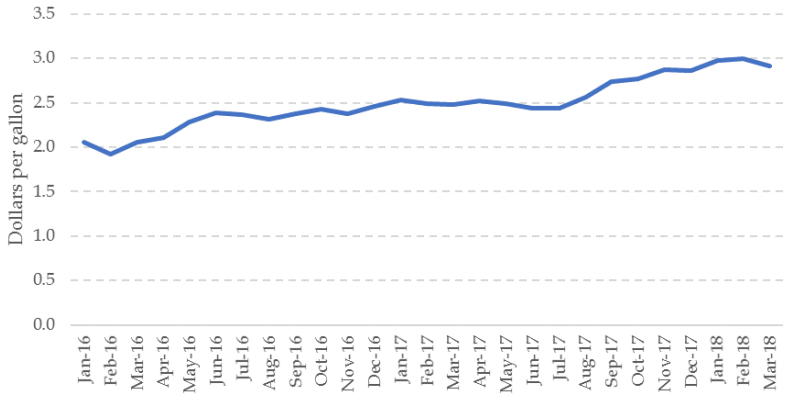
Figure 10. Hourly wage for fuel tanker driver, not including benefits, bonuses, or commissions



Source: PayScale[26]

The retail price of diesel fuel in the Petroleum Administration for Defense District ("PADD") 2 (the district which includes Michigan) including taxes ranged from $2.00 per gallon to slightly under $3.00 per gallon in 2016/17 (see Figure 11).

Figure 11. PADD 2 retail price of No. 2 diesel, ultra-low sulfur (0-15 ppm), including taxes



Source: EIA[27]

[25] PayScale. "Fuel Tanker Driver Salary." Accessed on July 2018. <https://www.payscale.com/research/US/Job=Fuel_Tanker_Driver/Hourly_Rate>

[26] PayScale. "Fuel Tanker Driver Salary." Accessed on July 2018. <https://www.payscale.com/research/US/Job=Fuel_Tanker_Driver/Hourly_Rate>

[27] EIA. "Midwest No 2 Diesel Ultra Low Sulfur (0-15 ppm) Retail Prices Dollars per Gallon." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMD_EPD2DXL0_PTE_R20_DPG&f=M>

As discussed in more detail in Section 3.2, LEI used this public information to test the reasonableness of Dynamic Risk's crude oil trucking cost estimates.

3.1.1.3 Elements of rail costs

Transportation by rail is an alternative to crude pipeline transportation. A typical railcar can hold between 670 and 750 barrels of crude oil depending on the density of the crude.[28] Heavy crude oil requires heating and/or insulation, with less room left over for the oil; lighter crude oil, such as that produced in Michigan, does not require heated or insulated rail cars.

Railroads offer tariffs in the form of "walk-up" rates which apply to the equivalent of a last-minute transaction. Many shippers do not pay walk-up rates. Instead, they pay discounted rates by providing their own equipment such as tanker cars, and/or committing to shipping large or fixed volumes. In 2015, the average freight revenue in the United States for Class I rail was $0.0395 per ton-mile, equivalent to $0.00593 per barrel-mile of crude oil.[29] Freight rates charged for crude oil specifically are not publicly available.

The cost to lease railcars is another important component of the cost of transporting crude by rail. For light crude oil this cost was about $500 per car per month in 2016, down from about $2,000 per car per month in 2014 (see Figure 12). Lease rates are usually fixed under a leasing agreement for a specific period, which can vary from 2 years to 20 years, depending on the type of lease.[30]

[28] Canadian Association of Petroleum Producers. "Transporting Crude Oil by Rail in Canada." March 2014.

[29] United States Department of Transportation. "Average Freight Revenue per Ton-Mile." Accessed on July 2018. <https://www.bts.gov/content/average-freight-revenue-ton-mile>

[30] Market Insider. Global Railcar Leasing Market 2017-2021. Press Release PR Newswire. September 2017. <http://markets.businessinsider.com/news/stocks/global-railcar-leasing-market-2017-2021-1002359341>

Figure 12. Crude railcar lease rates, 2013 to 2015

Source: Genscape[31] "30k" refers to 30,000 gallons, or about 715 barrels; "31.8k" refers to 31,800 gallons, or about 750 barrels; "29k" refers to 29,000 gallons, or about 690 barrels.

3.2 Step two: LEI replicated Dynamic Risk's crude transportation cost results

Dynamic Risk examined the cost of one alternative for crude oil producers in Michigan if Line 5 were not in service: they examined the cost of using tanker trucks rather than Line 5 to transport oil from the Lewiston terminal to Marysville (Option Two). They assumed that producers would continue to truck oil to MarkWest Michigan Pipeline (if they were already doing so), then ship by MarkWest to Lewiston, then offload from MarkWest into trucks for the remainder of the journey to Marysville. Thus, for oil which is not directly interconnected to the MarkWest Michigan Pipeline, Dynamic Risk implicitly assumed two legs of the journey by truck: one from the field to the Michigan Pipeline, then another from Lewiston to Marysville.

Dynamic Risk concluded that it would cost $3.05 per barrel to truck oil from Lewiston to Marysville.[32] Dynamic Risk based this on an assumed tanker truck capacity of 248 barrels[33] but did not provide all the other detailed assumptions or calculations to support this conclusion.

[31] Genscape. "Tank-Car Lease Rates Plummet on Weak Crude-By-Rail Demand, Low Crude Prices." November 11, 2015. <https://www.genscape.com/blog/tank-car-lease-rates-plummet-weak-crude-rail-demand-low-crude-prices>

[32] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines" Prepared for the State of Michigan. October 26, 2017. P ES-23.

[33] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines" Prepared for the State of Michigan. October 26, 2017. P 7-1

Therefore, LEI examined its plausibility based on other assumptions which Dynamic Risk provided for its propane transportation cost analysis (see Figure 13).[34] LEI's replication of Dynamic Risk's crude oil results were based on the assumptions in Figure 13 (except for the tanker truck volume), so LEI did not expect to arrive at precisely the same results as Dynamic Risk, for its analysis of Option Two.

Figure 13. Dynamic Risk assumptions for trucking cost analysis

General				
Volume of Propane per Tractor Trailer	10,400		gal	
Terminal Load/Unload Time	1		h	
Operating Hours Per Day	24		h/d	
Truck Fuel Mileage	7.9		mpg	
Driver Wage	$35		$/h	
Diesel Fuel Costs	$3.00		$/gal	
Capital Costs of Tractor Truck	$120,000		$/Unit	
Capital Cost of Propane Trailer	$145,000		$/Unit	
Insurance/License Fees/Permits	$0.09		$/Mile	
Truck/Trailer Repairs	$0.16		$/Mile	
Truck/Trailer Tires	$0.04		$/Mile	
Truck Tractor Life	7		Years	
Propane Trailer Life	15		Years	
Incremental Overhead	0.45		Man Years	
Incremental Storage	270,000		gal	
Incremental Transload Equipment	2		Units	
Capital Cost Storage Tanks (90,000 gal)	$350,000		$/Unit	
Capital Cost Transload Equipment	$100,000		$/Unit	
Useful Life (Storage Tank/Transloader)	20		Years	
Amortization Rate	15%		Per Annum	
Cost of Overhead	$80,000		$/Annum	
Terminal Specific	**Distance mi. (km)**	**Transit Time (h)**	**Cycle Time (h)**	**Fleet (#)**
Kincheloe, MI	150 (241)	3	8	5
Owen, WI	240 (386)	5	12	8
Superior, WI	290 (467)	6	14	9
Sarnia, ON	427 (688)	8	18	12
Lewiston, MI	221 (356)	4	10	21

Source: Dynamic Risk Appendix J[35]

[34] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J. Prepared for the State of Michigan. October 26, 2017.

[35] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J, P. J-4. Prepared for the State of Michigan. October 26, 2017.

3.2.1 Replicating Dynamic Risk's methodology and assumptions

LEI wanted to ensure we were performing the cost calculations in the same way that Dynamic Risk did. Once that was established, LEI could change the assumptions and examine the impact on the results.

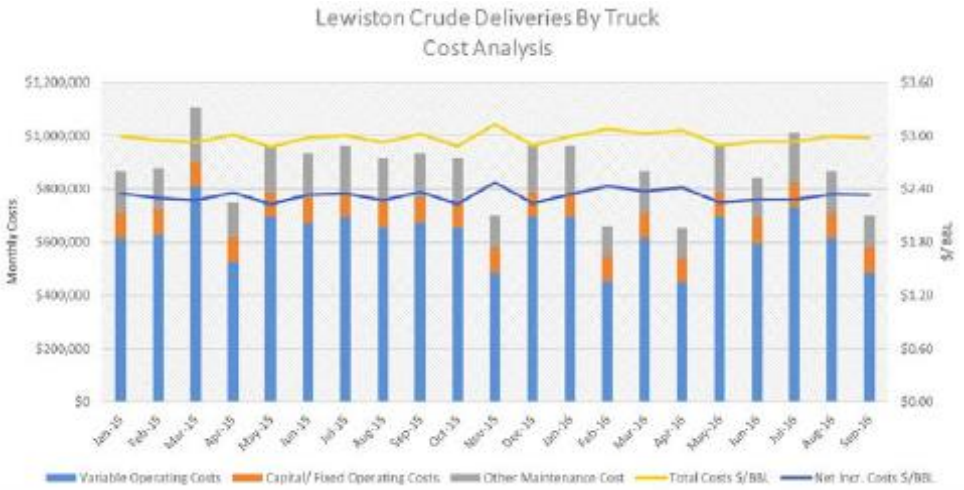
3.2.1.1 Verifying pipeline shipping costs

LEI compared the pipeline costs used by Dynamic Risk to Enbridge Line 5's and MarkWest Michigan Pipeline's published tariffs. Dynamic Risk used a rate of $0.65 per barrel for Lewiston to Maryville for Enbridge Line 5, which was the rate that was in place for the time period for which they conducted their analysis.[36] The current rate, as mentioned previously, is $0.59 per barrel. Dynamic Risk did not conduct any cost analysis related to the MarkWest Michigan Pipeline.

3.2.1.2 Replicating tanker truck shipping costs

LEI examined Dynamic Risk's total cost to ship crude oil by truck from Lewiston to Marysville. As mentioned above, Dynamic Risk did not provide the numerical assumptions for all its cost components, but they did provide a visual representation of costs in their Final Report, in Figure 4-10, page 4-17 (see Figure 14). Dynamic Risk arrived at a transport cost by tanker truck from Lewiston to Marysville of $3.05 per barrel by dividing these total monthly costs by the monthly volumes of oil transported.

Figure 14. Dynamic Risk's Option Two (trucking from Lewiston to Marysville) estimates



Source: Dynamic Risk. Figure 4.10[37]

[36] FERC. "ICA Oil Tariff No. 43.21.0." Issued May 31, 2016.

[37] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Prepared for the State of Michigan. October 26, 2017. P 4-17.

LEI used this visual representation and Dynamic Risk's total cost estimate of $3.05 per barrel as a "target" for its replication of Dynamic Risk's analysis of Option Two.

Dynamic Risk's monthly variable operating costs had two components: fuel cost and driver wages. LEI calculated the monthly diesel fuel cost using the diesel fuel cost and the truck fuel mileage used by Dynamic Risk (see Figure 13 above), multiplied by the mileage from Lewiston to Marysville (Dynamic Risk Final Report page 4-14) and by the number of truckloads. LEI calculated the monthly driver wage cost based on driver hourly wage used by Dynamic Risk ($35 per hour) multiplied by the estimated round-trip cycle time of 10 hours (see Figure 13 above).

LEI calculated the monthly capital and fixed operating costs, including three separate components: overhead cost, incremental overhead cost (both based on the same data used by Dynamic Risk (see Figure 13 above) and assuming a 2,000-hour work year); and fixed cost recovery. To replicate fixed cost recovery, LEI used the average annual fixed cost recovery charge of $0.20 per barrel which it appeared that Dynamic Risk used.

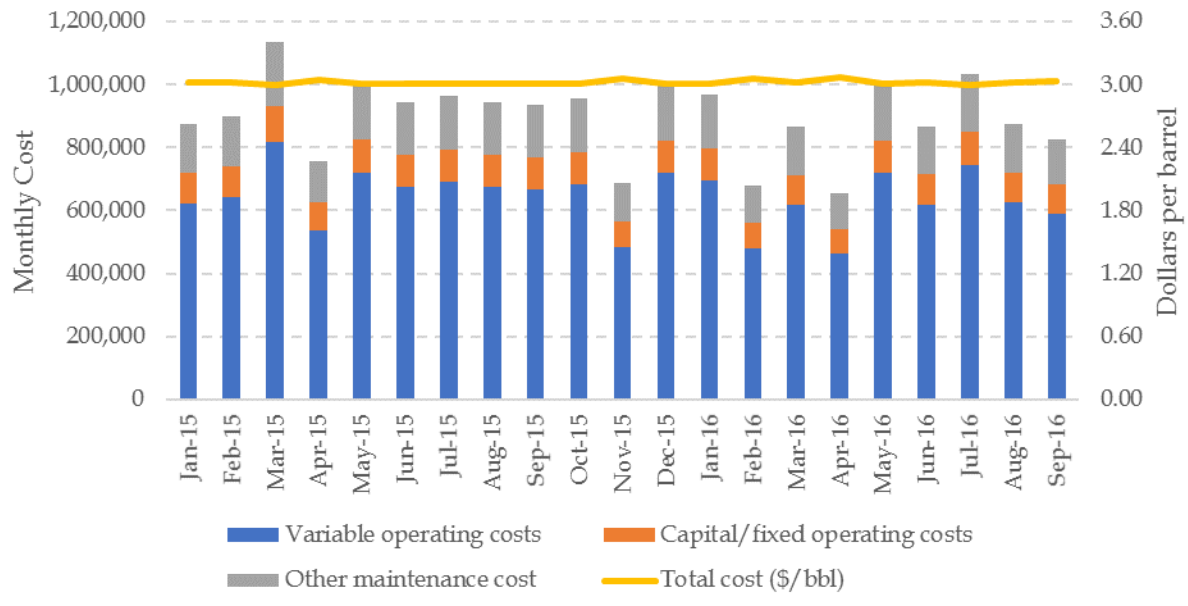
To replicate "Other maintenance costs," LEI used the following inputs provided by Dynamic Risk: Insurance/License/fees/permits, truck/trailer repairs, and truck/trailer tires (see Figure 13 above). LEI multiplied these costs by mileage and truckload as appropriate.

To replicate Dynamic Risk's costs per barrel, LEI used monthly light crude oil injections into Line 5 at Lewiston (from Appendix C, pages C-2 and C-3 of the Dynamic Risk Report). LEI arrived at a weighted average total cost of $2.93 per barrel (see Figure 15 and Figure 16). This is within four percent of Dynamic Risk's $3.05 per barrel results. This confirms that LEI understood Dynamic Risk's approach and used their assumptions correctly.

Figure 15. LEI's replication of Dynamic Risk's Option Two results (trucking from Lewiston to Marysville) (numerical data)

Year	Month	Light crude deliveries to Lewiston (barrels)	Number of truck delivery trips needed in the month	Miles per round trip	Fuel cost per month	Driver wage cost per month	Insurance, license, fees, permits,and repair cost per month	Overhead cost	Incremental overhead cost	Fixed cost recovery	Total cost per barrel
2015	Jan	289,170	1,166	442	$ 195,712	$ 408,103	$ 149,459	$ 6,667	$ 31,500	$ 57,834	$2.94
2015	Feb	297,995	1,202	442	$ 201,685	$ 420,558	$ 154,020	$ 6,667	$ 31,500	$ 59,599	$2.93
2015	Mar	379,061	1,528	442	$ 256,551	$ 534,965	$ 195,919	$ 6,667	$ 31,500	$ 75,812	$2.91
2015	Apr	248,895	1,004	442	$ 168,454	$ 351,264	$ 128,643	$ 6,667	$ 31,500	$ 49,779	$2.96
2015	May	334,408	1,348	442	$ 226,330	$ 471,947	$ 172,840	$ 6,667	$ 31,500	$ 66,882	$2.92
2015	Jun	313,808	1,265	442	$ 212,387	$ 442,874	$ 162,193	$ 6,667	$ 31,500	$ 62,762	$2.93
2015	Jul	320,954	1,294	442	$ 217,224	$ 452,959	$ 165,886	$ 6,667	$ 31,500	$ 64,191	$2.92
2015	Aug	312,764	1,261	442	$ 211,681	$ 441,401	$ 161,654	$ 6,667	$ 31,500	$ 62,553	$2.93
2015	Sep	309,845	1,249	442	$ 209,705	$ 437,282	$ 160,145	$ 6,667	$ 31,500	$ 61,969	$2.93
2015	Oct	317,444	1,280	442	$ 214,848	$ 448,005	$ 164,072	$ 6,667	$ 31,500	$ 63,489	$2.93
2015	Nov	224,364	905	442	$ 151,851	$ 316,643	$ 115,964	$ 6,667	$ 31,500	$ 44,873	$2.98
2015	Dec	332,848	1,342	442	$ 225,274	$ 469,745	$ 172,034	$ 6,667	$ 31,500	$ 66,570	$2.92
2016	Jan	321,928	1,298	442	$ 217,883	$ 454,335	$ 166,390	$ 6,667	$ 31,500	$ 64,386	$2.92
2016	Feb	222,358	897	442	$ 150,493	$ 313,811	$ 114,927	$ 6,667	$ 31,500	$ 44,472	$2.98
2016	Mar	286,440	1,155	442	$ 193,865	$ 404,250	$ 148,048	$ 6,667	$ 31,500	$ 57,288	$2.94
2016	Apr	213,797	862	442	$ 144,699	$ 301,730	$ 110,502	$ 6,667	$ 31,500	$ 42,759	$2.98
2016	May	332,848	1,342	442	$ 225,274	$ 469,745	$ 172,034	$ 6,667	$ 31,500	$ 66,570	$2.92
2016	Jun	286,824	1,157	442	$ 194,124	$ 404,792	$ 148,246	$ 6,667	$ 31,500	$ 57,365	$2.94
2016	Jul	344,742	1,390	442	$ 233,324	$ 486,532	$ 178,182	$ 6,667	$ 31,500	$ 68,948	$2.92
2016	Aug	289,755	1,168	442	$ 196,108	$ 408,929	$ 149,761	$ 6,667	$ 31,500	$ 57,951	$2.94
2016	Sep	273,049	1,101	442	$ 184,801	$ 385,351	$ 141,127	$ 6,667	$ 31,500	$ 54,610	$2.94
Weighted average											**$2.93**

Figure 16. LEI's replication of Dynamic Risk's Option Two results (trucking from Lewiston to Marysville)



3.3 Step three: LEI re-calculated Dynamic Risk's estimate using public data

For the final step, LEI tested the impact on Dynamic Risk's Option Two cost estimate of using the public data for several key assumptions.

3.3.1 Option Two (trucking from Lewiston to Marysville)

For Option Two (trucking from Lewiston to Marysville) LEI's analysis of publicly available data showed different values than those used by Dynamic Risk. Diesel fuel prices have been somewhat below Dynamic Risk's $3.00 per gallon; LEI used $2.90 per gallon. Public data for driver wages was lower than the $35 per hour used by Dynamic Risk, but did not include benefits, bonuses, or commissions. Based on the public data noted previously, LEI assumed an average pay of $19.51 per hour (from Figure 10), a 2,000-hour working year, $18,000 per driver per year for health insurance, and $8,000 per driver per year for bonuses and commissions, for a total cost of $32.51 per hour. Substituting public data (a $2.90 per gallon diesel price, and a wage cost of $32.51 per hour) into the Dynamic Risk model resulted in a cost of $2.80 per barrel (see Figure 17). This is somewhat lower than the Dynamic Risk's result (see Figure 18).

Figure 17. LEI's cost for Option Two (trucking from Lewiston to Marysville) based on public data

Year	Month	Light crude deliveries to Lewiston (barrels)	Number of truck delivery trips needed in the month	Fuel cost per month	Driver wage cost per month	Insurance, license, fees, permits,and repair cost per month	Overhead cost	Incremental overhead cost	Fixed cost recovery	Total cost per barrel
2015	Jan	289,170	1,166	$ 189,189	$ 378,953	$ 149,459	$ 6,667	$ 29,250	$ 57,834	$2.81
2015	Feb	297,995	1,202	$ 194,962	$ 390,518	$ 154,020	$ 6,667	$ 29,250	$ 59,599	$2.80
2015	Mar	379,061	1,528	$ 247,999	$ 496,753	$ 195,919	$ 6,667	$ 29,250	$ 75,812	$2.78
2015	Apr	248,895	1,004	$ 162,839	$ 326,173	$ 128,643	$ 6,667	$ 29,250	$ 49,779	$2.83
2015	May	334,408	1,348	$ 218,785	$ 438,236	$ 172,840	$ 6,667	$ 29,250	$ 66,882	$2.79
2015	Jun	313,808	1,265	$ 205,308	$ 411,240	$ 162,193	$ 6,667	$ 29,250	$ 62,762	$2.80
2015	Jul	320,954	1,294	$ 209,983	$ 420,604	$ 165,886	$ 6,667	$ 29,250	$ 64,191	$2.79
2015	Aug	312,764	1,261	$ 204,625	$ 409,872	$ 161,654	$ 6,667	$ 29,250	$ 62,553	$2.80
2015	Sep	309,845	1,249	$ 202,715	$ 406,047	$ 160,145	$ 6,667	$ 29,250	$ 61,969	$2.80
2015	Oct	317,444	1,280	$ 207,686	$ 416,005	$ 164,072	$ 6,667	$ 29,250	$ 63,489	$2.79
2015	Nov	224,364	905	$ 146,790	$ 294,026	$ 115,964	$ 6,667	$ 29,250	$ 44,873	$2.84
2015	Dec	332,848	1,342	$ 217,765	$ 436,192	$ 172,034	$ 6,667	$ 29,250	$ 66,570	$2.79
2016	Jan	321,928	1,298	$ 210,621	$ 421,882	$ 166,390	$ 6,667	$ 29,250	$ 64,386	$2.79
2016	Feb	222,358	897	$ 145,477	$ 291,396	$ 114,927	$ 6,667	$ 29,250	$ 44,472	$2.84
2016	Mar	286,440	1,155	$ 187,403	$ 375,375	$ 148,048	$ 6,667	$ 29,250	$ 57,288	$2.81
2016	Apr	213,797	862	$ 139,876	$ 280,178	$ 110,502	$ 6,667	$ 29,250	$ 42,759	$2.85
2016	May	332,848	1,342	$ 217,765	$ 436,192	$ 172,034	$ 6,667	$ 29,250	$ 66,570	$2.79
2016	Jun	286,824	1,157	$ 187,654	$ 375,878	$ 148,246	$ 6,667	$ 29,250	$ 57,365	$2.81
2016	Jul	344,742	1,390	$ 225,547	$ 451,779	$ 178,182	$ 6,667	$ 29,250	$ 68,948	$2.79
2016	Aug	289,755	1,168	$ 189,571	$ 379,719	$ 149,761	$ 6,667	$ 29,250	$ 57,951	$2.81
2016	Sep	273,049	1,101	$ 178,641	$ 357,826	$ 141,127	$ 6,667	$ 29,250	$ 54,610	$2.81
Weighted average										**$2.80**

Figure 18. Comparison of trucking cost estimates, Lewiston to Marysville (dollars per barrel)

Dynamic Risk estimate for Option Two	$	3.05
LEI replication of Dynamic Risk's estimate, using Dynamic Risk's assumptions	$	2.93
LEI estimate of Option Two using public data	$	2.80

3.4 LEI examined two other options for producers

Gaylord, a rail terminal with transloading services, is located about 30 miles from the Lewiston terminal. Crude oil could be trucked directly from Northern region wells to Gaylord, so LEI felt the combination of trucking to Gaylord followed by rail from Gaylord to Marysville was an option worth examining for cost-effectiveness (LEI's Option Four). LEI compared this to trucking crude oil from the Northern region all the way to Marysville (LEI's Option Three).

3.4.1 Option Three: Trucking from Kalkaska to Marysville

Kalkaska, as noted previously, is a trucking receipt point on the MarkWest Michigan Pipeline about halfway along the pipeline, with an incentive tariff rate equal to the rate at Lewiston. LEI assumed this halfway point would represent the average distance a Northern producer would have to truck their oil (233 miles) to get to Marysville, if they did not use MarkWest and Enbridge Line 5. This distance implies a 10-hour cycle time; and given the transport volume and truck size, a fleet of 21 trucks (based on assumptions shown in Figure 13 previously). Using the same methodology as above, LEI calculated that the cost to producers for trucking from Kalkaska to Marysville would be $2.81 per barrel (see Figure 19).

Figure 19. LEI's cost for Option Three (trucking from Kalkaska to Marysville)

Year	Month	Light crude deliveries to Lewiston (barrels)	Number of truck delivery trips needed in the month	Fuel cost per month	Driver wage cost per month	Insurance, license, fees, permits,and repair cost per month	Overhead cost	Incremental overhead cost	Fixed cost recovery	Total cost per barrel
2015	Jan	289,170	1,166	$ 199,718	$ 379,069	$ 157,777	$ 3,667	$ 16,092	$ 57,834	$2.82
2015	Feb	297,995	1,202	$ 205,813	$ 390,638	$ 162,592	$ 3,667	$ 16,092	$ 59,599	$2.81
2015	Mar	379,061	1,528	$ 261,802	$ 496,906	$ 206,823	$ 3,667	$ 16,092	$ 75,812	$2.80
2015	Apr	248,895	1,004	$ 171,902	$ 326,274	$ 135,802	$ 3,667	$ 16,092	$ 49,779	$2.83
2015	May	334,408	1,348	$ 230,962	$ 438,371	$ 182,460	$ 3,667	$ 16,092	$ 66,882	$2.81
2015	Jun	313,808	1,265	$ 216,735	$ 411,367	$ 171,220	$ 3,667	$ 16,092	$ 62,762	$2.81
2015	Jul	320,954	1,294	$ 221,670	$ 420,734	$ 175,119	$ 3,667	$ 16,092	$ 64,191	$2.81
2015	Aug	312,764	1,261	$ 216,013	$ 409,998	$ 170,651	$ 3,667	$ 16,092	$ 62,553	$2.81
2015	Sep	309,845	1,249	$ 213,998	$ 406,172	$ 169,058	$ 3,667	$ 16,092	$ 61,969	$2.81
2015	Oct	317,444	1,280	$ 219,246	$ 416,133	$ 173,204	$ 3,667	$ 16,092	$ 63,489	$2.81
2015	Nov	224,364	905	$ 154,959	$ 294,116	$ 122,418	$ 3,667	$ 16,092	$ 44,873	$2.84
2015	Dec	332,848	1,342	$ 229,885	$ 436,326	$ 181,609	$ 3,667	$ 16,092	$ 66,570	$2.81
2016	Jan	321,928	1,298	$ 222,343	$ 422,012	$ 175,651	$ 3,667	$ 16,092	$ 64,386	$2.81
2016	Feb	222,358	897	$ 153,574	$ 291,486	$ 121,323	$ 3,667	$ 16,092	$ 44,472	$2.84
2016	Mar	286,440	1,155	$ 197,833	$ 375,491	$ 156,288	$ 3,667	$ 16,092	$ 57,288	$2.82
2016	Apr	213,797	862	$ 147,661	$ 280,264	$ 116,652	$ 3,667	$ 16,092	$ 42,759	$2.84
2016	May	332,848	1,342	$ 229,885	$ 436,326	$ 181,609	$ 3,667	$ 16,092	$ 66,570	$2.81
2016	Jun	286,824	1,157	$ 198,098	$ 375,994	$ 156,497	$ 3,667	$ 16,092	$ 57,365	$2.82
2016	Jul	344,742	1,390	$ 238,100	$ 451,918	$ 188,099	$ 3,667	$ 16,092	$ 68,948	$2.80
2016	Aug	289,755	1,168	$ 200,122	$ 379,836	$ 158,096	$ 3,667	$ 16,092	$ 57,951	$2.82
2016	Sep	273,049	1,101	$ 188,584	$ 357,936	$ 148,981	$ 3,667	$ 16,092	$ 54,610	$2.82
Weighted average										**$2.81**

3.4.2 Option Four: Trucking from Kalkaska to Gaylord plus rail from Gaylord to Marysville

For the first leg of Option Four, LEI assumed the average distance a producer would have to truck crude to get to Gaylord would be 40 miles, the distance from Kalkaska to Gaylord. The 40 miles implies a 1.8-hour cycle time and requires four trucks (based on the assumptions shown in Figure 13). Based on this, LEI estimated that average trucking cost for the 40 miles to Gaylord would be $0.55 per barrel (see Figure 20).

Figure 20. LEI's cost for the first leg of Option Four (trucking from Kalkaska to Gaylord)

Year	Month	Light crude deliveries to Lewiston (barrels)	Number of truck delivery trips needed in the month	Fuel cost per month	Driver wage cost per month	Insurance, license, fees, permits,and repair cost per month	Overhead cost	Incremental overhead cost	Fixed cost recovery	Total cost per barrel
2015	Jan	289,170	1,166	$ 34,242	$ 68,610	$ 27,051	$ 3,667	$ 16,092	$ 10,468	$0.55
2015	Feb	297,995	1,202	$ 35,287	$ 70,704	$ 27,877	$ 3,667	$ 16,092	$ 10,787	$0.55
2015	Mar	379,061	1,528	$ 44,887	$ 89,938	$ 35,461	$ 3,667	$ 16,092	$ 13,722	$0.54
2015	Apr	248,895	1,004	$ 29,473	$ 59,054	$ 23,284	$ 3,667	$ 16,092	$ 9,010	$0.56
2015	May	334,408	1,348	$ 39,599	$ 79,343	$ 31,283	$ 3,667	$ 16,092	$ 12,105	$0.54
2015	Jun	313,808	1,265	$ 37,160	$ 74,456	$ 29,356	$ 3,667	$ 16,092	$ 11,360	$0.55
2015	Jul	320,954	1,294	$ 38,006	$ 76,151	$ 30,025	$ 3,667	$ 16,092	$ 11,618	$0.55
2015	Aug	312,764	1,261	$ 37,036	$ 74,208	$ 29,259	$ 3,667	$ 16,092	$ 11,322	$0.55
2015	Sep	309,845	1,249	$ 36,691	$ 73,515	$ 28,986	$ 3,667	$ 16,092	$ 11,216	$0.55
2015	Oct	317,444	1,280	$ 37,590	$ 75,318	$ 29,696	$ 3,667	$ 16,092	$ 11,491	$0.55
2015	Nov	224,364	905	$ 26,568	$ 53,234	$ 20,989	$ 3,667	$ 16,092	$ 8,122	$0.57
2015	Dec	332,848	1,342	$ 39,414	$ 78,973	$ 31,137	$ 3,667	$ 16,092	$ 12,049	$0.54
2016	Jan	321,928	1,298	$ 38,121	$ 76,382	$ 30,116	$ 3,667	$ 16,092	$ 11,654	$0.55
2016	Feb	222,358	897	$ 26,331	$ 52,758	$ 20,801	$ 3,667	$ 16,092	$ 8,049	$0.57
2016	Mar	286,440	1,155	$ 33,919	$ 67,962	$ 26,796	$ 3,667	$ 16,092	$ 10,369	$0.55
2016	Apr	213,797	862	$ 25,317	$ 50,726	$ 20,000	$ 3,667	$ 16,092	$ 7,739	$0.58
2016	May	332,848	1,342	$ 39,414	$ 78,973	$ 31,137	$ 3,667	$ 16,092	$ 12,049	$0.54
2016	Jun	286,824	1,157	$ 33,964	$ 68,053	$ 26,832	$ 3,667	$ 16,092	$ 10,383	$0.55
2016	Jul	344,742	1,390	$ 40,823	$ 81,795	$ 32,250	$ 3,667	$ 16,092	$ 12,479	$0.54
2016	Aug	289,755	1,168	$ 34,312	$ 68,749	$ 27,106	$ 3,667	$ 16,092	$ 10,489	$0.55
2016	Sep	273,049	1,101	$ 32,333	$ 64,785	$ 25,543	$ 3,667	$ 16,092	$ 9,884	$0.56
Weighted average										**$0.55**

For the second leg of Option Four, LEI calculated the cost of rail transport from Gaylord to Marysville. This is a distance of 234 miles, which implies a 10.2-hour cycle time (based on rail cost and performance assumptions shown in Dynamic Risk's Appendix J).[38] The cycle time combined with the needed monthly deliveries and the volume of a railcar (660 barrels) requires a fleet of eight railcars. Based on LEI's research of public sources discussed in Section 3.1 above, LEI assumed tanker lease costs of $750 per car per month. The freight rate for crude hauling in Michigan is not publicly available, as noted previously. The average freight rate in the United States for all types of freight in 2015 was $3.95 per ton-mile; the equivalent of $0.00593 per barrel-mile.[39] This amounts to $1.39 per barrel for the 234-mile trip. LEI assumed this average freight rate in its analysis.

LEI added all the monthly costs and divided by the monthly crude oil delivered to Lewiston. LEI arrived at an average of $2.54 per barrel to ship by rail from Gaylord to Marysville (see Figure 20).

[38] Dynamic Risk, "Final Report: Alternative Analysis for the Straits Pipelines." Appendix J, P. J-2. Prepared for the State of Michigan. October 26, 2017.

[39] https://www.bts.gov/content/average-freight-revenue-ton-mile.

Figure 21. LEI's cost for the second leg of Option Four (rail transport from Gaylord to Marysville)

Year	Month	Light crude deliveries to Lewiston (barrels)	Number of railcar deliveries needed in the month	Round trip time (days)	Trip days required	Number of cars required	Freight charge	Railcar lease cost	Transloading cost	Overhead plus incremental overhead cost	Fixed capital recovery	LEI rail cost per barrel
2015	Jan	289,170	438.1	0.4	186.9	6.2	$400,923	$ 4,671	$ 306,696	$ 8,167	$ 14,696	$2.54
2015	Feb	297,995	451.5	0.4	192.6	6.4	$413,158	$ 4,814	$ 316,055	$ 8,167	$ 15,144	$2.54
2015	Mar	379,061	574.3	0.4	244.9	8.2	$525,552	$ 6,123	$ 402,034	$ 8,167	$ 19,264	$2.54
2015	Apr	248,895	377.1	0.4	160.8	5.4	$345,083	$ 4,021	$ 263,980	$ 8,167	$ 12,649	$2.55
2015	May	334,408	506.7	0.4	216.1	7.2	$463,643	$ 5,402	$ 354,675	$ 8,167	$ 16,995	$2.54
2015	Jun	313,808	475.5	0.4	202.8	6.8	$435,082	$ 5,069	$ 332,827	$ 8,167	$ 15,948	$2.54
2015	Jul	320,954	486.3	0.4	207.4	6.9	$444,989	$ 5,185	$ 340,405	$ 8,167	$ 16,311	$2.54
2015	Aug	312,764	473.9	0.4	202.1	6.7	$433,634	$ 5,052	$ 331,719	$ 8,167	$ 15,895	$2.54
2015	Sep	309,845	469.5	0.4	200.2	6.7	$429,588	$ 5,005	$ 328,624	$ 8,167	$ 15,746	$2.54
2015	Oct	317,444	481.0	0.4	205.1	6.8	$440,123	$ 5,128	$ 336,683	$ 8,167	$ 16,132	$2.54
2015	Nov	224,364	339.9	0.4	145.0	4.8	$311,072	$ 3,624	$ 237,962	$ 8,167	$ 11,402	$2.55
2015	Dec	332,848	504.3	0.4	215.1	7.2	$461,480	$ 5,377	$ 353,021	$ 8,167	$ 16,915	$2.54
2016	Jan	321,928	487.8	0.4	208.0	6.9	$446,341	$ 5,200	$ 341,439	$ 8,167	$ 16,360	$2.54
2016	Feb	222,358	336.9	0.4	143.7	4.8	$308,290	$ 3,592	$ 235,834	$ 8,167	$ 11,300	$2.55
2016	Mar	286,440	434.0	0.4	185.1	6.2	$397,138	$ 4,627	$ 303,800	$ 8,167	$ 14,557	$2.54
2016	Apr	213,797	323.9	0.4	138.1	4.6	$296,421	$ 3,454	$ 226,755	$ 8,167	$ 10,865	$2.55
2016	May	332,848	504.3	0.4	215.1	7.2	$461,480	$ 5,377	$ 353,021	$ 8,167	$ 16,915	$2.54
2016	Jun	286,824	434.6	0.4	185.3	6.2	$397,670	$ 4,633	$ 304,207	$ 8,167	$ 14,576	$2.54
2016	Jul	344,742	522.3	0.4	222.8	7.4	$477,971	$ 5,569	$ 365,636	$ 8,167	$ 17,520	$2.54
2016	Aug	289,755	439.0	0.4	187.2	6.2	$401,734	$ 4,681	$ 307,316	$ 8,167	$ 14,725	$2.54
2016	Sep	273,049	413.7	0.4	176.4	5.9	$378,571	$ 4,411	$ 289,597	$ 8,167	$ 13,876	$2.54
Weighted average												**$2.54**

The total for the truck-plus-rail option from Kalkaska to Marysville is $0.55 + $2.54 = $3.09 per barrel. This is more than the $2.81 per barrel cost for trucking-only from Kalkaska to Marysville (see Figure 22). Therefore, although rail options exist, this rail route would be more expensive assuming the crude oil freight charge is $1.39 per barrel.

LEI's analysis demonstrated that the single option (Option Two) examined by Dynamic Risk—trucking along the Lewiston – Marysville route while continuing to use the MarkWest Michigan Pipeline—is not cost effective compared to simply trucking crude oil to Marysville (Option Three). The trucking option LEI examined costs $1.31 per barrel more than the MarkWest-Enbridge Line 5 option (Option One) that Northern region producers currently use. The truck-plus-rail option (Option Four), though not as cost-effective as the truck-only option, was still cheaper than the option examined by Dynamic Risk, because it does not involve using the MarkWest Michigan Pipeline.

For producers located in the Central region, the cost of trucking directly to market in Marysville could be lower than the cost for Northern producers. The Central region is physically closer to Marysville (though the distance varies depending on the county). For Central region producers, it would make more sense to truck crude oil south or southeast directly to Marysville, rather than north to Kalkaska then south to Marysville.

Figure 22. LEI's weighted average annual cost of crude transportation to Marysville ($ per barrel)

Option	Option 1: MI Pipeline and Enbridge Line 5	Option 2: MI Pipeline and trucking from Lewiston	Option 3: Trucking only	Option 4: Trucking plus rail
Mode of transportation	Michigan Pipeline	Michigan Pipeline		
Cost of transportation ($ per barrel)	$0.92	$0.92		
Terminal	Lewiston	Lewiston	Kalkaska	Kalkaska
Mode of transportation	Enbridge Line 5 Pipeline	Truck	Truck	Truck
Cost of transportation ($ per barrel)	$0.59	$2.80	$2.81	$0.55
Terminal				Gaylord
Mode of transportation				Rail
Cost of transportation ($ per barrel)				$2.54
Destination	**Marysville**			
Total cost ($ per barrel)	$1.51	$3.72	$2.81	$3.09
Difference compared to Option One		$2.22	$1.31	$1.59

Note: The transportation costs in this table are typical costs. They are neither averages, nor maximums, nor minimums. For example, the $0.92 per barrel cost for the Michigan Pipeline is the tariff for injection at Lewiston; which is the same as the incentive tariff rate at Michigan Pipeline's Kalkaska truck receipt point (see Section 3.1.1.1 for details). Thus, the $0.92 is typical of the rate a shipper on Michigan Pipeline would pay to access the Lewiston injection point for Enbridge Line 5. Totals are rounded independently.

4 Conclusions and implications

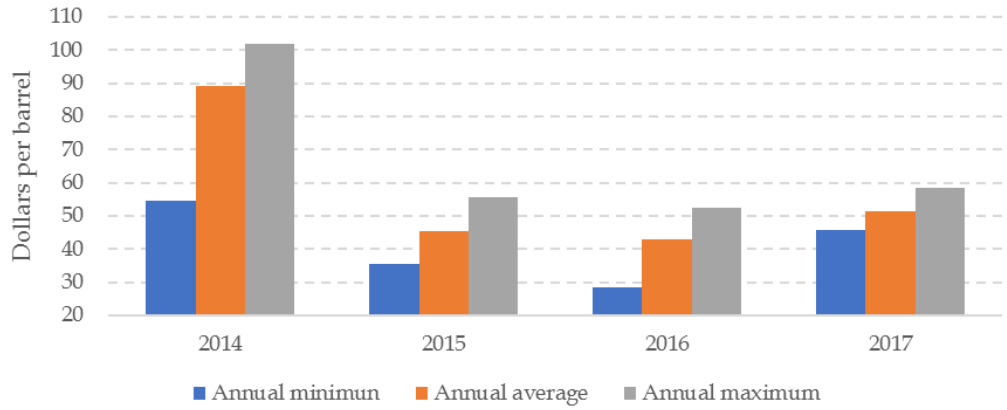
If Enbridge Line 5 was not in service, the three regions in Michigan which produce crude oil would each face different impacts:

- **Northern region:** Without access to Enbridge Line 5, Northern region oil producers would seek the least-expensive alternative. The cheapest option is trucking to Marysville, without using the MarkWest Michigan line. LEI estimates this would add $1.31 per barrel to the weighted average annual cost of transporting oil.
- **Central region:** Oil producers in the Central region would likely pay less than Northern producers to transport oil to market, as they are generally closer to Marysville. The impact on these producers would probably be less than $1.31 per barrel.
- **Southern region:** Oil producers in the Southern region will not be impacted as they do not use Enbridge Line 5 to transport their crude oil to market.

4.1 The cost increase would be small compared with the value of crude oil

The average price of crude oil in Michigan was just over $50 per barrel in 2017. A transportation cost increase of $1.31 per barrel amounts to 2.6 percent of that average price. Higher crude oil prices for 2018 imply an even lower percentage for the cost impact in terms of the value of crude oil. Also, monthly average crude oil prices in the past four years have been as low as $28 per barrel and as high as $100 per barrel (see Figure 23). A $1.31 per barrel difference in transport cost is small compared with such large changes in the value of Michigan crude oil.

Figure 23. Annual maximum, minimum, and average prices for crude oil first purchase prices in Michigan (2015-2017)



Source: EIA[40]

[40] EIA. "Domestic Crude Oil First Purchase Prices by Area – Michigan." Accessed on July 2018. <https://www.eia.gov/dnav/pet/pet_pri_dfp1_k_a.htm>

4.2 Impact on Michigan crude oil producers could be minimal

The volume of crude oil the Michigan producers have been shipping on Line 5 (about 10,000 barrels per day) is tiny compared to the over 700,000 barrels per day used by nearby Detroit, Toledo, and Sarnia refineries. If Line 5 were not in service, these refineries would need other options for sourcing the rest of the 414,000 barrels per day that Line 5 has typically delivered.[41] Without Line 5, refiners and other purchasers of crude oil would have to find alternatives to a portion of the 414,000 barrels per day. Michigan's production of 10,000 barrels per day would account for only a small fraction of this. Rail could carry large volumes from distant supply regions such as North Dakota but could cost more than trucking Michigan-produced crude oil. This would give Michigan producers headroom to increase their delivered prices to refineries and other purchasers; the impact on the profitability of Michigan crude oil producers may therefore be minimal.

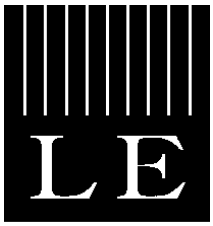
[41] Average Line 5 deliveries of light crude oil 2015/16. Dynamic Risk. Dynamic Risk, "Final Report: Alternative Analysis for the Straits Pipelines." Appendix C. Prepared for the State of Michigan. October 26, 2017.

ASSESSMENT OF ALTERNATIVE METHODS OF SUPPLYING PROPANE TO MICHIGAN IN THE ABSENCE OF LINE 5

Prepared for

National Wildlife Federation

By



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July 27, 2018

Assessment of alternative methods of supplying propane to Michigan in the absence of Line 5

Prepared by London Economics International LLC

July 27, 2018

London Economics International LLC ("LEI") was funded by the National Wildlife Federation ("NWF") with a grant from the Charles Steward Mott Foundation ("CS Mott") to examine alternatives to Enbridge Energy, Limited Partnership ("Enbridge") Line 5 for supply of propane to consumers in the State of Michigan. Enbridge Line 5 provides natural gas liquids ("NGLs") from which propane is extracted, directly to a facility in Michigan's Upper Peninsula, and to facilities in Ontario that then supply propane to Michigan's Lower Peninsula. LEI's assessment assumes that Line 5 would not be in use for the transport of oil and NGLs across the Straits of Mackinac.

LEI finds that, with strong recent and projected growth in supply of NGLs from the United States, and with flat to declining demand for propane in Michigan, the prospect of persistent propane supply shortages in Michigan is unlikely, even if Enbridge Line 5 ceased to operate. Event-driven supply interruptions or weather-driven shortages such as experienced in 2014 during the Polar Vortex winter, will likely occur on occasion, as they have in the past. But with the prospect of plentiful supplies relative to demand, the main concern with the potential absence of Enbridge Line 5 is the delivered cost of alternative sources of propane.

With this focus on the cost of alternatives, LEI's key findings are that the lowest-cost alternative options to Enbridge Line 5 would be truck or rail from Superior, Wisconsin ("WI"). LEI estimates the price increase to consumers in the Upper Peninsula would likely be about $0.05 per gallon. This small price increase would be lost in the noise of typical propane price volatility.

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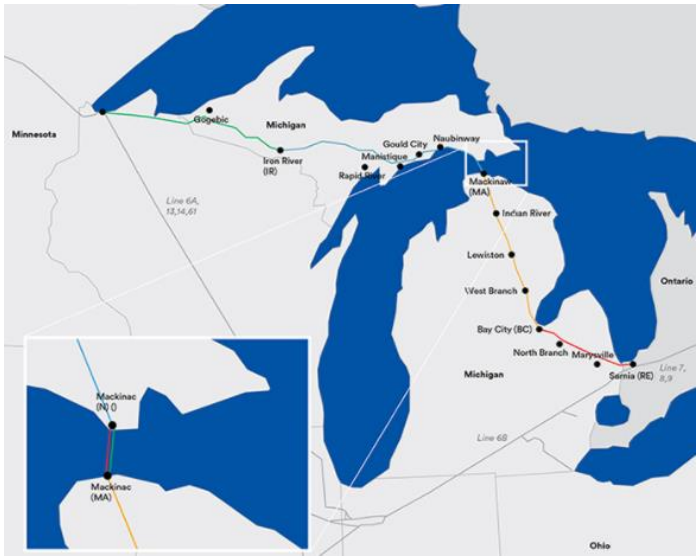
1 Introduction and executive summary

1.1 Enbridge Line 5

The State of Michigan is considering options for ongoing operations of the Enbridge Line 5 liquids pipeline, which traverses Michigan's Upper Peninsula and Lower Peninsula. Line 5 begins in Superior, WI and terminates in Sarnia, Ontario ("ON"). The pipeline's capacity is 540,000 barrels per day.[1] It transports light crude oil, light synthetic crude, and NGLs, which include propane.

Enbridge Line 5 was built in 1953. The pipeline runs for 645 miles from Wisconsin, under the Straits of Mackinac, through Michigan to Sarnia. The 30-inch diameter pipeline splits into two 20-inch diameter lines where it crosses the Straits of Mackinac for 4.5 miles (see Figure 1).

Figure 1. Enbridge Line 5



Source: Enbridge[2]

LEI was engaged to assist in understanding the current and potential future role of Enbridge Line 5 from the perspective of Michigan propane consumers. More specifically, the CS Mott Foundation and NWF wished to understand the degree of reliance on Enbridge Line 5 by Upper Peninsula consumers for the supply of propane and if there are alternative viable options; and understand the potential impact on Lower Peninsula consumers.

[1] Enbridge. "The Straits of Mackinac crossing and Line 5." September 2015. <http://www.enbridge.com/~/media/Enb/Documents/Brochures/Brochure_Line5.pdf>

[2] Enbridge. "About Line 5." Accessed on April 2018. <https://www.enbridge.com/projects-and-infrastructure/public-awareness/line-5-michigan/about-line-5>

In this report, LEI provides an independent view of whether and to what extent Enbridge Line 5 is needed for Michigan propane consumers; and what would be the cost impact on consumers if Enbridge Line 5 into Michigan did not exist.

A report by Dynamic Risk Assessments, Inc ("Dynamic Risk")—funded by Enbridge Energy and overseen by the State of Michigan—also estimated the potential impact on Michigan propane consumers.[3] LEI did not perform a comprehensive critique of the Dynamic Risk report, which covers a wide variety of issues in addition to the impact on propane consumers. However, Dynamic Risk provided specific assumptions about the elements of pipeline, rail, and trucking costs for propane, which LEI compared to publicly-available data and then used to evaluate the impact on the cost per gallon of propane. Dynamic Risk's assumptions and their resulting estimates for the cost of alternatives to Enbridge Line 5 provide useful comparisons to LEI's, and we refer to Dynamic Risk's assumptions and results in this report.

1.2 LEI's approach

To provide a foundation for understanding the cost of alternatives to Enbridge Line 5, LEI began by laying out the facts that describe the Michigan propane market (supply, demand, storage, transportation, and prices) in the context of the relevant broader US propane market (see Section 2). This provides a deeper understanding of the most important issues for propane supply in the Upper Peninsula and the rest of Michigan.

Then LEI analyzed the cost of propane supply, particularly to the Upper Peninsula, with and without Enbridge Line 5 (see Section 3). LEI took a three-step approach to this. First, LEI examined publicly-available data sources for reported prices at propane trading hubs, published pipeline tariffs, and public reports of rail and truck shipment costs. Second, LEI re-produced the cost calculations provided by Dynamic Risk[4] to understand to what degree Dynamic Risk's cost results (in dollars per gallon of propane) depended on their assumptions about key elements of cost. Third, LEI substituted publicly-available data for key cost elements, and applied the Dynamic Risk methodology, to arrive at new estimates of the additional cost per gallon to propane consumers if Enbridge Line 5 did not exist. LEI also examined several alternatives not considered by Dynamic Risk.

[3] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." October 26, 2017. Prepared for the State of Michigan. October 26, 2017.

[4] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." October 26, 2017. Prepared for the State of Michigan. October 26, 2017. Appendix J.

1.3 Key findings and conclusions

LEI's key findings were:

1. There is no shortage of propane in the United States; supply is growing faster than demand;
2. The least expensive alternative supply options are pipeline transportation to Superior, WI combined with either trucking from Superior to Rapid River or rail from Superior to Rapid River. The cost of these two options could be nearly identical. They could add an estimated $0.11 per gallon to the cost of propane supply in the Upper Peninsula (see Figure 2). An econometric analysis of propane demand in Michigan shows that this cost increase would translate into a $0.05 per gallon increase in consumer propane prices in the Upper Peninsula;
3. Although more expensive options are available, as shown in Figure 2, it would not make sense to assume that these would be chosen instead of the least expensive option, except under emergency conditions. Even if rail or trucking from Kincheloe to Rapid River was free, the total cost of using the Kincheloe route would be higher than the route from Edmonton through Superior;
4. In the Lower Peninsula, the impact on the cost of propane may be negligible; and
5. A price increases of $0.05 per gallon is small compared with the usual volatility of weekly propane prices. Michigan prices swung from $0.86 per gallon to $3.50 per gallon over the past few years. The small price increase from using alternatives to Enbridge Line 5 would be lost in the noise of typical price volatility.

Figure 2. Estimated weighted average annual cost of propane supply to Rapid River (all costs in $ per gallon)

Market hub	Edmonton, Alberta				Conway, KS
Hub price, 2017	$0.53	$0.53	$0.53	$0.53	$0.72
Mode of transportation	Pipeline	Pipeline	Pipeline	Rail	Rail
Cost of transportation	$0.078	$0.064	$0.064	$0.27	$0.15
Terminal		Superior, WI	Superior, WI	Kincheloe, MI	Owen, WI
Mode of transportation		Rail	Truck	Truck	Truck
Cost of transportation		$0.126	$0.124	$0.08	$0.11
	Rapid River Terminal (total cost, $/gallon)				
Total cost	$0.61	$0.720	$0.718	$0.88	$0.99
Difference		$0.11	$0.11	$0.27	$0.38

1.4 Roadmap to this report

This report begins by describing the propane market in Michigan, neighboring states, and the United States, trends in propane consumption, sources of supply, use of storage, transportation modes, and wholesale and retail prices; these are presented in Section 2 of this report. In Section 3, LEI examines the cost of propane supply and delivery to the Upper Peninsula, and Lower Peninsula, of different supply sources and transportation routes. In Section 4, LEI uses econometric analysis to estimate the impact of higher supply costs on residential consumer prices. LEI's conclusions and implications are in Section 5. Details of LEI's econometric analysis can be found in Appendix A (Section 6).

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2 Understanding the Michigan propane market

2.1 What is propane?

Propane is a hydrocarbon classified as a liquefied petroleum gas ("LPG"); LPGs in turn are a subset of natural gas liquids ("NGLs"). Propane is one of the NGLs that come to the surface during field production of natural gas. The produced natural gas (methane and NGLs) is sent to a gas processing plant near the point of field production, which separates the NGLs from the methane to produce pipeline-quality natural gas (mostly methane, sometimes with a small amount of ethane) in a gaseous state. The leftover NGLs can then be transported or stored in their liquid state. For propane, a second stage of processing, called fractionation, separates the propane from the other NGLs. Unlike natural gas processing, which occurs near the point of field production, fractionation often occurs closer to markets, after the NGL stream has been shipped to market hubs.

Propane produced from natural gas drilling therefore requires two stages of processing: 1) natural gas plant processing, to separate NGLs from methane, and 2) fractionation, to separate the propane from the other NGLs. Companies involved in this process often combine fractionation and transportation into a single service for wholesale buyers of propane. Such companies also usually also operate natural gas processing plants in the field. Propane can also be extracted from refinery gas streams during the crude oil refining process.

Propane is used for space and water heating, cooking, crop drying, as fuel for vehicle engines, and for refinery operations.

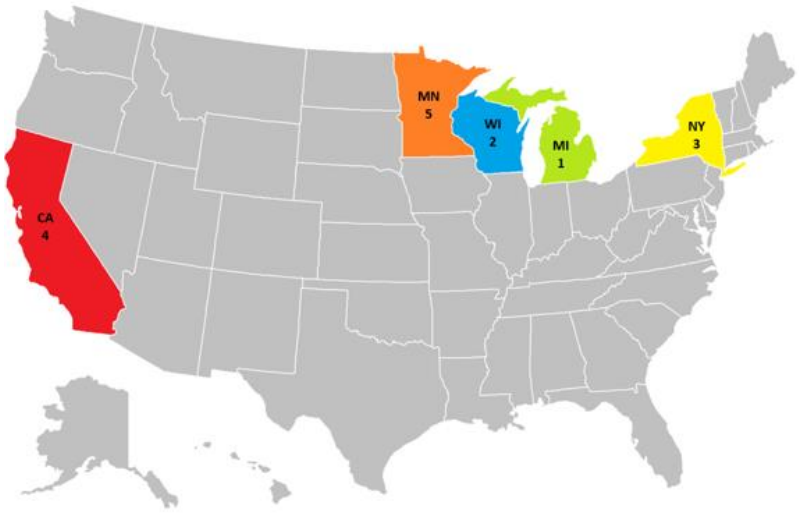
2.2 Propane demand in Michigan

The Michigan residential sector has the highest consumption of propane of any residential sector in the United States, according to the Energy Information Administration ("EIA") (see Figure 3).[5] EIA reports that Michigan residential propane demand ranged from 0.83 million gallons per day to 1.02 million gallons per day (303 million gallons per year to 372 million gallons per year) for 2013-2017.[6]

[5] US-wide, five percent of households use propane for heating, while in Michigan it is estimated to be around eight percent. Sources: Michigan Agency for Energy. "Michigan Energy Appraisal. Winter Outlook 2017/18." November 2017. <http://www.michigan.gov/documents/energy/ea-winter17_606208_7.pdf>; EIA. Michigan State Energy Profile. May 18, 2017. <https://www.eia.gov/state/print.php?sid=MI#42>

[6] EIA. "Prime Supplier Sales Volumes of Propane (Consumer Grade)." April 2, 2018.

Figure 3. Top five states for residential sector propane consumption, 2015



Source: EIA[7]

The State of Michigan estimates propane is used as a primary heating fuel in about 320,000 households in the state.[8] This translates into annual average consumption per household of 1,037 gallons per year if residential consumption of 0.91 million gallons per day (the 2013-2017 state-wide average, per EIA) is divided by the 320,000 households. Other sources of information are consistent with this; one source notes that a typical Michigan household using propane consumes 500-1,200 gallons per year.[9]

2.2.1 Propane demand in Michigan has been falling

Consumption of propane in Michigan has generally been falling since the 1980s (see Figure 4). Propane use for heating in Michigan is being displaced by electricity, which is estimated to have increased by almost 30 percent from 2009 to 2016.[10] Gas used for heating remained stable during this time.

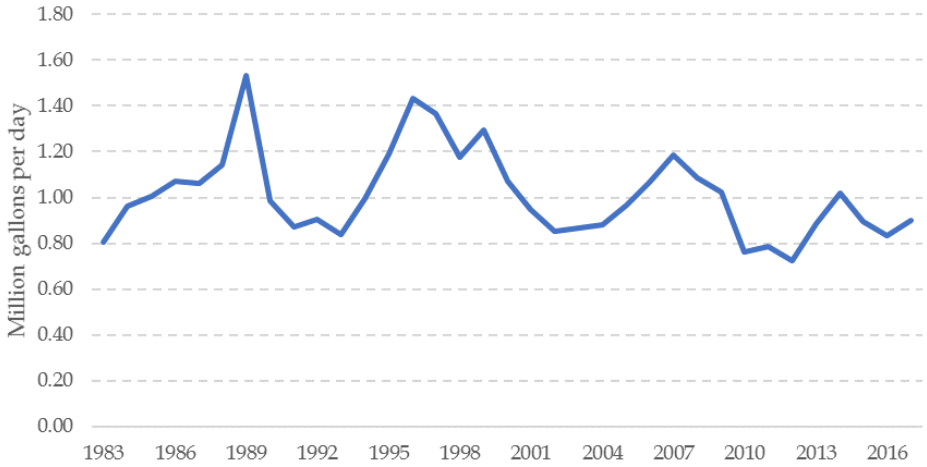
[7] EIA. "Top five residential sector propane consuming states." 2015. <https://www.eia.gov/energyexplained/images/charts/propane_consuming_states_map-large.gif>

[8] Michigan Agency for Energy. "Propane in MI." Accessed on April 9, 2018. <http://www.michigan.gov/energy/0,4580,7-230-73789_83112_83114---,00.html>

[9] Crumm, Charles. "Lower utility prices and a milder winter in the forecast." Macomb Daily. November 27, 2015. <http://www.macombdaily.com/article/MD/20151127/NEWS/151129620>

[10] US Census Bureau. "2011-2015 American Community Survey 5-Year Estimates." Accessed on April 18, 2018.

Figure 4. Annual propane consumption in Michigan



Source: EIA Propane Prime Supplier Sales Volumes[11]

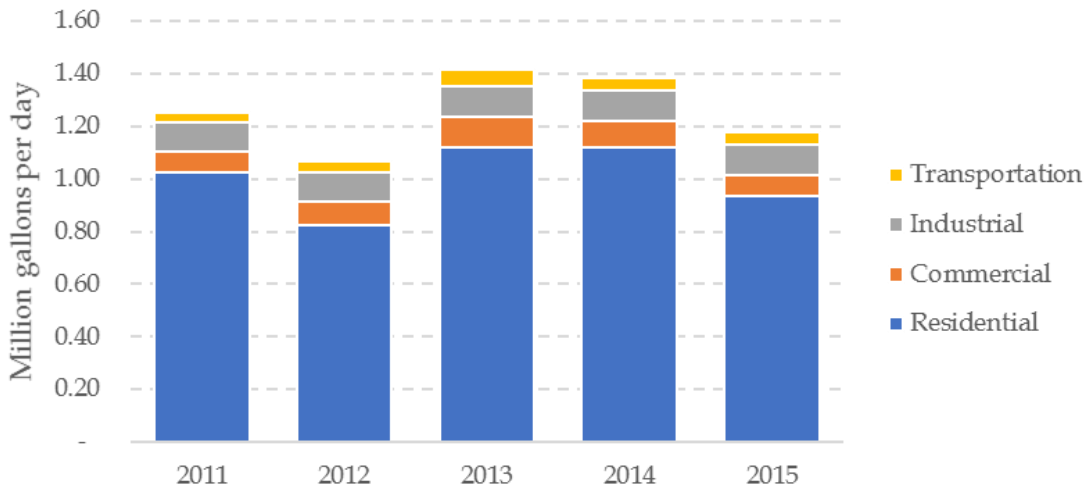
2.2.2 The residential sector consumes much of the propane used in Michigan

The EIA reports that in Michigan, the residential sector consumes about 80 percent of all the LPGs (propane, ethane, and olefins) used in the state (see Figure 5). EIA does not provide a sectoral breakout for propane specifically; but, as mentioned above, EIA reports state-wide average 2013-2017 propane consumption to be 0.91 million gallons per day. Comparing to the 1.2 million gallons per day for LPGs in 2015 in Figure 5 implies that propane makes up about 75 percent of LPGs used in Michigan. The residential sector does not have much direct use for ethane or olefins, so it is safe to assume that the residential consumption shown in Figure 5 is all propane.[12]

[11] EIA. "Michigan Propane All Sales/Deliveries by Prime Supplier." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=C900020261&f=M>

[12] EIA. "Hydrocarbon gas liquids explained." <https://www.eia.gov/energyexplained/index.php?page=hgls_uses>

Figure 5. Total LPG consumption by sector in Michigan



Source: EIA State Energy Data System (SEDS). June 30, 2017

2.2.3 Upper Peninsula propane consumption

Unlike Michigan state-level consumption data which is provided by the EIA, there are no official figures for annual consumption of propane in the Upper Peninsula versus Lower Peninsula.

- The Michigan Propane Gas Association reported that 460 million gallons of propane was consumed in Michigan in 2015, of which 430 million gallons was in the Lower Peninsula.[13] This leaves 30 million gallons (about 6.5 percent of the Michigan total) consumed in the Upper Peninsula.[14] These estimates include all sectors, not just the residential sector.

- The US Census Bureau estimates that in the 15 counties in the Upper Peninsula, 22,050 households used bottled, tank, or LP gas ("LPG") as the primary source of heating fuel in 2016.[15] If the typical Michigan household consumes 500-1,200 gallons per year, as

[13] Note that the Michigan Propane Gas Association's estimate of propane consumption in Michigan in 2015 is higher than EIA's estimate.

[14] MPGA. "Comments on the Alternatives Analysis for the Straits Pipeline." August 4, 2017.

[15] https://www.census.gov/hhes/www/housing/census/historic/fuels.html

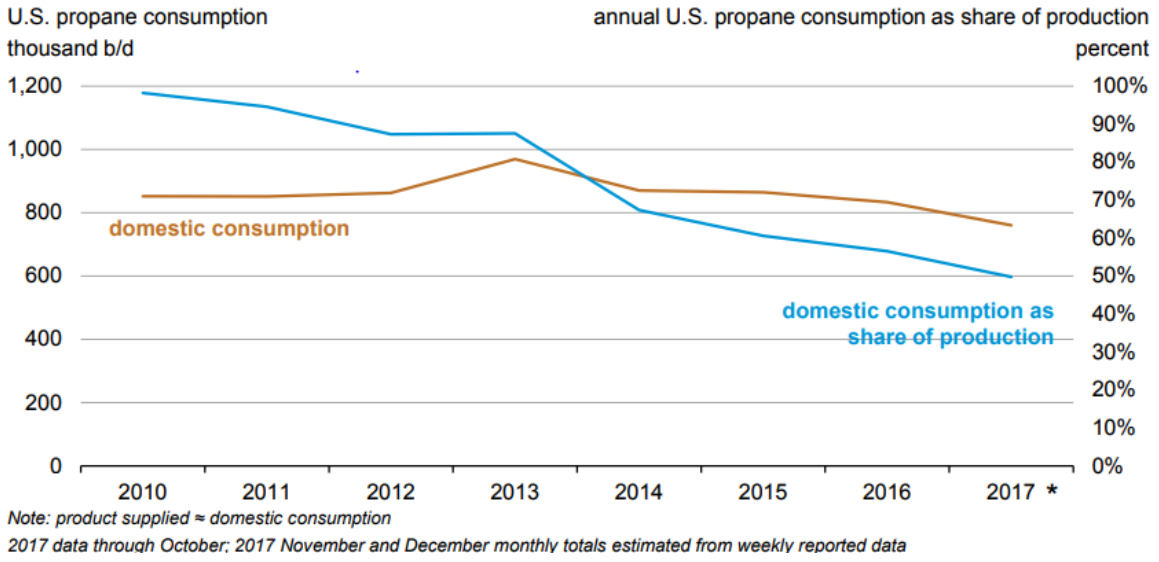
noted above[16] then the 22,050-household residential sector consumes 11 million to 26.5 million gallons per year.

The estimates all indicate that Upper Peninsula propane consumption is small compared with Michigan over all.

2.2.4 Propane demand in the United States is flat to declining

Falling propane consumption is not unique to Michigan. Consumption of propane in the United States was lower in 2017 than in 2010 (see Figure 6). At the same time, US production (to be discussed in more detail in Section 2.3) has been on the rise, resulting in US domestic demand accounting for a smaller share of US production.

Figure 6. EIA's US propane consumption, and consumption as share of production



Source: EIA[17]

2.2.5 US propane demand is seasonal

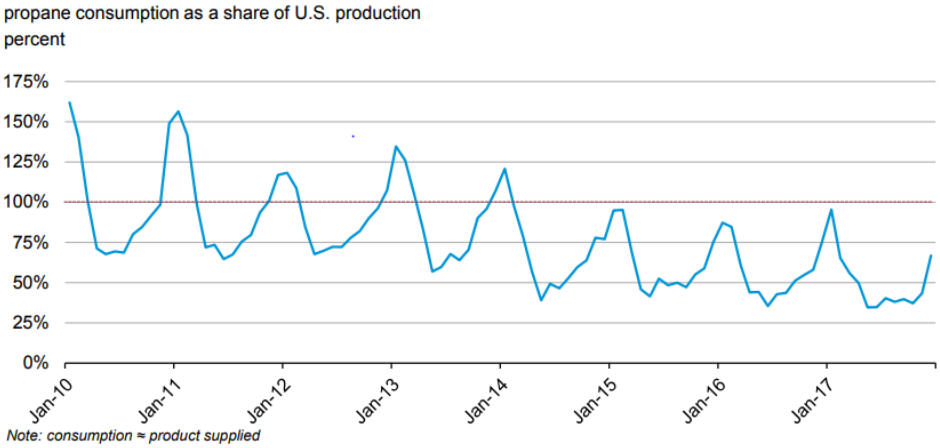
Propane is consumed seasonally, because much of it is used for home heating. Propane is produced year-round as that is the most efficient way to produce it, therefore seasonal storage has played an important role in meeting wintertime demand. US wintertime demand of 61

[16] Crumm, Charles. "Lower utility prices and a milder winter in the forecast." Macomb Daily. November 27, 2015. <http://www.macombdaily.com/article/MD/20151127/NEWS/151129620>

[17] EIA. "EIA's propane market indicators and measures of supply adequacy." January 10, 2018. <https://www.eia.gov/pressroom/events/pdf/Propane_01102018.pdf> Note: EIA uses "product supplied" as a proxy for propane consumption. Product supplied = production + imports – stock change – exports.

million gallons per day (the weekly average during the months of December 2016, and January and February 2017) was somewhat lower than total US production of 75 million gallons per day on average in 2017.[18]

Figure 7. United States seasonal propane demand as share of US production



Source: EIA[19]

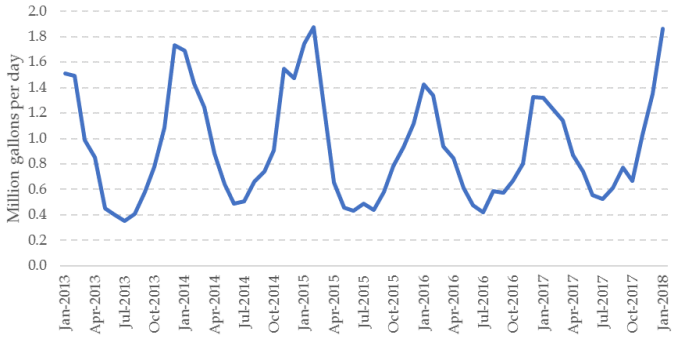
2.2.6 Michigan propane demand is also seasonal

In Michigan as in the United States more broadly, propane demand is much higher in the winter than in the summer (see Figure 8). The colder-than-normal winters of 2013/14 and 2014/15 are evident in the spikes in demand during those winters, compared winter 2015/16 and 2016/17.

[18] EIA. "Weekly U.S. Refiner Blender and Gas Plant Net Production of Propane and Propylene." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WPRTP_NUS_2&f=W>; and EIA. "Weekly U.S. Product Supplied of Propane and Propylene." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WPRUP_NUS_2&f=W>

[19] EIA. "EIA's propane market indicators and measures of supply adequacy." January 10, 2018. <https://www.eia.gov/pressroom/events/pdf/Propane_01102018.pdf> Note: EIA uses "product supplied" as a proxy for propane consumption. Product supplied = production + imports – stock change – exports.

Figure 8. Michigan seasonal propane demand

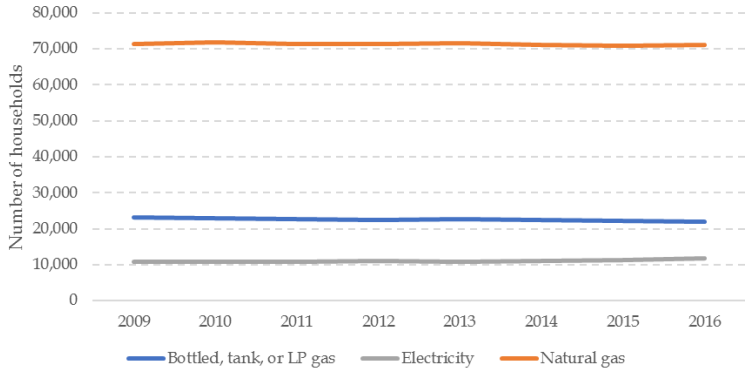


Source: EIA Propane Prime Supplier Sales Volumes[20]

2.2.7 Number of Upper Peninsula households using propane is unlikely to increase

The number of Upper Peninsula households using LP gas (including propane) has not changed in many years (see Figure 9). The total number of households in the Upper Peninsula (whether or not they are users of propane) decreased by one percent from 2010 to 2016, according to the US Census Bureau.[21] LEI believes the number of households in the Upper Peninsula which use propane is unlikely to rise in the future.

Figure 9. Number of Upper Peninsula homes heated with propane and other fuels



Source: US Census Bureau "2012-2016 American Community Survey 5-Year Estimates - House Heating Fuel."

[20] EIA. "Michigan Propane All Sales/Deliveries by Prime Supplier." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=C900020261&f=M>

[21] US Census Bureau. U.S. Census Bureau. "2012-2016 American Community Survey 5-Year Estimates - House Heating Fuel."

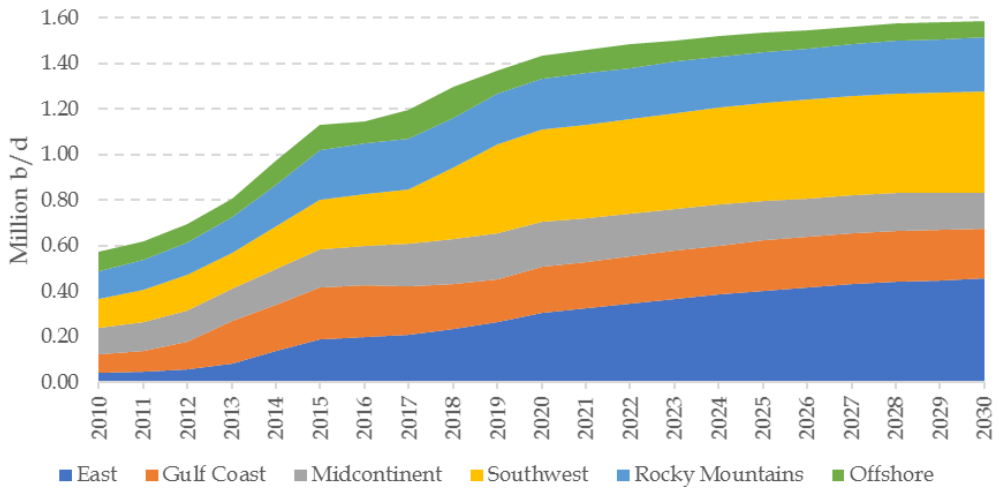
2.3 Sources of propane supply

The United States and Canada have both seen substantial growth in oil and gas production, driven by prolific and cost-effective shale oil and gas plays (and, in Canada, the oil sands). This is boosting production of NGLs, including propane.

2.3.1 United States propane production is rising

Annual propane production in the United States is increasing and reached a record 1.2 million barrels per day in 2017 (see Figure 10). EIA forecasts a 9 percent increase in propane production in 2018, and projects long-term growth at a slower pace, with production rising to 1.6 million barrels per day in 2030.[22]

Figure 10. Outlook for US propane production from natural gas processing



Source: EIA NGPL production[23]
Note: Michigan is included in the East region

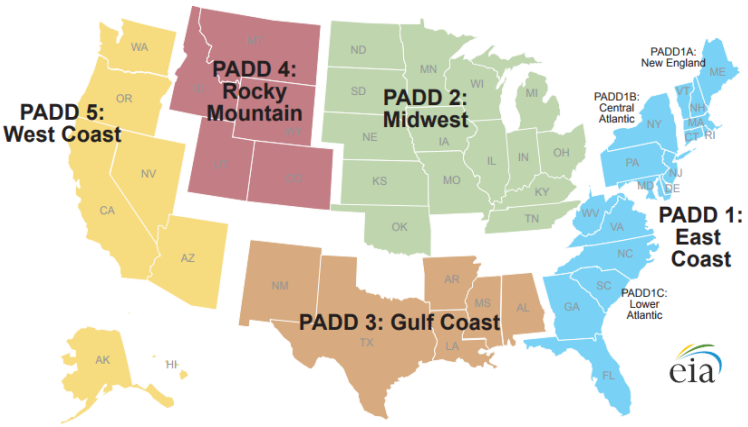
2.3.2 Propane supply from states near Michigan is set to increase

Michigan is part of the US refined product Petroleum Administration for Defense District ("PADD") 2 (see Figure 11). PADDs are an administrative concept, developed by the federal government during World War II to help manage fuel rationing. Thus, PADDs do not represent physical boundaries between markets. However, PADDs are useful to help keep track of supply, demand and transportation issues and trends for refined products and other petroleum liquids, including propane.

[22] EIA. "Natural Gas Weekly Update for week ending February 28, 2018." March 1, 2018. <https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2018/03_01/>

[23] Ibid.

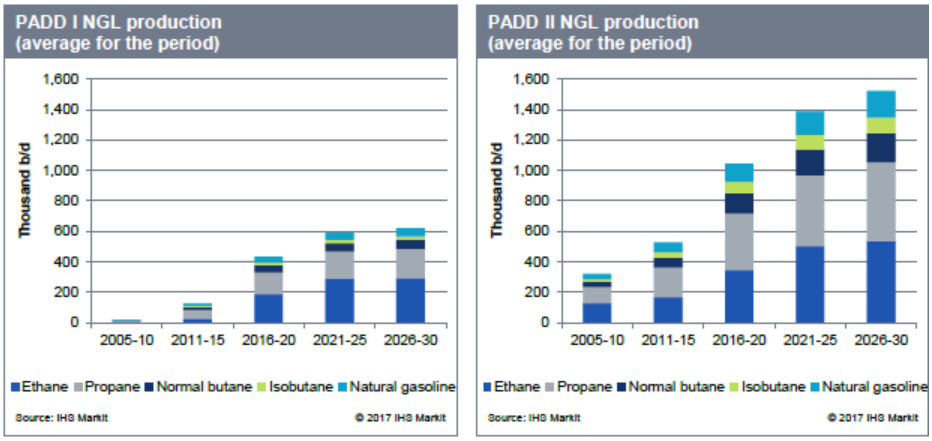
Figure 11. United States Petroleum Administration for Defense Districts (PADD)



Source: EIA

NGL production in PADD 1 and PADD 2 has been increasing strongly and EIA expects it to keep rising (see Figure 12).[24] PADD 1 includes Pennsylvania, with huge growth in NGLs associated with shale gas production. PADD 2 includes Ohio, also with strong growth in shale gas; Kansas, which is the location of an important storage and trading hub for propane; and North Dakota, which has seen strong growth in tight oil production.

Figure 12. Projections for PADD I and PADD II NGL production from natural gas



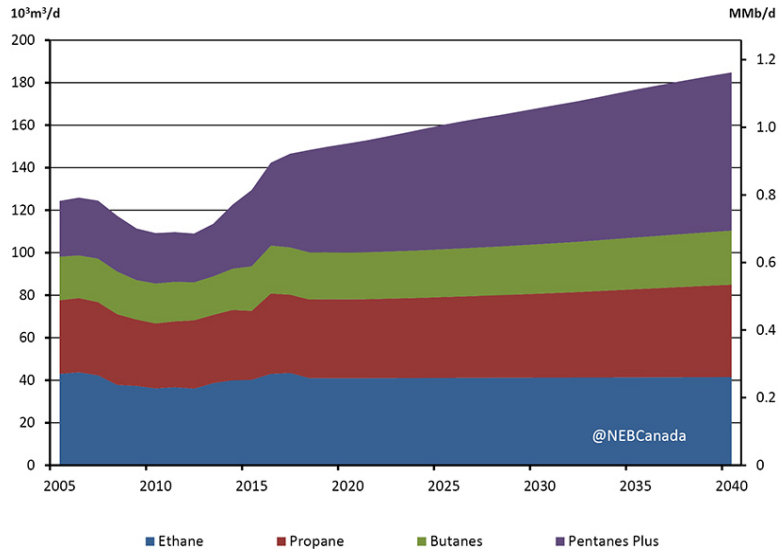
Source: IHS Markit[25]

[24] IHS Markit. "Prospects to Enhance Pennsylvania's Opportunities in Petrochemical Manufacturing." March 2017. <https://teampa.com/wp-content/uploads/2017/03/Prospects_to_Enhance_PAs_Opportunities_in_Petrochemical_Mfng_Report_21March2017.pdf>

[25] Ibid.

Canada's National Energy Board's ("NEB") expects NGL production to increase, though not at the fast rate of supplies expected from the United States. Propane production in Alberta increased in 2017 by 11 percent.[26] The NEB 2017 outlook projects Canadian propane production to increase somewhat in the long term (see Figure 13).

Figure 13. NEB outlook for Canadian NGL production



Source: National Energy Board https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2017/chptr3-eng.html

2.4 Propane transportation

Propane can be transported by various means including pipelines, rail, and trucking. In pipelines, propane sometimes travels with other NGLs, and is separated at a fractionation plant near final end-users. Sometimes it is shipped in dedicated propane pipelines. Propane can also be transported in water-borne vessels, which facilitate exports from the United States to markets overseas.

2.4.1 Pipelines are the option traditionally favored for transporting large volumes

Pipelines are usually the lowest-cost form of transportation for propane and NGLs.[27] For this reason, pipelines are the most widely-used transportation for propane between PADDs within the United States.[28]

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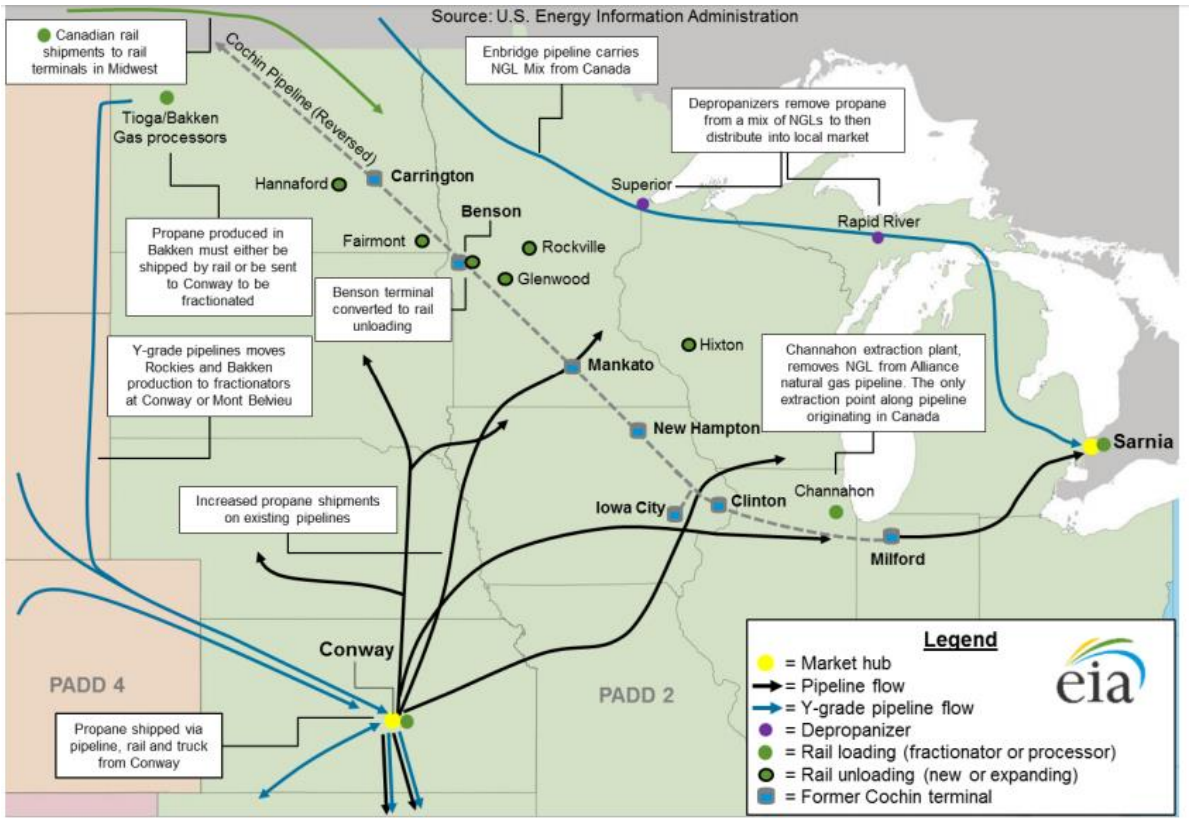
[26] AER. "Propane Supply/Demand." Accessed on April 2018. <https://www.aer.ca/data-and-publications/statistical-reports/propane-supply-demand>

[27] EIA. "Hydrocarbon Gas Liquids (HGL): Recent Market Trends and Issues." November 2014. <https://www.eia.gov/analysis/hgl/pdf/hgl.pdf>

2.4.2 Cochin pipeline taken out of propane service

In April 2014, the 95,000 barrels per day Cochin pipeline, which shipped propane from Alberta to the US Midwest was taken out of service for southbound propane shipments (see Figure 14).[29] That stretch of the pipeline was re-configured to ship light condensate petroleum liquids northbound from Milford, Illinois to Alberta. After the conversion, rail imports of propane from Canada to the Midwest increased from 5,700 barrels per day in 2013 to 28,400 barrels per day in 2017.[30]

Figure 14. Cochin pipeline and related propane transportation infrastructure in 2014



Source: www.eia.gov/petroleum/heatingoilpropane/workshop/2014/pdf/propanesupply.pdf

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[28] EIA Propane Movements by Pipeline, Tanker, Barge and Rail between PAD Districts, and Propane Movements by Pipeline between PAD Districts.

[29] Kinder Morgan. "Cochin Pipeline System." Accessed on April 12, 2018. <https://www.kindermorgan.com/business/products_pipelines/cochin.aspx>

[30] EIA. "Winter 2014-15: Propane Supply & Infrastructure for State Heating Oil and Propane Program (SHOPP) Workshop." October 8, 2014, Washington, DC. <https://www.eia.gov/petroleum/heatingoilpropane/workshop/2014/pdf/propanesupply.pdf

2.4.3 Utopia pipeline could supply additional propane to Michigan

In January 2018, the Utopia project, which could support expanded propane deliveries into Michigan, entered service (see Figure 15). The Utopia project converted the eastern portion of the Cochin pipeline to transport up to 50,000 barrels per day (expandable to 75,000 barrels per day) of ethane and ethane/propane ("E/P") mix from gas processing plants in Ohio to Windsor, ON. It is reported to be flowing ethane only at the current time, with a capacity of 50,000 barrels per day.[31] If it were expanded to 75,000 barrels per day, it could in theory supply additional propane to Michigan. This could expand propane supplies to the Lower Peninsula.

Figure 15. The Utopia pipeline project

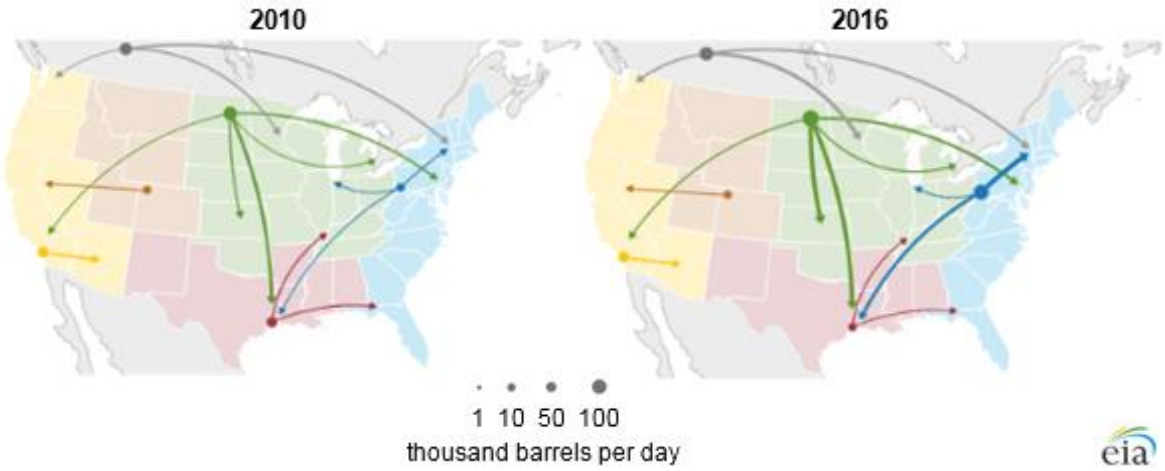
Source: Kinder Morgan. "Utopia Pipeline." https://www.kindermorgan.com/business/products_pipelines/utopia/

2.4.4 Propane by rail to US Gulf Coast for export has increased

Shipments of propane by rail have increased dramatically from the Marcellus area (Pennsylvania and Ohio) and the Bakken region (North Dakota) (see Figure 16). Oil and gas production from these regions has run ahead of the pipeline capacity needed to ship NGLs to market hubs such as Mont Belvieu, Texas and Conway, Kansas. As can be seen in Figure 16, these two hubs are important destinations for propane from the Marcellus and Bakken regions.

[31] Kinder Morgan. "Utopia Pipeline." https://www.kindermorgan.com/business/products_pipelines/utopia/

Figure 16. US and Canadian propane shipments by rail

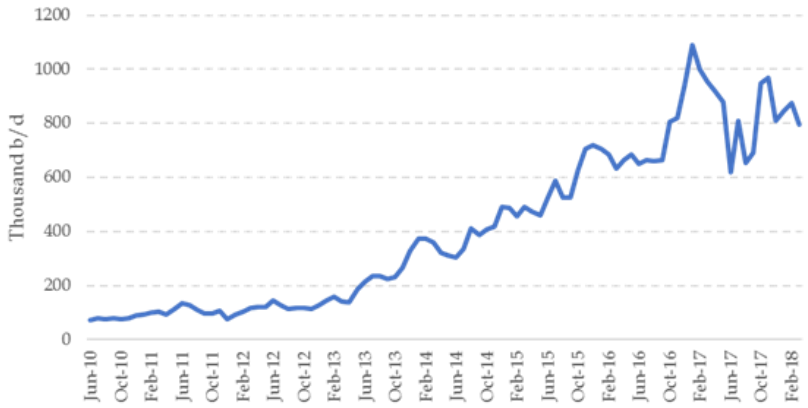


Source: EIA[32]

2.4.5 US exports of propane surged beginning in 2013

With strong growth in supplies and flat-to-declining demand, exports of propane from the United States began growing rapidly in 2013 (see Figure 17). Most of these exports originated from the US Gulf Coast.

Figure 17. US propane exports



Source: EIA[33]

[32] EIA. "New EIA data series track shipments of hydrocarbon gas liquids by rail." February 2, 2017. <https://www.eia.gov/todayinenergy/detail.php?id=29792>

[33] EIA. "4-Week Avg U.S. Exports of Propane and Propylene (Thousand Barrels per Day)." <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=w_epllpz_eex_nus-z00_mbbld&f=4>

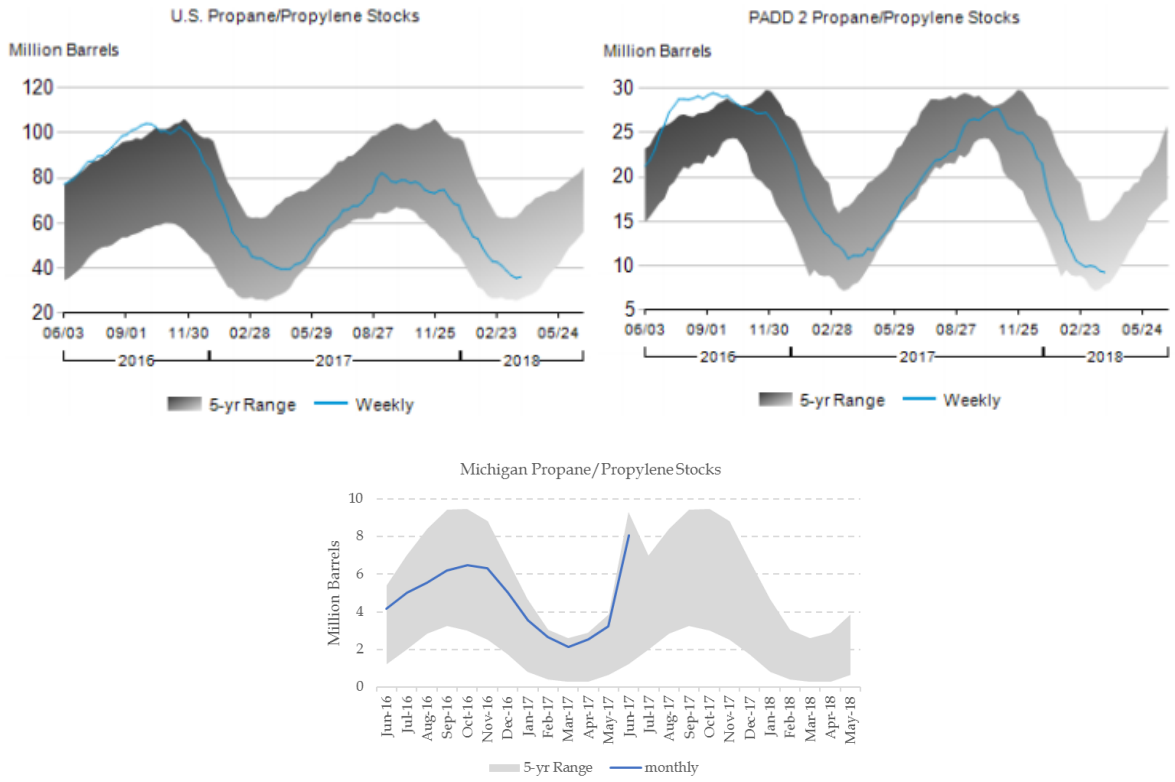
2.5 Propane seasonal storage

As noted previously in Section 2.2.5, propane demand in the United States varies greatly by season. Propane storage facilities are used to match seasonal demand with year-round production.

2.5.1 Michigan propane storage capacity

Michigan has above-ground propane and propylene storage capacity of about 9 million barrels (378 million gallons).[34] Michigan also has large volumes of propane storage capacity in underground rock formations and caverns.[35]

Figure 18. Stocks of propane and propylene in the US, PADD 2, and Michigan



Source: EIA[36] Note: Vertical axes are different scales

[34] EIA Stocks of Propane/Propylene dataset (maximum recorded stock volume)

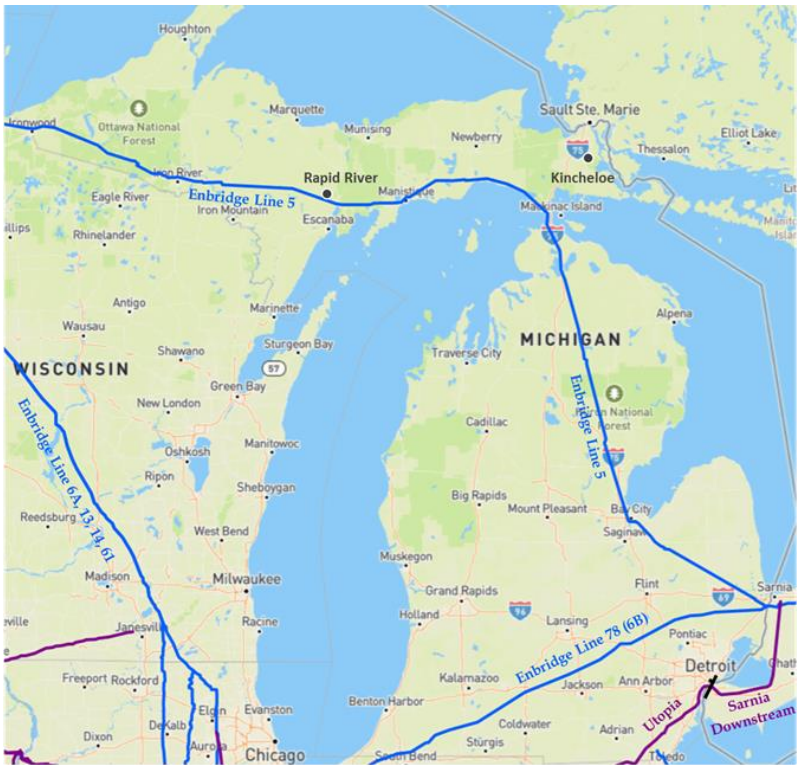
[35] Michigan Agency for Energy. "Propane in MI." Accessed on April 11, 2018. <http://www.michigan.gov/energy/0,4580,7-230-73789_83112_83114-333394--,00.html>

Michigan's capacity accounts for about one-quarter of PADD 2's 32 million barrels (1,344 million gallons) of propane and propylene capacity, which in turn is about 20 percent of total propane and propylene working and net available shell storage capacity in the United States (see Figure 18). Storage capacity at Rapid River is reported by Dynamic Risk to be 1.26 million gallons of NGLs; Michigan Public Service Commission data reports one million gallons.[37]

2.6 Propane transportation into Michigan

Propane is imported into Michigan from outside the state through two pipeline systems: Enbridge Line 5, and the Sarnia Downstream System ("SDS") operated by Plains Midstream Canada (see Figure 19). SDS carries propane from Sarnia, Ontario to the Michigan border near Detroit.

Figure 19. Selected liquids pipelines in Michigan



Source: Bloomberg

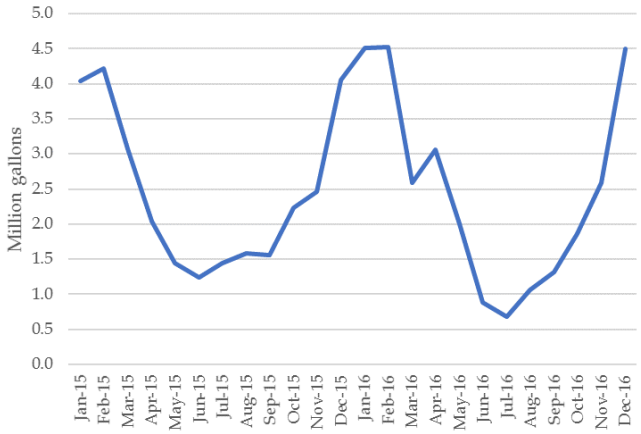
[36] EIA. "Stocks of Propane/Propylene by PAD District, June 2016 to Present." <https://www.eia.gov/petroleum/supply/weekly/pdf/figure6.pdf>

[37] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Prepared for the State of Michigan. October 26, 2017. P. 4-7; and Michigan Public Service Commission "Michigan SHOPP: Energy Data and Security Section." 10-2-2014. LEI converted to gallons at 42 gallons per barrel. https://www.eia.gov/petroleum/heatingoilpropane/workshop/2014/pdf/michigan.pdf

2.6.1 Enbridge Line 5 propane deliveries

Enbridge Line 5 transports about 3.4 million gallons per day of NGLs out of Superior, WI and into Michigan. At Rapid River, MI, about 0.081 million gallons per day (about 29 million gallons per year) are extracted. Much more propane is delivered in the winter than in the summer (see Figure 20).

Figure 20. Propane deliveries to Rapid River, Enbridge Line 5, 2015 and 2016



Source: Dynamic Risk, Appendix C[38]

2.6.2 Propane deliveries from Sarnia nearly match Lower Peninsula demand

After Rapid River, there are no further propane or other NGL withdrawals from Line 5 in Michigan. All the remaining NGLs are transported across the Lower Peninsula and delivered to Sarnia, Ontario for fractionation.[39] According to Enbridge, these deliveries amounted to an average of 3.321 million gallons per day of NGLs in 2015/16.[40] Sarnia also has rail links with

[38] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix C, P. C-3. Prepared for the State of Michigan. October 26, 2017. Dynamic Risk notes on page PR-7 of its Final Report that "Enbridge obtained permission from shippers to release publicly the historical and gross throughput of Line 5 on a monthly an annual basis showing deliveries and withdrawals of oil and NGLs at various points on Line 5.… Portions of the volume data were cleared for release in June 2017 and are provided in Table C-1 of Appendix C."

[39] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." P. PR-7. Prepared for the State of Michigan. October 26, 2017.

[40] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix C. Prepared for the State of Michigan. October 26, 2017. Pp. C-3, C-3.

western Canada which supply NGLs;[41] and the Sarnia region is connected by rail to the US Marcellus natural gas region.

Sarnia's fractionation capacity is reportedly 4.79 million gallons per day with an 84 percent capacity utilization rate, which amounts to throughput of 4.02 million gallons per day.[42] Based on this, the NGL shipments on Enbridge Line 5 in 2015/16 accounted for about 83 percent of the throughput of the fractionation plant at Sarnia.

An average of 1.08 million gallons per day of propane from Sarnia was shipped to the US border at Detroit through the SDS system from 2015-2017.[43] The 1.08 million gallons per day is about 90 percent of the 1.2 million gallons per day average annual consumption of the Lower Peninsula (based on Michigan Propane Gas Association consumption estimates for 2015). If consumption is lower than 1 million gallons per day, as EIA data shows, then SDS provides more than the equivalent of all the propane used in the Lower Peninsula.

2.7 Drivers of wholesale and retail propane prices in Michigan

2.7.1 US propane prices are connected to North American natural gas prices and global oil prices

Propane prices in the Unites States reflect the global price of crude oil, as represented by the price of Brent crude, a widely-used global benchmark price (see Figure 21). As one source explains "depending on market conditions, produced propane may be sold, consumed as fuel (in the refinery) or transformed to other refined products within the refinery."[44] This is one reason that propane's price can rise and fall with the price of crude oil. The price of crude oil in turn is determined by continental as well as global supply and demand events.

Another reason for the connection to Brent crude oil prices is that, with propane supplies growing faster than demand, the United States is exporting increasing volumes of propane. Most exported propane originates from the US Gulf Coast, but the US Northeast has begun exporting NGLs, to provide an outlet for growing Marcellus-area supplies. This expanding connection to the global market means that propane prices in North America can be influenced by global propane prices, which in turn are influenced by global oil prices.

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[41] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix G. Prepared for the State of Michigan. October 26, 2017. P G-10.

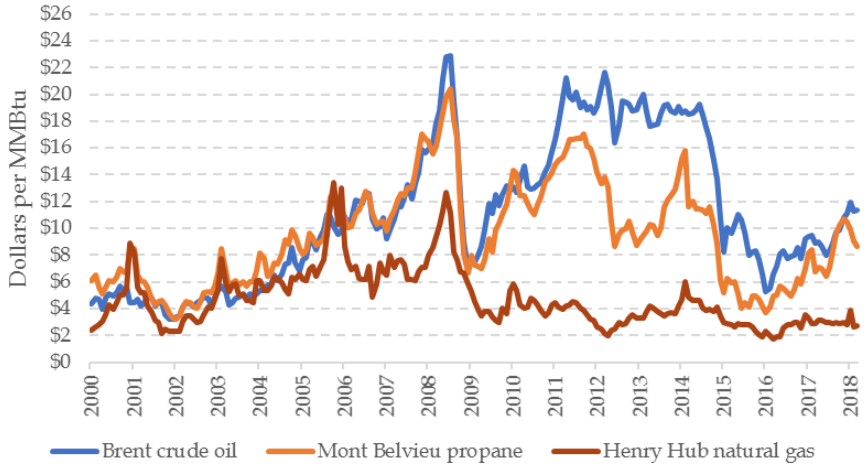
[42] Canadian Energy Research Institute. "Natural Gas Liquids (NGLs) in North America: An Update Part II – Midstream and Downstream Infrastructure." May 2014. P. 12.

[43] Plains Midstream Canada. "Filing of Plains Midstream Canada ULC – Sarnia Downstream System (SDS) Tariff Filing NEB No. 112 – International Join Rate Tariff Land Matters Consultation Initiative (LMCI) Collection Mechanism. May 12, 2017. https://docs2.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90465/92837/813094/813186/3266454/A83570-1_PMC-_SDS_NEB_No._112_%E2%80%93_Tariff_Submission_Letter_-_A5L7G0.pdf?nodeid=3268764&vernum=1

[44] Gas Processing Management Inc. "Canadian Propane Supply and Demand through 2055." January 2018. P. 14.

The cost and supply of natural gas plays an important role in propane prices. The price of natural gas in the United States is determined mostly by supply and demand in the North American continent, rather than global gas supply and demand. With strong growth in natural gas supplies in the United States, continental gas prices declined dramatically after 2008, and the availability of NGLs increased. This reduced the price of NGLs such as propane. Before 2010, propane prices were nearly identical to crude oil prices; but starting in about 2011, a gap has appeared between Brent crude oil prices and United States propane prices, with US propane usually selling at a discount to Brent crude.

Figure 21. Prices of Brent crude oil, Henry Hub gas, and Mont Belvieu propane

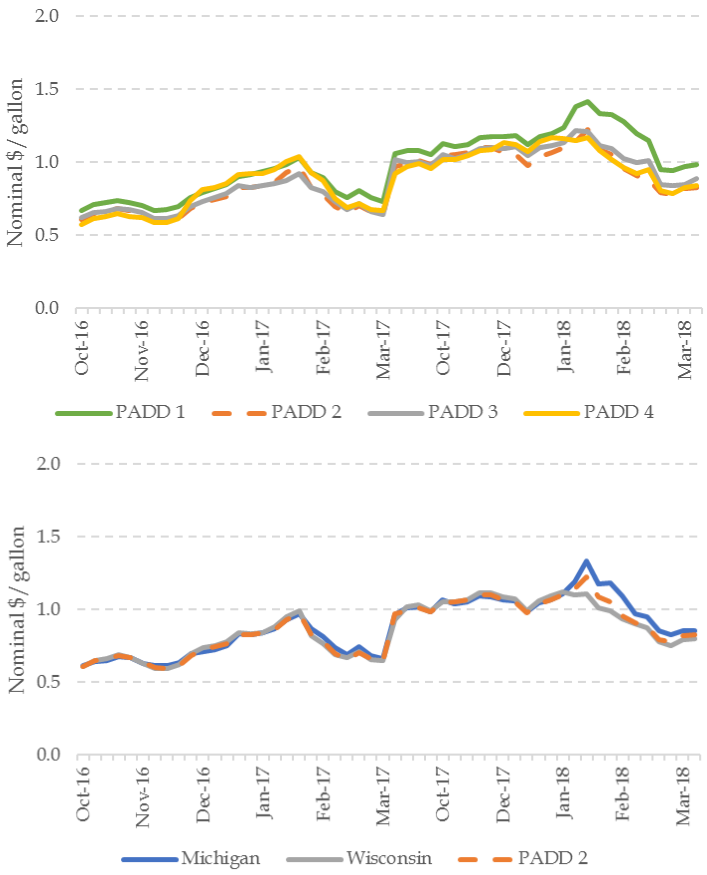


Source: EIA Europe Brent Spot Price FOB, EIA Propane Wholesale/Resale Price, EIA Henry Hub natural gas price

2.7.2 Wholesale prices in Michigan usually track PADD 2 prices closely

The average wholesale price of propane in Michigan usually tracks the PADD 2 price closely (see Figure 22). The average wholesale price of propane in Michigan was about $0.76 per gallon for winter (November-March) 2016/17, and $1.04 per gallon for winter 2017/18.

Figure 22. Wholesale winter propane prices



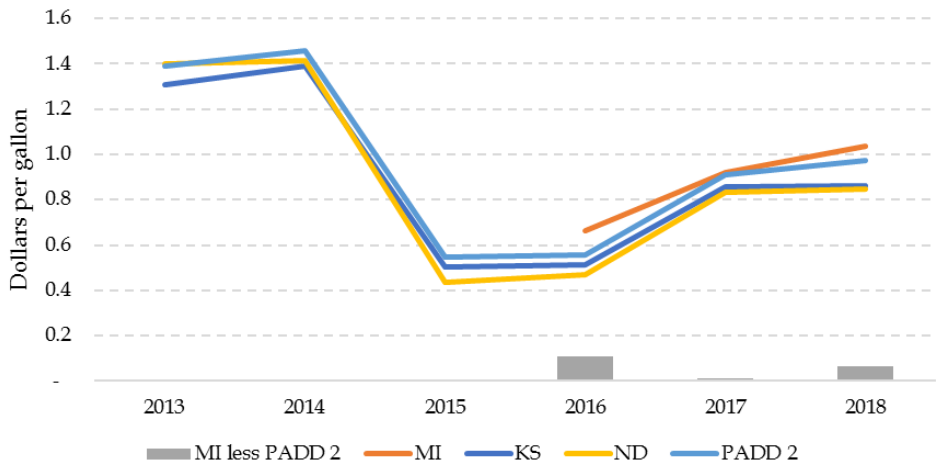
Source: EIA. Wholesale propane excluding taxes, from Weekly Heating Oil and Propane Prices (October - March)

Michigan wholesale prices averaged one percent higher than in Wisconsin in 2017. However, in 2018 Michigan prices were seven percent higher than the PADD 2 average. This may have been related to an unusual January and February 2018 price increase at Sarnia, Ontario.[45]

EIA data, which begins in 2016 for Michigan wholesale prices, shows the wholesale price of propane in Michigan was an average of $0.06 per gallon higher than the PADD 2 average in 2016/18 (see Figure 23). Other PADD 2 locations include Kansas, the location of the Conway propane supply hub; Ohio, home of the prolific Marcellus supply region; and North Dakota, home of the Bakken supply region. These low-wholesale cost areas contribute to slightly lower PADD 2 average wholesale prices compared with Michigan.

[45] Based on the higher spot FOB propane prices from Bloomberg at Sarnia, Ontario, observed in early 2018.

Figure 23. Wholesale propane prices, PADD 2 and selected PADD 2 states



Source: EIA. Wholesale propane excluding taxes, from Weekly Heating Oil and Propane Prices (October - March)

2.7.3 Recent residential propane prices in Michigan were about $2 per gallon

Propane prices to residential consumers in Michigan were about $2 per gallon for the winter of 2017/18, about $1 more than wholesale price (see Figure 24). Part of the total residential price of propane in Michigan is a four-percent sales tax on propane (classified by the State as an "unregulated fuel") used in the residential sector.[46] Propane sales for any other use are charged a six-percent sales tax, with some exemptions.

[46] Michigan Department of Treasury. https://www.michigan.gov/treasury/0,4679,7-121-44402_44415_44416-7217--,00.html

Figure 24. Wholesale and residential winter 2017/18 propane prices

Source: EIA Weekly Heating Oil and Propane Prices (October - March)

3 Cost of propane supply with and without Enbridge Line 5

With strong growth in supply of NGLs in the United States, and with flat to declining demand for propane in Michigan, indeed, in the United States overall, the prospect of persistent propane supply shortages in Michigan is unlikely. Weather-driven or event-driven supply interruptions, such as experienced in 2014 during the Polar Vortex winter, will likely occur on occasion, as they have in the past. But with the prospect of plentiful supplies relative to demand, the main concern with the potential absence of Enbridge Line 5 is the delivered cost of alternative sources of propane.

LEI took a three-step approach to examining the cost of alternative supply sources and transportation routes to the Upper Peninsula.

1. **LEI examined public supply and transportation cost data.** To the extent public data were available, LEI compared them to the cost assumptions that underpinned the analysis conducted by Dynamic Risk. Section 3.1 provides a review of those costs. LEI found that some of Dynamic Risk's assumptions were consistent with publicly-available data, and others were not.

2. **LEI replicated Dynamic Risk's computations.** Using Dynamic Risk's own assumptions and their cost model, LEI replicated Dynamic Risk's calculations of the cost of alternatives to Line 5. This step ensured that we understood Dynamic Risk's methodology and used their model correctly (but does not imply we agree with their assumptions). This is presented in Section 3.2.

3. **LEI tested the reasonableness of Dynamic Risk's results**. LEI used the publicly-available data from Step 1 in the Dynamic Risk model (see Section 3.3) and calculated the results. LEI concluded that Dynamic Risk's pipeline and trucking cost estimates were consistent with public sources of data, but the rail cost estimates were higher than supported by public sources. LEI calculated alternative rail transport costs.

LEI did not perform precisely the same analysis for the impact on Lower Peninsula costs, as the region is less reliant on Enbridge Line 5. However, we provided a qualitative view on the impacts on propane costs in the Lower Peninsula, in Section 3.3.5.

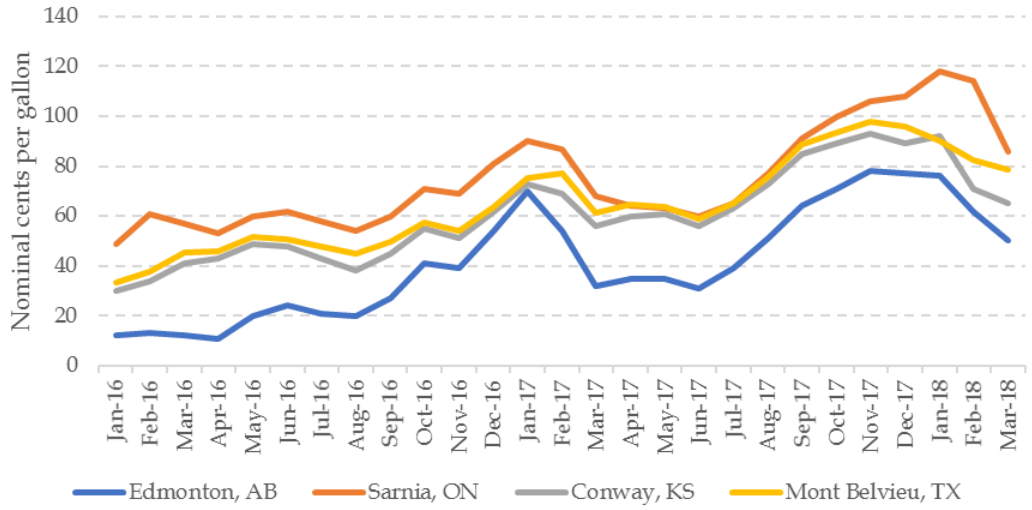
3.1 Step One: LEI examined data from publicly-available sources

LEI examined a broad array of public data sources to collect information on the key determinants of the cost of propane supply in Michigan.

3.1.1 Propane prices at supply hubs

Propane prices are published for hubs where large volumes are traded: at Mont Belvieu in Texas, Conway in Kansas, Sarnia in Ontario, and Edmonton in Alberta. Prices tend to be higher during winter and lower during summer (see Figure 25). Prices at Edmonton are lower than at the other hubs because supplies in Alberta are abundant, demand is much less than supply, the distance to markets is long, and transport capacity to the rest of North American is tight.

Figure 25. North American wholesale propane prices by market hub



Source: Bloomberg (spot FOB prices for Edmonton, Sarnia, and Conway) and EIA (Mont Belvieu, propane spot price FOB)

3.1.2 Transportation cost data

Pipeline tariffs for transportation of propane or NGLs are publicly available. Rail and truck costs have many elements which are not publicly available and are not simple to estimate, but some cost information is available in the public domain. This section covers key elements of pipeline, rail, and trucking costs for propane.

3.1.2.1 Costs by pipeline

Propane contracted for delivery via a pipeline usually pays for transportation costs at a published tariff for a specific route, with a receipt point near where the propane or NGLs are produced, to a delivery point where they are fractionated if needed and stored for distribution.

For transportation to Michigan, the transportation tariff for NGLs (including propane) on Enbridge's system from Edmonton, Alberta to Rapid River, MI, is $20.5562 per cubic meter, or $0.078 per gallon.[47] This is based on Enbridge's 2011 Competitive Tolling Settlement ("CTS") that came into effect in 2011 and expires in June 2021.[48]

[47] International joint rate tariff. "NEB No. 402 FERC No. 45.12.0." Issued July 22, 2016.

[48] NEB. "Canada's Pipeline Transportation System 2016 - Enbridge Pipelines Inc.'s Enbridge Mainline." Accessed on April 12, 2018. <https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprttn/2016/grp1cmpns/lndlqds/nbrdg-ppln-nc-nbrdg-mnln-eng.html?=undefined&wbdisable=true>

From Sarnia to the US border in Michigan (the end of the SDS line) the propane transportation pipeline tariff effective in 2016 was $0.008 per gallon.[49]

3.1.2.2 Elements of rail costs

Railroads offer tariffs in the form of "walk-up" rates which apply to the equivalent of a last-minute transaction. Most shippers do not pay walk-up rates. Instead, they pay discounted rates by providing their own equipment such as tanker cars, and/or committing to shipping large or fixed volumes.

Pressurized tanker cars are an important piece of the kit required to transport propane or other NGLs. The cost to lease such tankers is reported to range from about $100 per car per month to about $500 per car per month in 2017, down from a range of $100-$750 per car per month in 2016 (see Figure 26).

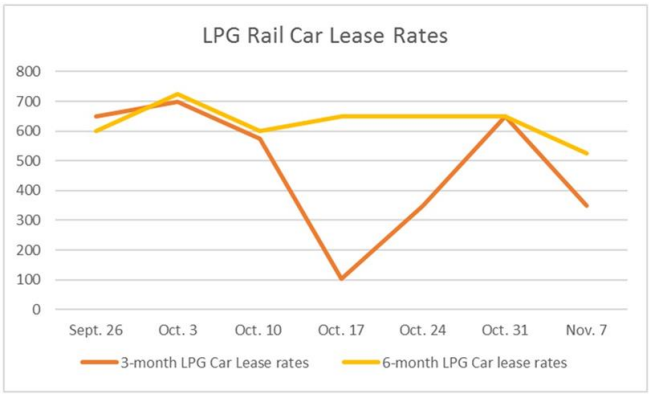
Rail cars may also be used to store propane. A distributor may find it cost-effective to buy propane in the summer when it is cheap and store it in a railcar until the winter. The cost to store a loaded rail car is reported to range from $10-$15 per rail car per day (about $300-$450 per month), while the cost to store an empty car is reported at about $3 per car per day (about $90 per month).[50]

[49] NEB. "Plains Midstream Canada ULC Tariff (via the Sarnia Downstream Pipeline System)." Issued March 01, 2016.

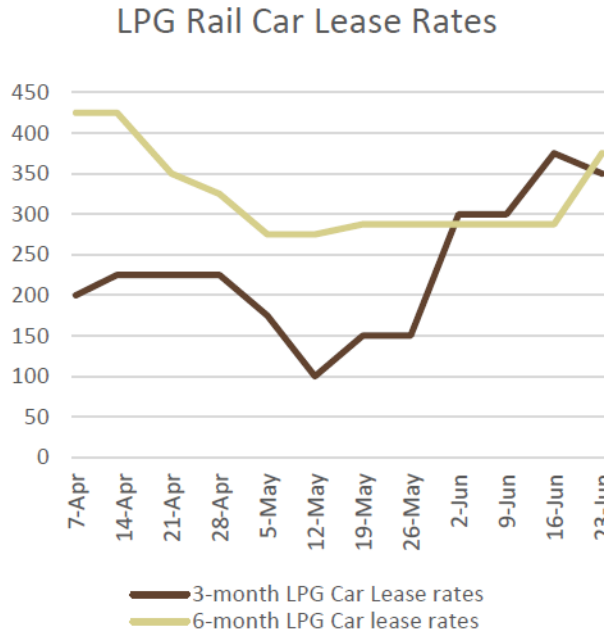
[50] Energy Transport Insider. "Longer-Term LPG Tank Car Lease Rates Up as Urge to Avoid Storage Continues." June 23, 2017. Vol. 2, Issue 25. <https://www.tradepointrail.com/wp-content/uploads/2017/07/Energy_Transport_Insider_June_23_2017.pdf>

Figure 26. LPG railcar lease rates, 2016 and 2017

Lease rates, 2016



Lease rates, 2017



Source: Energy Transport Insider[51]

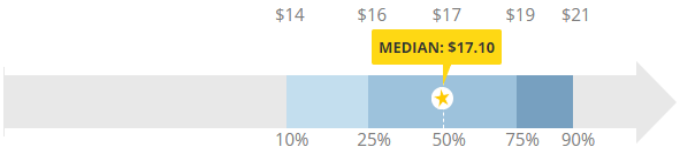
[51] Energy Transport Insider. "LPG Rail Car Lease Rates Fall as Demand Softens; Firms Try to Keep Cars Out of Storage." November 11, 2016. <http://energytransportinsider.com/blog/2016/11/11/lpg-rail-car-lease-rates-fall-as-demand-softens-firms-try-to-keep-cars-out-of-storage/>; and Energy Transport Insider, June 23, 2017. Vol. 2, Issue 25. <https://www.tradepointrail.com/wp-content/uploads/2017/07/Energy_Transport_Insider_June_23_2017.pdf>

3.1.2.3 Elements of propane trucking costs

Two important components of the cost of trucking propane are the driver's salary and the cost of diesel fuel.

Public data for the hourly pay for a propane truck driver is reported to range from about $14 per hour to about $21 per hour not including benefits, bonuses, or commissions (see Figure 27).[52] In comparison, Dynamic Risk assumed an hourly wage rate of $35 per hour, but might have included benefits, bonuses and commissions (they did not specify).

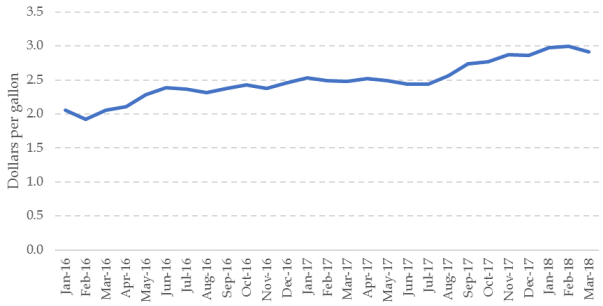
Figure 27. Hourly wage for propane delivery truck driver, not including benefits, bonuses, or commissions



Source: PayScale[53]

Public data for the retail price of diesel fuel in PADD 2 including taxes was $2.00 to just under $3.00 per gallon in 2016/17 (see Figure 28). This compares to the $3.00 per gallon assumed by Dynamic Risk.

Figure 28. PADD 2 retail price of No. 2 diesel, ultra-low sulfur (0-15 ppm), including taxes



Source: EIA[54]

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[52] PayScale. "Propane Delivery Driver Salary." Accessed on April 2018. <https://www.payscale.com/research/US/Job=Propane_Delivery_Driver/Hourly_Rate>

[53] PayScale. "Propane Delivery Driver Salary." Accessed on April 2018. <https://www.payscale.com/research/US/Job=Propane_Delivery_Driver/Hourly_Rate>

[54] EIA. "Midwest No 2 Diesel Ultra Low Sulfur (0-15 ppm) Retail Prices Dollars per Gallon." Accessed on April 2018. <https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMD_EPD2DXL0_PTE_R20_DPG&f=M>

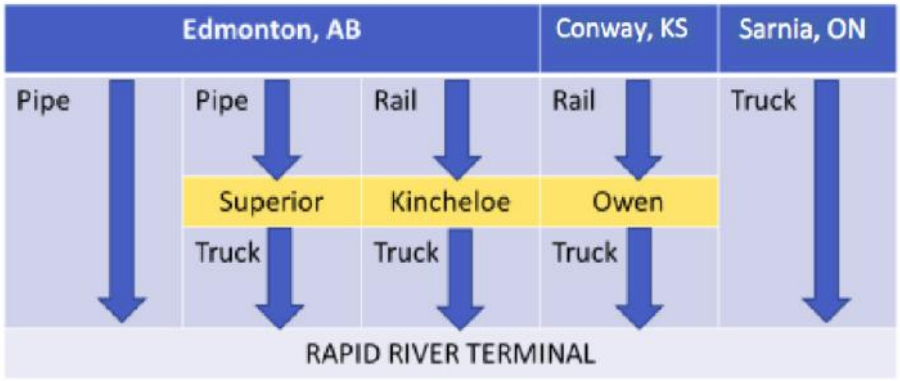
As discussed in more detail in Section 3.3, LEI used this public information to test the reasonableness of Dynamic Risk's cost estimates.

3.2 Step two: LEI replicated Dynamic Risk's propane supply cost results

Dynamic Risk calculated the impact on the cost of propane of several alternatives to Enbridge Line 5. Dynamic Risk concluded that the Upper Peninsula could face cost increases in the range of $0.10-$0.35 per gallon (based on winter months only).[55] LEI replicated this analysis and arrived at a similar low end of the range. However, as LEI discusses in Section 3.3, high-cost options would not be adopted if low-cost options are available, and therefore should not be used to assess impacts on consumers.

To perform their analysis, Dynamic Risk examined several transportation and supply alternatives from three different hubs (see Figure 29).

Figure 29. Dynamic Risk's alternatives to Enbridge Line 5 for Upper Peninsula propane supplies



Source: Dynamic Risk Appendix J[56]

Dynamic Risk relied on extensive and detailed cost assumptions and analysis, which they supplied in Appendix J of their Final Report.[57] LEI will be referring to these assumptions, so we reproduced them for the reader's convenience (see Figure 30 for rail cost assumptions and Figure 31 for trucking cost assumptions).

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[55] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines" Prepared for the State of Michigan. October 26, 2017. P 4-13.

[56] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J, P. J-1. Prepared for the State of Michigan. October 26, 2017.

[57] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J. Prepared for the State of Michigan. October 26, 2017.

Figure 30. Dynamic Risk assumptions for alternative supply of propane – rail cost analysis

General			
Volume of Propane per Railcar	31,500		gal
Terminal Load/Unload Time	24		h
Operating Hours Per Day	24		h/d
Railcar Lease Cost	$3,000		Monthly
Railcar Storage Cost	$1,000		Monthly
Freight Charge	$10.00		$/bbl
Transload Cost	$700		$/Railcar
Incremental Overhead	0.30		Man Years
Incremental Storage	270,000		gal
Capital Cost Storage Tanks (90,000 gal)	$350,000		$/Unit
Capital Cost Transload Equipment	$100,000		$/Unit
Useful Life (Storage Tank/Transloader)	20		Years
Amortization Rate	15%		Per Annum
Cost of Overhead	$80,000		$/Annum
Terminal Specific	**Transit Time (h)**	**Cycle Time (h)**	**Fleet (#)**
Kincheloe, MI	72	192	39
Owen, WI	36	120	25

Source: Dynamic Risk Appendix J[58]

[58] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J, P. J-2. Prepared for the State of Michigan. October 26, 2017.

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Figure 31. Dynamic Risk assumptions for alternative supply of propane - trucking cost analysis

General				
Volume of Propane per Tractor Trailer	10,400		gal	
Terminal Load/Unload Time	1		h	
Operating Hours Per Day	24		h/d	
Truck Fuel Mileage	7.9		mpg	
Driver Wage	$35		$/h	
Diesel Fuel Costs	$3.00		$/gal	
Capital Costs of Tractor Truck	$120,000		$/Unit	
Capital Cost of Propane Trailer	$145,000		$/Unit	
Insurance/License Fees/Permits	$0.09		$/Mile	
Truck/Trailer Repairs	$0.16		$/Mile	
Truck/Trailer Tires	$0.04		$/Mile	
Truck Tractor Life	7		Years	
Propane Trailer Life	15		Years	
Incremental Overhead	0.45		Man Years	
Incremental Storage	270,000		gal	
Incremental Transload Equipment	2		Units	
Capital Cost Storage Tanks (90,000 gal)	$350,000		$/Unit	
Capital Cost Transload Equipment	$100,000		$/Unit	
Useful Life (Storage Tank/Transloader)	20		Years	
Amortization Rate	15%		Per Annum	
Cost of Overhead	$80,000		$/Annum	
Terminal Specific	**Distance mi. (km)**	**Transit Time (h)**	**Cycle Time (h)**	**Fleet (#)**
Kincheloe, MI	150 (241)	3	8	5
Owen, WI	240 (386)	5	12	8
Superior, WI	290 (467)	6	14	9
Sarnia, ON	427 (688)	8	18	12
Lewiston, MI	221 (356)	4	10	21

Source: Dynamic Risk Appendix J[59]

3.2.1 Replicating Dynamic Risk's methodology and assumptions

As mentioned above, the purpose of Step 2 was to ensure LEI performed the cost calculations in the same way that Dynamic Risk did. Once that was established, LEI could then change key assumptions and examine the impact on the bottom line.

3.2.1.1 Replicating pipeline shipping costs

LEI compared the pipeline costs used by Dynamic Risk to the published tariffs for Enbridge Line 5 and SDS. Dynamic Risk's assumptions were consistent with the published tariffs ($0.078

[59] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J, P. J-4. Prepared for the State of Michigan. October 26, 2017.

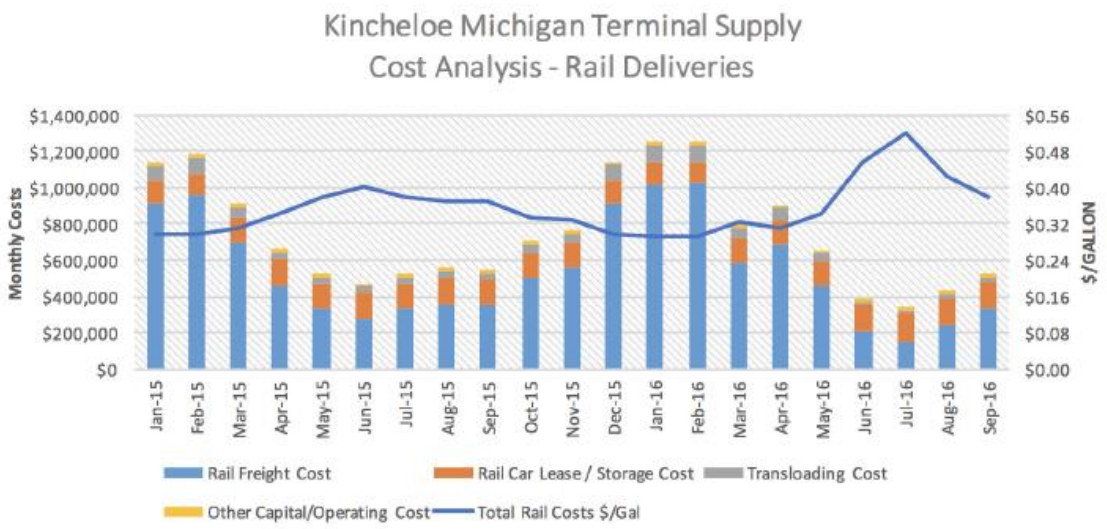
per gallon for Enbridge Line 5 and $0.008 per gallon for SDS). There was therefore no need for LEI to perform further calculations to replicate pipeline shipping costs.

3.2.1.2 Replicating rail shipping costs

For the cost to ship by rail, LEI first examined Dynamic Risk's results for the cost to ship by rail from Edmonton to Kincheloe; these costs include monthly railcar lease and storage costs, monthly freight costs, monthly transloading costs, and other costs. Dynamic Risk did not provide the numerical data for these results, but they did provide a visual representation in the Final Report, as Figure 4-4, page 4-10 and in Appendix J, as Figure J.2.1 (reproduced as Figure 32 below, for the reader's convenience).

Dynamic Risk noted that their estimated transport costs by rail from Edmonton to Kincheloe were in the range of $0.12 to $0.50 per gallon (Final report, Section 4: Alternative 6, page 4-10). However, it is clear from the figure that accompanied the discussion that the range is more like $0.28 to $0.50 per gallon. If their Figure (reproduced as Figure 32 below) is correct, the Dynamic Risk text appears to contain an error.

Figure 32. Dynamic Risk's Edmonton to Kincheloe rail cost estimates



Source: Dynamic Risk Appendix J, Figure J.2.1.[60]

LEI used this visual representation (and the $0.28 to $0.50 range) as a "target" for our replication of the Dynamic Risk analysis.

[60] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Appendix J, P. J-2. Prepared for the State of Michigan. October 26, 2017

LEI replicated these costs by using monthly propane deliveries to Rapid River (from Appendix C, pages C-2 and C-3). LEI cannot confirm the exact level of monthly propane deliveries Dynamic Risk used in its analysis, but we think it is reasonable to assume that their monthly estimate would be close to actual deliveries reported by Enbridge. Dynamic Risk said it reduced these deliveries by five percent to derive propane production volumes from the NGL flow data provided by Enbridge. To match Dynamic Risk's methodology, LEI did the same. LEI then calculated the monthly freight charge by using the $10 per barrel charge used by Dynamic Risk (see Figure 30 above), converting it to dollars per gallon, and multiplying it by the number of gallons of propane delivered.

LEI replicated the railcar lease cost by multiplying Dynamic Risk's monthly costs per car ($3,000, see Figure 30 above) by the number of railcars assumed by Dynamic Risk (39 cars, see Figure 30 above).

To replicate monthly storage costs, LEI first estimated the number of cars that would be in storage each month (Dynamic Risk did not provide this number). In December, January, and February we assumed no cars would be in storage, i.e., we assumed all 39 railcars would be needed for deliveries. For the other months, we scaled down the 39 cars based on the quantity of propane delivered in the month relative to the quantity delivered in December, January, and February. For example, if propane deliveries in April were only half the level of monthly deliveries in December, we assumed that half the railcars would be in storage in April. We then multiplied the number of cars in storage by the $1,000 per car storage cost assumed by Dynamic Risk (see Figure 30).

To replicate monthly transloading costs,[61] LEI multiplied the monthly transloading fee of $700 per car by the number of cars in the fleet which were assumed to be operating in a given month (i.e., 39 less the number of cars assumed to be in storage) and by the number of trips the cars needed to make.

To replicate "Other operating costs," LEI calculated monthly overhead and incremental overhead costs; for incremental overhead costs we assumed a 2,000-hour work year and a labor cost of $30 per hour.

To replicate "Other capital costs," LEI assumed a 20-year asset life for storage tanks and transloading equipment (the same as Dynamic Risk); used the same capital costs as Dynamic Risk; assumed two units of transloading equipment (one for each end of the journey) would be needed, and three storage tanks (to accommodate the assumed 270,000 gallons of storage), and the same 15 percent discount rate that it appears Dynamic Risk used, to arrive at net present value of the capital. LEI assumed deliveries of 30 million gallons per year for 20 years, to arrive at an average annual fixed cost recovery charge of $0.0055 per gallon.

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[61] Transloading refers to transferring cargo from one mode of transportation to another (such as railcar to truck) or transferring cargo from one vehicle to another. Source: UPDS. "How Transloading Works." <https://web.archive.org/web/20160603200116/http://www.upds.com/customers/attachments/transload/transload_works.pdf>

LEI added all the monthly costs and divided by the monthly deliveries to Rapid River. We arrived at an average of $0.32 per gallon to ship by rail from Kincheloe to Rapid River for the time period covered by the Dynamic Risk analysis (see Figure 33 and Figure 34, which is a visual representation of the data in Figure 33). This is very close to Dynamic Risk's $0.31 per gallon estimate of the incremental rail cost for the same route.[62]

Figure 33. LEI's replication of Dynamic Risk's costs for rail shipping from Edmonton to Kincheloe (numerical data)

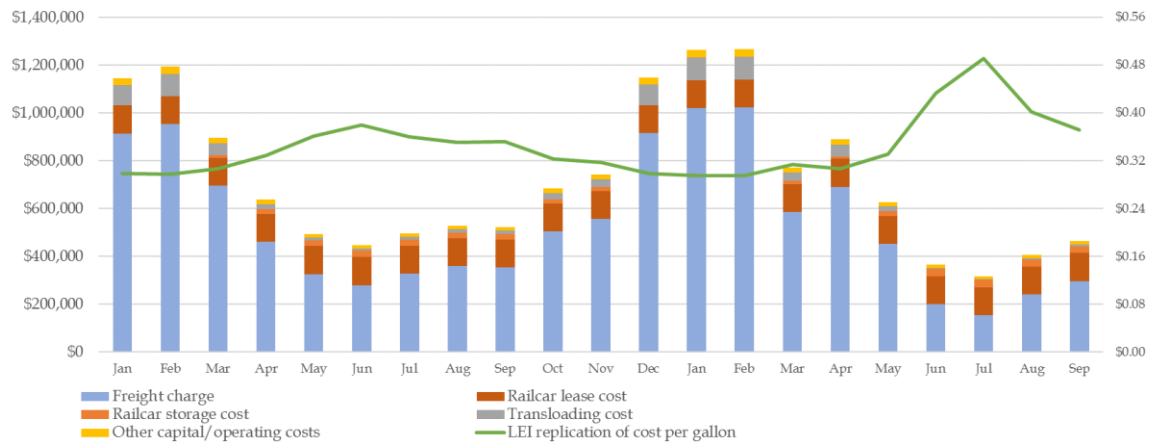
Year	Month	Propane deliveries to Rapid River (gallons)*	Freight charge	Number of rail cars in fleet	Railcar lease cost	Railcar storage cost	Transloading cost	Overhead plus incremental overhead cost	Fixed capital recovery	LEI replication of cost per gallon
2015	Jan	3,843,224	$915,053	39.0	$ 117,000	$0	$ 85,405	$ 8,167	$ 21,138	$0.30
2015	Feb	4,005,346	$953,654	39.0	$ 117,000	$0	$ 92,762	$ 8,167	$ 22,029	$0.30
2015	Mar	2,925,207	$696,478	39.0	$ 117,000	$9,316	$ 49,477	$ 8,167	$ 16,089	$0.31
2015	Apr	1,934,913	$460,694	39.0	$ 117,000	$19,365	$ 21,648	$ 8,167	$ 10,642	$0.33
2015	May	1,369,246	$326,011	39.0	$ 117,000	$25,105	$ 10,841	$ 8,167	$ 7,531	$0.36
2015	Jun	1,174,500	$279,643	39.0	$ 117,000	$27,081	$ 7,976	$ 8,167	$ 6,460	$0.38
2015	Jul	1,377,026	$327,863	39.0	$ 117,000	$25,026	$ 10,964	$ 8,167	$ 7,574	$0.36
2015	Aug	1,509,282	$359,353	39.0	$ 117,000	$23,684	$ 13,171	$ 8,167	$ 8,301	$0.35
2015	Sep	1,483,182	$353,139	39.0	$ 117,000	$23,949	$ 12,720	$ 8,167	$ 8,158	$0.35
2015	Oct	2,116,107	$503,835	39.0	$ 117,000	$17,526	$ 25,892	$ 8,167	$ 11,639	$0.32
2015	Nov	2,341,471	$557,493	39.0	$ 117,000	$15,239	$ 31,701	$ 8,167	$ 12,878	$0.32
2015	Dec	3,851,004	$916,906	39.0	$ 117,000	$0	$ 85,751	$ 8,167	$ 21,181	$0.30
2016	Jan	4,286,673	$1,020,637	39.0	$ 117,000	$0	$ 95,259	$ 8,167	$ 23,577	$0.30
2016	Feb	4,300,476	$1,023,923	39.0	$ 117,000	$0	$ 95,566	$ 8,167	$ 23,653	$0.29
2016	Mar	2,458,419	$585,338	39.0	$ 117,000	$14,053	$ 34,946	$ 8,167	$ 13,521	$0.31
2016	Apr	2,906,134	$691,937	39.0	$ 117,000	$9,509	$ 48,834	$ 8,167	$ 15,984	$0.31
2016	May	1,898,273	$451,970	39.0	$ 117,000	$19,737	$ 20,836	$ 8,167	$ 10,441	$0.33
2016	Jun	843,231	$200,769	39.0	$ 117,000	$30,443	$ 4,111	$ 8,167	$ 4,638	$0.43
2016	Jul	645,724	$153,744	39.0	$ 117,000	$32,447	$ 2,411	$ 8,167	$ 3,551	$0.49
2016	Aug	1,011,375	$240,804	39.0	$ 117,000	$28,737	$ 5,914	$ 8,167	$ 5,563	$0.40
2016	Sep	1,249,788	$297,569	39.0	$ 117,000	$26,317	$ 9,032	$ 8,167	$ 6,874	$0.37
Weighted average										**$0.32**

*Deliveries reduced by 5 percent per month to be consistent with Dynamic Risk's calculations.

As can be seen in Figure 34 in comparison to Figure 32, LEI's total monthly freight charges were nearly identical to Dynamic Risk's, which indicates LEI replicated Dynamic Risk's approach for that cost component almost perfectly. LEI's estimates of monthly storage and transloading costs appear to be slightly different from Dynamic Risk's, which probably reflects slightly different assumptions for the number of cars in service versus in storage in a given month.

[62]Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." Prepared for the State of Michigan. October 26, 2017. P. 4-13.

Figure 34. LEI's replication of Dynamic Risk's cost for rail shipping from Edmonton to Kincheloe



LEI's replication of Dynamic Risk's results does not imply that LEI agrees with Dynamic Risk's assumptions. It simply confirmed that LEI understood Dynamic Risk's approach and used Dynamic Risk's assumptions correctly.

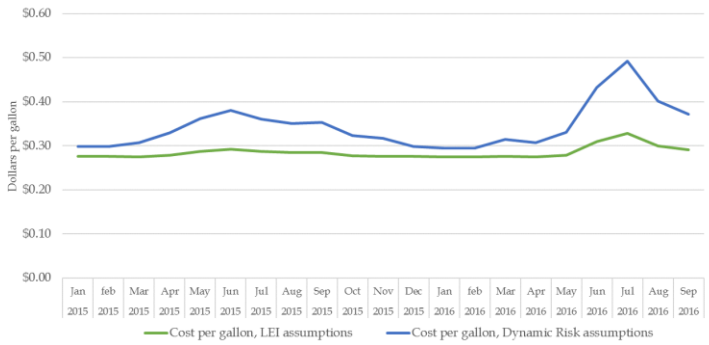
3.3 Step three: LEI calculated propane transportation costs using public data

For the final step, LEI substituted public data into the Dynamic Risk models, and calculated the results.

For the rail analysis, LEI's research of public sources discussed in Section 3.1 above indicated that LPG tanker car lease costs were considerably less than $3,000 per car per month assumed by Dynamic Risk. Costs for 2016-2017 ranged from $100-$750 per car per month, depending on supply and demand conditions and length of lease (see Figure 26 previously). Railcar storage costs (for empty cars) was reported at $90 per car per month; storage of loaded cars was reported at $300-$450 per car per month.

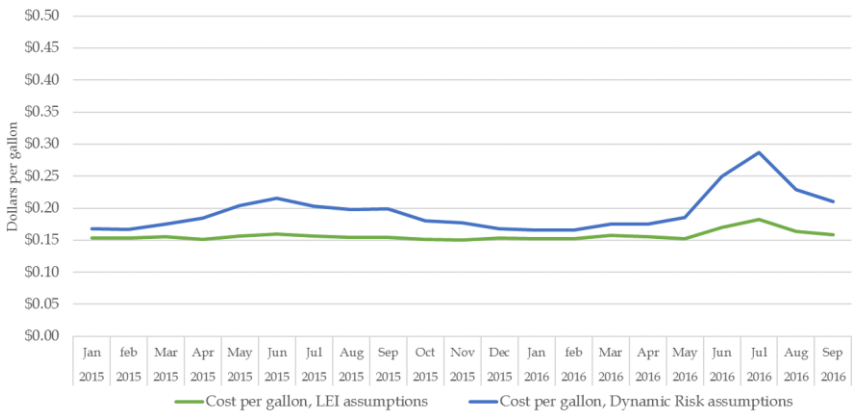
LEI performed the same analysis as described above but substituted $750 per car per month for the railcar lease cost (Dynamic Risk assumed $3,000) and $450 per car per month storage cost—assuming cars are stored loaded (Dynamic Risk assumed $1,000 per car per month). This resulted in an average cost of $0.27 per gallon (see Figure 35), which was $0.05 per gallon lower than the $0.32 per gallon estimated by LEI using Dynamic Risk's assumptions. The lower lease cost per rail car shifted the cost per month downward, while the lower storage cost flattened the summer peak in cost per gallon.

Figure 35. Edmonton to Kincheloe rail cost per gallon, comparison of impact of lease and storage cost assumptions



LEI performed the same calculations for the rail cost from Conway, KS to Owen, WI. We calculated the cost per gallon assuming lease costs were $750 per car per month and storage costs were $450 per car per month. LEI's assumptions based on the public data resulted in costs of $0.15 per gallon, a reduction of $0.03 per gallon compared to LEI's replication of Dynamic Risk's results.

Figure 36. Conway to Owen rail cost per gallon, comparison of impact of lease and storage cost assumptions



3.3.1 Trucking costs

For the cost of trucking propane to Rapid River, Dynamic Risk reported a winter average cost of $0.06 per gallon (Kincheloe to Rapid River), $0.09 per gallon (Owen to Rapid River), and $0.11 per gallon (Superior to Rapid River) (see Figure 37).[63] LEI replicated Dynamic Risk's trucking

[63] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." P. 4-13. Prepared for the State of Michigan. October 26, 2017.

analysis in the same manner as we did for their rail analysis. On an annual average basis, LEI calculated that trucking costs were $0.09 per gallon from Kincheloe to Rapid River, $0.12 per gallon from Owen to Rapid River, and $0.14 per gallon for Superior to Rapid River. LEI's annual averages are somewhat higher than Dynamic Risk's wintertime averages, because fixed costs are spread over fewer volumes in the non-winter months.

Figure 37. Comparison of trucking cost estimates

Route	Dynamic Risk estimate (November-March average)	LEI replication of Dynamic Risk's results using Dynamic Risk's assumptions (annual average)	LEI trucking cost using public data (annual average)
Kincheloe to Rapid River	$0.06	$0.09	$0.08
Owen to Rapid River	$0.09	$0.12	$0.11
Superior to Rapid River	$0.11	$0.14	$0.12

LEI's replication of Dynamic Risk's results does not imply that LEI agrees with Dynamic Risk's assumptions. It simply confirmed that LEI understood Dynamic Risk's approach and used Dynamic Risk's assumptions correctly.

LEI's analysis of publicly available data showed different values to those used by Dynamic Risk: 11,000-gallon truck volume (Dynamic Risk assumed 10,400 gallons); and recent (winter 2017/18) diesel fuel prices somewhat below Dynamic Risk's $3.00 per gallon). Public data for driver wages was lower than the $35 per hour used by Dynamic Risk, but did not include benefits, bonuses, or commissions. LEI assumed an average pay of $17 per hour (from Figure 27), a 2,000-hour working year, $18,000 per driver per year for health insurance,[64] and $8,000 for bonuses and commissions,[65] for a total cost of $30 per hour. Substituting public data (11,000-gallon truck, $2.90 per gallon diesel price, and a wage cost of $30 per hour) into the Dynamic Risk model reduced the cost per gallon for each of the routes by about $0.01 per gallon (see Figure 37 above).

3.3.2 The cost of rail from Superior to Rapid River

LEI also estimated the cost of transportation on a hypothetical new rail connection and transloading facilities at Rapid River. We used the same analytical framework and cost assumptions we used for the analysis of the other rail options and adjusted for the distance between Superior and Rapid River (which impacts transit time and therefore the number of railcars needed). We included the cost of storage and offloading equipment using the same

[64] National Conference of State Legislatures. *2016 Employer Health Benefits Survey*. http://www.ncsl.org/research/health/health-insurance-premiums.aspx.

[65] https://www.indeed.com/q-Propane-Delivery-Driver-Class-B-CDL-Tanker-Hazmat-jobs.html

assumptions as Dynamic Risk. The one important element of cost which is not publicly available is the freight rail charge. Canadian National Railway Company ("CN") currently serves this route but does not have a published tariff for LPGs. LEI calculated that, assuming a freight rate of up to $4.00 per barrel ($0.095 per gallon), rail from Superior to Rapid River would be within a fraction of a cent of trucking. This $4.00 per barrel would likely be the highest price a railroad could charge—it if were any higher, it would lose the propane business to truckers.

3.3.3 Upper Peninsula propane costs could increase $0.11 per gallon on an annual average basis

LEI combined the transport costs we estimated based on public data with cost of supply at alternative sources, to arrive at the total cost of propane at Rapid River.[66] On a weighted average annual basis, the cost of propane at Rapid River was lowest, at $0.61 per gallon, if delivered by Enbridge Line 5 from Edmonton (see Figure 38). The next lowest-cost options are the combination of pipeline to Superior, and thence by rail or truck to Rapid River, with an incremental cost of $0.11 per gallon (including variable costs, overhead, and capital costs). A rail carrier may choose to charge a freight rate lower than $4.00 per barrel, in which case the incremental cost could be lower than $0.11 per gallon.[67]

Figure 38. Estimated weighted average annual cost of propane supply to Rapid River (all costs in $ per gallon)

Market hub	Edmonton, Alberta				Conway, KS
Hub price, 2017	$0.53	$0.53	$0.53	$0.53	$0.72
Mode of transportation	Pipeline	Pipeline	Pipeline	Rail	Rail
Cost of transportation	$0.078	$0.064	$0.064	$0.27	$0.15
Terminal		Superior, WI	Superior, WI	Kincheloe, MI	Owen, WI
Mode of transportation		Rail	Truck	Truck	Truck
Cost of transportation		$0.126	$0.124	$0.08	$0.11
	Rapid River Terminal (total cost, $/gallon)				
Total cost	$0.61	$0.720	$0.718	$0.88	$0.99
Difference		$0.11	$0.11	$0.27	$0.38

[66] By using the propane price at Edmonton rather than a value for NGLs at Edmonton, LEI implicitly assumed fractionation costs are included in the supply hub price, though the fractionation does not occur until the NGLs arrive at Rapid River.

[67] LEI also analyzed the cost of trucking from Sarnia to Rapid River, using the same assumptions used for the other trucking options. This route requires crossing the Straits, which is not favored by NWF. In any case, the cost of that option was $1.00 per gallon ($0.82 per gallon supply cost plus a $0.18 per gallon trucking cost) which made it clearly out-of-the money.

3.3.4 Other alternatives cost more

In theory, there are a wide variety of options for supply sources and routes to the Upper Peninsula. In practice, any viable alternative would have to be cheaper than the Edmonton-Superior alternatives, otherwise suppliers would not invest in it—they would not be able to beat the cost of the Edmonton-Superior route. For example:

- **Expanding storage at Kincheloe:** Dynamic Risk noted that propane storage exists at Kincheloe, which receives propane by rail from Alberta.[68] LEI's analysis summarized in Figure 38 shows that that even if rail or trucking from Kincheloe to Rapid River was free, the total cost of using the Kincheloe route would be $0.80 per gallon, which is more expensive than the Edmonton-Superior route. Therefore, LEI did not examine the option of expanding storage at Kincheloe--it cannot compete economically with the Edmonton-Superior route.

- **A new 4-inch diameter pipeline from Superior:** LEI was asked to examine whether a new, smaller pipeline dedicated to transport of propane to the Upper Peninsula would be economically viable. LEI modeled a 4-inch (internal diameter) pipeline running 290 miles from Superior Wisconsin, to Rapid River. Even if the cost of abandoning Line 5 in the Upper Peninsula is excluded, and even if operating and maintenance costs are excluded, the cost of this option was very expensive. At an assumed capital cost of about $2 million per mile,[69] a length of 290 miles from Superior to Rapid River, a 40-year period to cover return of capital, and a four percent discount rate, the cost would be $0.86 per gallon. This is expensive because the volume of propane needed in the Upper Peninsula is too small to support the capital cost of dedicated pipeline.

- **Using existing Line 5 far below capacity:** Apart from any engineering and operational problems, this would involve a large increase in transportation costs per gallon. Pipeline tariffs are designed to recoup investment and are agreed under a regulatory process. Propane demand in Rapid River is less than 4,000 barrels per day even in high-demand months, less than one percent of the 540,000 barrels which is the basis of the current tariff. Continued operations would require a very large increase in the tariff, given the small volume of propane and large pipeline capacity.

LEI concluded that the Edmonton-Superior route which relies on pipeline service to Superior and trucking or rail transport to Rapid River, is the lowest-cost alternative and therefore the most likely market response if Enbridge Line 5 did not exist.

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[68] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." P. 4-9. Prepared for the State of Michigan. October 26, 2017.

[69] ICF. "North America Midstream Infrastructure through 2035: Capitalizing on Our Energy Abundance." INGAA Foundation Final Report No. 2014.01. March 18, 2014. Pp. 14, 17. Note: ICF indicated a cost of about $3 million per mile; LEI assumed a generously-low cost of $2 million per mile for the analysis.

3.3.5 Lower Peninsula may have negligible cost impact

For the Lower Peninsula, the loss of the delivery of NGLs to Sarnia may have a negligible cost impact. Enbridge Line 5 is the main source of NGLs to Sarnia as noted in Section 2.6, but it is not the only source. Sarnia is located close to cheap sources of NGLs from the Marcellus shale. Dynamic Risk noted that "(w)ith the potential availability of low cost ethane and additional propane from Marcellus and Utica, the Sarnia area petrochemical industry is able to source alternate feedstock supplies for their respective plants given the well-developed infrastructure and logistics available in the region as well as proposed new pipelines."[70]

Dynamic Risk estimated the cost impact at $0.06 per gallon (on Sarnia supply costs), and also noted that the producers would probably absorb some of this cost increase.[71] LEI examined Dynamic Risk's assumptions and calculations and found that, assuming Dynamic Risk's assumption of a stand-alone rail rate of $6.49 per barrel from Superior to Sarnia (which we could not verify) and the other assumptions (which we could verify), that the $0.06 per gallon could be accurate, assuming the NGLs had to come from Edmonton through Superior.

However, there is no obvious reason why the 4 million gallons per day of NGLs processed at the Sarnia fractionation plant would have to be sourced from Edmonton via Superior. Sarnia is closer to the Marcellus supply region than it is to Superior. If Sarnia needed additional supplies of NGLs, rail transport from Ohio through Michigan might be cheaper because the distance is shorter, and pipeline transport costs might be lower still. So, if Line 5 were not in service, Sarnia could still receive NGLs, and still provide propane via SDS to Michigan.

Also, in terms of propane rather than NGLs, the potential future expansion of the Utopia pipeline could increase the quantity of propane shipped into the Lower Peninsula. This could potentially add 25,000 barrels per day, which coincidentally is the equivalent of the 25,000 barrels per day currently shipped from Sarnia on SDS. The tariff for this has not been established (as the expansion is not under way, it is only proposed) so costs are not known. LEI examined several recent tariff filings and found a range of $0.064 per gallon to $0.089 per gallon for propane transportation by pipeline, which gives a general indication of the potential cost.[72] The supply cost of propane in the Marcellus region is not widely available or publicly reported, so LEI could not estimate the total cost of propane supply plus transportation, to compare it to the $0.828 per gallon total from Sarnia.[73]

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[70] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines (Appendices)." October 26, 2017. Prepared for the State of Michigan. October 26, 2017. Appendix G, P. G-9.

[71] Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." October 26, 2017. Prepared for the State of Michigan. October 26, 2017. Appendix J. P. J-12.

[72] Blue Racer NGL Pipelines, Inc. "Local pipeline tariff. FERC oil tariff." December 2015; Tri-Sates NGL Pipeline, LLC. "FERC oil tariff." January 2016; and Mid-America Pipeline Company.

[73] Adding the $0.008 per gallon rate on SDS to the average propane cost at Sarnia of $0.82 (from January 2016-December 2017) totals $0.828 from Sarnia to Detroit.

4 Impact of a cost increase on consumer prices

The cost increases will not be borne entirely by consumers in the Upper Peninsula of Michigan. LEI found that $0.05 per gallon of the $0.11 per gallon cost increase would be borne by consumers in the form of a price increase. The remaining $0.06 per gallon would be borne by producers and suppliers in the form of lower margins.

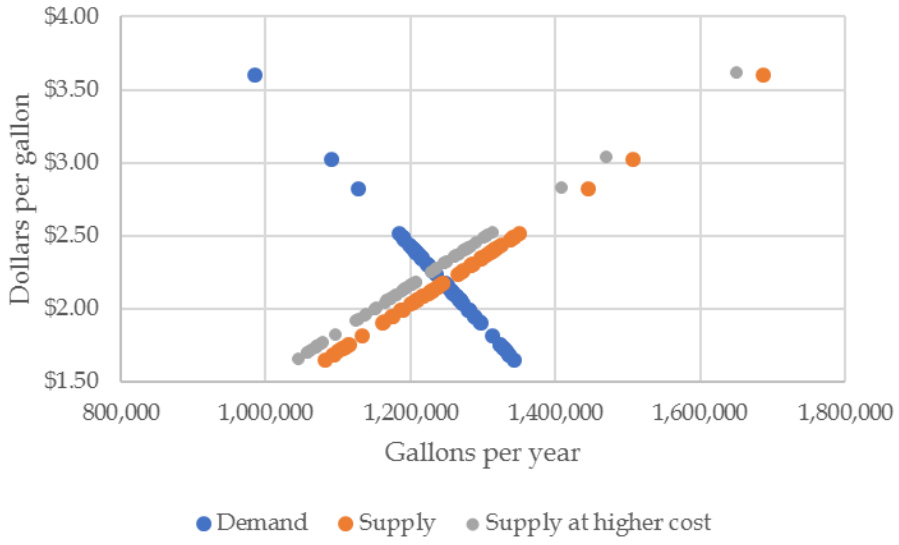
4.1 Cost increase is shared by suppliers and consumers

To estimate the shares of the cost borne by suppliers versus consumers, LEI used econometric analysis of propane supply and demand in Michigan. LEI focused on the impact of prices on supply and demand; there are drivers other than price that can affect supply and demand, and econometric analysis isolates these, so that we can examine the impact of prices alone. Detailed information about the econometric methodology, the drivers tested, data LEI used, and the results are available in Section 6 (Appendix A).

LEI used the econometric analysis to create supply and demand curves for propane in Michigan (see Figure 39). The orange dots represent Michigan propane supply as it relates to the price of propane; as prices rise suppliers are willing and able to supply more propane, so the orange trend has an upward slope. The blue dots are Michigan demand for propane as it relates to price. It has a downward slope in relation to propane prices, because as prices rise consumers are less able or willing to buy propane. The market-clearing residential price, where (orange) supply and (blue) demand meet, is $2.284 per gallon (see Appendix A for calculations).

The grey line shows the supply of propane if the cost goes up $0.11 per gallon. This added cost shifts the supply curve upward: at any given quantity, the cost is $0.11 per gallon more. However, the new market-clearing price is not $2.394 (i.e., $2.284 + $0.11) per gallon. It is lower than that. This is because the demand curve is not perfectly vertical—it has a downward slope, because, as mentioned above, people want less propane when it costs more. The new market-clearing price, where supply and demand meet, is $2.337 per gallon, which is $0.053 per gallon higher (see Appendix A for calculations).

Figure 39. Supply and demand for propane in Michigan, 2008-2018



Based on data for January-March and October-December

5 Conclusions and implications

Without access to propane from Enbridge Line 5, consumers would seek the next-least-expensive alternative; and suppliers would not attempt to serve the market using a supply route that costs more than the cheapest option. The cheapest option is rail or trucking from Superior, WI. LEI estimates this would add about $0.11 per gallon to the weighted average annual cost of propane.

It would not make sense for consumers to choose the other alternatives unless there were some interruption in pipeline service to Superior, or road or rail access from Superior to Rapid River was closed off. Thus, it does not make sense to assume that the impact of the loss of Line 5 would be a $0.35 per gallon "upper bound," as Dynamic Risk argued.[74] The upper bound would only be relevant if the lower-cost alternatives did not exist. The upper bound cost impact under normal operating conditions would be $0.11 per gallon, the cost at which the two lowest-cost alternatives would compete to supply the market.

5.1 Consumers would pay for part of the cost increase, but not all of it

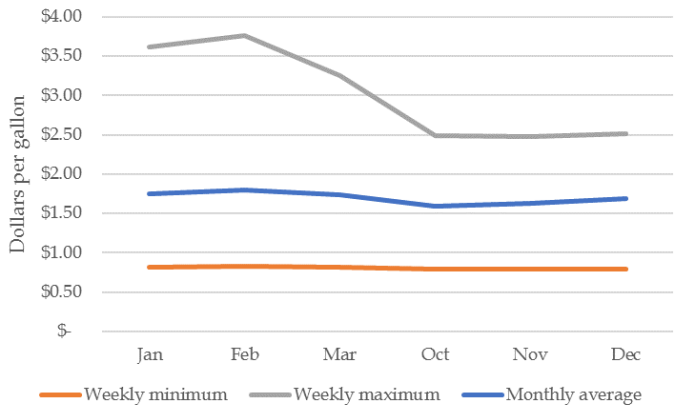
The demand for propane in Michigan, like demand for most goods and services in most places, is "downward-sloping." This means that consumers will buy less of something when its price goes up. LEI's econometric analysis shows that, of an $0.11 per gallon cost increase, the residential price of propane would increase $0.05 per gallon.

5.2 The price increase would be lost in the noise of typical price volatility

Each week, the price of propane varies widely compared with its monthly average. For Michigan, weekly prices of propane have been as low as $0.86 per gallon even in the winter, and as high as over $3.50 per gallon (see Figure 40). This wide variation is often referred to as price volatility and is typically measured as the standard deviation of prices. For Michigan residential propane prices, the standard deviation of weekly prices for 2008-2018 was about $0.58 per gallon. This is much larger than the $0.05 per gallon price increase estimated for the Upper Peninsula from using an alternative to Enbridge Line 5.

[74] Dynamic Risk. Analysis of Alternatives Dynamic Risk. "Final Report: Alternatives Analysis for the Straits Pipelines." October 26, 2017. Prepared for the State of Michigan. October 26, 2017. P. 4-13.

Figure 40. Weekly maximum and minimum prices, and monthly average prices for residential propane in Michigan (2008-Jan 2018)



Source: EIA, Weekly Michigan residential propane price

5.3 New supplies, but no surprises

LEI's economic analysis of supply options assumes that the need to transition to a new supply option, and the timing of this need, would be known in advance. This gives the industry time to plan. The Polar Vortex and surprises such as pipeline outages drive up prices precisely because they are unexpected. But if Enbridge Line 5 were not operating, ideally regulators and stakeholders would establish a timeline so that the industry can create new supply and transportation routes.

If Enbridge Line 5 did not exist, consumers should not expect shortages of supply under normal conditions (i.e., assuming the railroads are running, and highways are open). Consumers should continue to expect the price of propane to reflect supply and demand, weather conditions, and volatility, as it has for many years.

6 Appendix A: Details of econometric analysis of propane supply and demand

Econometric estimation is a technique based on statistical analysis of historical data. If enough data is available, econometric analysis allows isolation of the individual impacts of prices and of other drivers (known as regressors, or explanatory variables) on demand for a good; or similarly, on supply of a good.

6.1 Econometric model specification

LEI used a standard formulation of a system of demand and supply equations, which includes the price of the good as an explanatory variable for both demand and supply.

6.1.1 Demand model

The price of a good is a driver of demand, in that a higher price would probably reduce demand and a lower price would increase demand, so economists include price an explanatory variable in any demand model. Propane is used for heating, so the weather (measured as number of heating degree days ("HDD")) is likely to be an important driver.[75] Propane is also used for drying crops, a seasonal activity which typically happens in October. Finally, demand for propane could increase over time, or it could fall over time, depending on other factors such as adoption of other heating fuels, or a rising population. We do not necessarily know what these time-dependent factors might be, but we can include an explanatory variable which tracks an underlying trend over time and discover whether it tends to increase or decrease demand. If there is no impact over time, the econometric results would indicate that, too. This model is shown in Figure 41.

Figure 41. Demand and supply models estimated

Dependent variable	Regressors
Quantity demanded	Price, HDD, October, time
Quantity supplied	Price, time

6.1.2 Supply model

The price of propane is an incentive to supply it. A rising price would, all else equal, encourage more supply, while a lower price would induce less supply. Availability of propane could increase over time, or it could fall over time, depending on a variety of factors such as NGL

[75] A heating degree day is defined as the difference in the average temperature on a given day from 65 degrees Fahrenheit. For example, a day in which the temperature averaged 30 degrees would account for 35 heating degree days.

production and demand from refineries. Just as for propane demand, we do not necessarily know what these time-dependent factors might be, but we can track the trend over time and discover whether it tends to increase supply, decrease supply, or has no impact on supply. The supply model is also shown in Figure 41.

6.2 Data used in the econometric analysis

LEI used data from the EIA and the US National Oceanographic and Atmospheric Administration ("NOAA") (see Figure 42). The EIA price and consumption data are available for Michigan as a whole, but not for the Upper Peninsula separately; LEI used Michigan-wide data for the econometric analysis.

Figure 42. Data sources for econometric analysis

Variable	Source	Notes
Residential propane prices	EIA, Weekly Michigan Propane Residential Price (Dollars per Gallon)	converted to monthly prices to match consumption
Michigan propane consumption	EIA, Michigan Propane All Sales/Deliveries by Prime Supplier (Thousand Gallons per Day)	monthly data
Michigan heating degree days	NOAA, heating degree days, ftp://ftp.cpc.ncep.noaa.gov/htdocs/degree_days/weighted/legacy_files/heating/statesCONUS/	monthly data

LEI created the variable for October by using a "1" if the observation was in October, and "0" if not. This standard formulation is known as a "dummy variable." The time trend regressor equals "1" in 2008, and subsequent years are "2", "3", "4", etc. All the data values are shown in Figure 43. All data was for 2008-2018, for the months of January-March and October-December (except for 2018, for which only January data was available). This provided a sample size of 61 observations, which is enough observations to support statistically significant results.[76]

LEI computed the logarithms of consumption, price, and HDD and used those values in the econometric model. This widely-used formulation provides a straightforward way of interpreting the estimated coefficients: they are the elasticities of demand, as in "a one-percent change in the price of propane is associated with an x-percent change in demand."

[76] The more observations in a sample of data, the more likely it is that the sample represents reality. Statistical significance refers to whether the results of the econometric analysis are likely to closely match reality.

Figure 43. Data used in econometric analysis

Year	Month	MI residential price (2016 $ per gallon)	MI heating degree days	Time trend	October dummy	Consumption (gallons per day)
2008	1	2.71	1205	1.00	0	1,778,000
2008	2	2.71	1257	1.00	0	2,047,300
2008	3	2.72	1066	1.00	0	1,329,100
2008	10	2.73	511	1.00	1	1,087,000
2008	11	2.67	824	1.00	0	1,074,800
2008	12	2.65	1239	1.00	0	1,680,900
2009	1	2.59	1521	2.00	0	1,945,900
2009	2	2.58	1085	2.00	0	1,525,300
2009	3	2.54	911	2.00	0	1,055,000
2009	10	1.97	556	2.00	1	972,100
2009	11	2.14	669	2.00	0	1,111,600
2009	12	2.31	1176	2.00	0	1,654,000
2010	1	2.56	1296	3.00	0	1,554,700
2010	2	2.55	1116	3.00	0	1,481,600
2010	3	2.48	799	3.00	0	911,800
2010	10	2.31	395	3.00	1	633,900
2010	11	2.41	758	3.00	0	878,400
2010	12	2.50	1246	3.00	0	1,516,000
2011	1	2.55	1397	4.00	0	1,528,400
2011	2	2.59	1156	4.00	0	1,335,300
2011	3	2.59	1023	4.00	0	1,061,500
2011	10	2.61	420	4.00	1	656,000
2011	11	2.65	654	4.00	0	972,600
2011	12	2.69	980	4.00	0	1,138,100
2012	1	2.65	1116	5.00	0	1,164,700
2012	2	2.66	995	5.00	0	1,132,200
2012	3	2.68	534	5.00	0	704,700
2012	10	2.08	473	5.00	1	830,000
2012	11	2.12	800	5.00	0	1,085,800
2012	12	2.12	962	5.00	0	1,246,800
2013	1	2.16	1198	6.00	0	1,513,400
2013	2	2.21	1141	6.00	0	1,494,100
2013	3	2.23	1052	6.00	0	989,800
2013	10	2.17	423	6.00	1	777,300
2013	11	2.27	849	6.00	0	1,087,100
2013	12	2.46	1249	6.00	0	1,732,400
2014	1	2.91	1520	7.00	0	1,689,400
2014	2	3.71	1364	7.00	0	1,434,500
2014	3	3.11	1234	7.00	0	1,247,000
2014	10	2.15	459	7.00	1	909,600
2014	11	2.18	920	7.00	0	1,546,000
2014	12	2.19	1031	7.00	0	1,472,500
2015	1	2.19	1391	8.00	0	1,743,400
2015	2	2.20	1491	8.00	0	1,877,200
2015	3	2.20	1039	8.00	0	1,256,400
2015	10	1.68	414	8.00	1	784,100
2015	11	1.75	626	8.00	0	930,500
2015	12	1.77	811	8.00	0	1,115,200
2016	1	1.76	1215	9.00	0	1,422,800
2016	2	1.78	1047	9.00	0	1,341,600
2016	3	1.74	783	9.00	0	936,400
2016	10	1.70	300	9.00	1	664,800
2016	11	1.70	612	9.00	0	803,700
2016	12	1.83	1167	9.00	0	1,326,400
2017	1	1.93	1123	10.00	0	1,318,400
2017	2	2.01	853	10.00	0	1,234,500
2017	3	1.98	956	10.00	0	1,143,500
2017	10	1.90	310	10.00	1	668,600
2017	11	2.02	800	10.00	0	1,033,500
2017	12	2.11	1256	10.00	0	1,353,000
2018	1	2.12	1286	11.00	0	1,865,100

6.3 Econometric analysis

LEI estimated the demand and supply equations separately. We then used the results of the econometric analysis to calculate the impact of a $0.11 per gallon cost increase on the market-clearing price.

6.3.1 Econometric results, demand

LEI's econometric results showed that, for the demand model, the impact of a one-percent increase in price was to reduce quantity demanded by 0.29 percent (see Figure 44). This relationship defines the downward slope of the demand curve. For every one percent increase in HDD in a given month, demand increased by 0.88 percent. The impact of the time trend was negative: each year, Michigan demand declined by 0.01 percent. The impact of October was positive: 0.26 percent more propane would be used in October than in the other months, independently of price, time, or HDD.

Figure 44. Econometric results, demand

Demand model	Estimated coefficient	Standard Error	t-Statistic	P value
Intercept	8.27	0.45	18.53	0.00
ln real price	-0.29	0.13	-2.24	0.03
ln HDD	0.88	0.07	13.02	0.00
Time trend	-0.01	0.01	-2.00	0.05
October	0.26	0.07	3.73	0.00

Note that "ln" refers to the natural logarithm of the regressor

The results are statistically significant. The measures of statistical significance LEI used in this analysis are the well-known t-statistic and P value. The t-statistic is the difference between the estimated coefficient and zero (i.e., its value under the null hypothesis "H_0"),[77] divided by its standard error (see Figure 44). A t-statistic with an absolute value which is 2 or greater (given our 61 observations) indicates that we can be 95 percent confident that the estimated coefficient is accurate.

The P value is the probability of erroneously rejecting H_0 when it is true. For example, the P value of 0.03 in Figure 44 for the estimated coefficient on price indicates that there would be

[77] For our study, zero is the hypothesized value—i.e., we test the estimated coefficient against zero, which would be its value if the driver (for example, price) had no impact on demand. This is referred to as the "null hypothesis" or "H_0."

only a 3 percent chance of making that mistake. This means that we can be 97 percent sure that the estimated coefficient for price is accurate.

6.3.2 Econometric results, supply

LEI's econometric results showed that, for the supply model, a one percent increase in price increased quantity supplied by 0.54 percent (see Figure 45). This relationship defines the positive slope of the supply curve. The P value indicates that the estimated coefficient for price is significant at 98 percent.

The impact of the time trend was not statistically significant in a model that LEI tested which included the time trend, so we left time out of the final supply model.

Figure 45. Econometric results, supply

Supply model	Estimated coefficient	Standard Error	t-Statistic	P value
Intercept	13.54	0.19	72.76	0.00
ln real price	0.54	0.22	2.45	0.02
Intercept after cost increase:	13.52			

6.3.3 Impact of cost increase

When supply is equal to demand, the market is said to "clear." LEI solved for the market-clearing price (where the supply and demand curves intersect):

ln(quantity demanded) = 8.27 – (0.29 x (ln(price)) + (0.88 x ln(HDD average value)) - (0.01 x time average value) + (0.26 x October average value)

ln(quantity supplied) = 13.54 + (0.54 x ln(price))

Setting supply equal to demand and solving for the market-clearing price results in a price of $2.284 dollars per gallon.

If the cost to supply propane goes up $0.11 per gallon, the supply curve shifts upward by $0.11 per gallon, resulting in a new intercept of 13.52. The set of equations now has a new intercept for the supply curve:

ln(quantity demanded) = 8.27 – (0.29 x (ln(price)) + (0.88 x ln(HDD average value)) - (0.01 x time average value) + (0.26 x October average value)

ln(quantity supplied) = 13.52 + (0.54 x ln(price))

Again, we set supply equal to demand and solve for the market-clearing price. The new price is $2.337 per gallon, $0.053 per gallon more than the old price.

To: Governor Snyder, Michigan Pipeline Safety Advisory Co-Chairs Creagh and Grether

From: Jennifer McKay
Policy Director, Tip of the Mitt Watershed Council and Member, Michigan Pipeline Safety Advisory Board

Date: August 27, 2018

RE: Recommendations on the future of Enbridge's Line 5

Replacing Enbridge's dual Line 5 pipelines crossing the Straits of Mackinac
Tip of the Mitt Watershed Council does not agree that replacement of Enbridge Energy's Line 5 in or under the Straits of Mackinac is a wise decision for the future of Michigan's environment and economy. Replacement of Line 5 in the Straits, whether tunneled below the lakebed or trenched in secondary containment, will not eliminate the risk to the public trust waters of the Great Lakes. The inland portions of Line 5 will still remain, with nearly 400 sites where it crosses a waterbody in Michigan.

Of particular note, Line 5 will still traverse across the Upper Peninsula, along the U.S. 2 corridor, where there are a number of direct tributaries to Lake Michigan. A leak or rupture along this portion could still result in an oil spill into Lakes Michigan-Huron and the Straits of Mackinac, and the same containment and recovery difficulties would exist. The Draft Final Report Risk Analysis for the Straits Pipelines, prepared by Michigan Technological University, highlighted the risk associated with this inland portion of Line 5. U.S. Coast Guard (USCG) personnel and emergency managers both pointed to the stretch of the pipeline along U.S. Highway 2 near Lake Michigan's northern shore as their worst-case scenario, citing a combination of less robust technology such as pipeline wall thickness and monitoring equipment, as well as higher vulnerability to an errant strike and potential access problems for containment and cleanup equipment, as well as difficult terrain and environment for cleanup activities.

The inland portions can pose just as great, if not greater threat, due to the basic construction, operation, and maintenance of the line. The wall thickness of the inland pipeline is significantly less. It is 0.281 inches thick versus 0.813 inches at the Straits. Along with a thinner pipeline, it operates at a higher pressure. In addition, it has a side seam, which the Straits portion of pipe does not have. This seam can be subject to stress cracking and could cause the inland pipe to be more vulnerable. The inland portion is also not subject to the same inspection frequencies. If you look at historic dent summary, you will see that there are more dent features total and features per mile inland than in the Straits. Additionally, this is historically where Line 5 has experienced leaks and ruptures proving the vulnerability and risk of the inland portion of Line 5.

Therefore, simply replacing the Straits portion of the pipeline ultimately fails to eliminate the risk to the Great Lakes and Michigan's public trust waters.

Missing Analysis: Throughout all of the analyses conducted on Line 5, key questions that were never adequately addressed were how much of the commodities transported through Line 5 do the citizens and industries of Michigan utilize and what are the impacts if Line 5 were to be decommissioned. Mr. David Bryson, Senior VP Operations, Liquid Pipelines, Enbridge Inc. recently testified at a Senate Commerce field hearing on Monday, August 20th that only 30% of the product transported through Line

5 is used in Michigan. NWF contracted with London Economics International (LEI), with funding from the C.S. Mott Foundation, to analyze what the impacts to Michigan would be if Line 5 were to be decommissioned. The conclusion from the leading experts was that Michigan has substitutes for the services provided by Line 5 which would have no noticeable impact to our economy.

Recommendations:

With only 30% of product used in Michigan and high consequence of an oil spill throughout the entire State, alternative transportation options for the services provided should be pursued and the process to decommission Line 5 should begin.

As the process of decommissioning unfolds, the following recommendations should be immediately incorporated into a new agreement with Enbridge to provide the highest standards to protect Michigan's environment and economy in the near term:

- Require Enbridge to temporarily shut down Line 5 operations in the Straits until the rest of the Dual Pipelines in the Straits of Mackinac can be inspected and all of the bare steel and coating issues are fully repaired. The State should also require Enbridge to submit an independently verified report on the cause of the holidays and the relationship of the bare steel/calcareous deposits to girth welds.
- Modify the definition of "Sustained Adverse Weather Conditions" to "conditions in which median wave heights in the Straits of Mackinac over a continuous 60-minute period are greater than 3 feet based on 'Near-real Time Data' or in its absence 'Modeled Data,'" because the current emergency response equipment cannot effectively respond to oil spills in waves greater than such conditions.
- Replace the definition of "Sustained Adverse Weather Conditions" with a new term "Significant Adverse Maritime Conditions" defined to include all maritime conditions based upon sea state capabilities and operational limitations of watercraft and equipment that would prevent or significantly impair the effective containment and recovery of spilled oil or significantly exacerbate the spread of spilled oil.
- Increase in situ burn capability by requiring Enbridge to acquire and pre-deploy fire boom and air monitoring equipment, conduct trial burns at inland facilities to analyze air effects and residuals impacts in freshwater, and conduct research and development on residual containment and recovery technologies.
- Require Alternating Current Voltage Gradient Survey in conjunction with Alternating Current Attenuation, along with visual inspection by divers to improve assessment of the condition of pipe coating. It should be noted that Enbridge's choice of Cathodic Protection Close Interval Survey fails to actually detect areas of coating damage.
- Enhance leak detection of the dual Line 5 pipelines through Distributed Acoustic Sensing (DAS) on a pilot basis in the Straits, as well as use of Fluorescent Leak Detection after extreme weather events.
- Mitigate potential vessel anchor strikes to Line 5 at the Straits of Mackinac by requiring Enbridge to implement a holistic communication strategy, including an enhanced public awareness campaign, additional signage and physical marker buoys as well as full implementation of *Guardian:protect* with proactive advisory messages. We would note that the Watershed Council does not recommend an engineered gravel/rock cover due to the adverse impacts to

bottomlands, fish biota, commercial and tribal fisheries as well as the increased risk due to weight on pipe, inability to perform external inspections, and damage to structural integrity during installation.

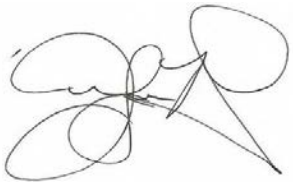
- To enhance safety and reduce potential impacts at Line 5 water crossings:
  - Implement all recommendations put forth in the report submitted by Enbridge.
  - Require more frequent inline inspections (ILI).
  - Require immediate inspections after major weather events.
  - Require improved leak detection systems.
  - Require real time monitoring for flood/storm events and proactive monitoring of snow levels prior to runoff.
  - Conduct additional analyses of crossings – include installation method, date of latest hydrotest, ILI dates and results, and field inspections (upstream obstructions, evidence of channel deepening or scour, visible erosion of stream banks).
  - Develop enforcement actions for not addressing known risks at water crossings.
  - Stockpile additional emergency response equipment at key identified water crossings.
  - Require development of tactical plans for key identified water crossings and conduct trainings with local emergency responders.
  - Add back-up energy supply/generator to valves near key water crossings.

The new agreement also should include timeframes for when the above measures need to be implemented. More importantly, the agreement needs to include a timeframe/deadline for the development of a plan to decommission Line 5 and implement alternatives to transport oil and natural gas liquids to serve the needs of the Michigan.

In addition to my comments, I would also like to voice my support for the comments submitted by fellow PSAB member, Mike Shriberg.

It has been an honor and privilege to serve on the Michigan Pipeline Advisory Board. Thank you for the opportunity to provide my insight and recommendations regarding the future of Line 5. Please let me know if you have any questions regarding the recommendations provided. I look forward to continued discussions on we can ensure oil and natural gas liquid transportation in Michigan is done in a manner that protects public health and safety and the state's economy and natural resources.

Sincerely



Jennifer McKay

Jeffrey R. Pillon, Member
Michigan Pipeline Safety Advisory Board

August 27, 2018

The Hon. Rick Snyder
Governor of the State of Michigan
Lansing , Michigan

Dear Governor Snyder:

I'm a member of the Michigan Pipeline Safety Advisory Board to which you appointed me to as a technical consultant. I thank you for this opportunity to serve on this board. As a matter of public policy it is vitally important to reducing the potential environmental risks and economic consequences of the Enbridge pipeline's on Straits of Mackinac and liquid petroleum and NGL pipelines in general. It is also important that we assure an adequate and reliable supply of petroleum products to the people and business in the State of Michigan and investments needed in the state aging infrastructure.

Based in my review of the extensive research and studies that have been done over the last few years I generally concur with the studies that the only viable alternative to the existing pipeline crossing the Straits of Mackinac is the construction of a tunnel for a new pipeline. This would then replace the existing pipelines on the bottom of the Straits. This is the best option for nearly eliminating the risk of a Line 5 oil spill into the Great Lakes. This proposal is detailed in the "Report to the State of Michigan on Alternatives for Replacing Enbridge dual Line 5 pipelines crossing the Straits of Mackinac[1]"(Alternative Study), dated June 15, 2018.

This new pipeline running through a tunnel under the Straits of Mackinac should be constructed as expeditiously as possible while assuring the necessary environmental and safety requirements are met. To the extent that permits might be expedited, to reduce the lead time, that should be considered as may be appropriate.

Oher critical pipeline water crossing points that present significant risks have also been studied and prioritized[2]. This work has produced an action plan for mitigation programs for each individual prioritized crossing. This work should continue and critical points of vulnerability at these locations remediated.

I have based these conclusions on the following facts.

- The cost to construct this tunnel and pipeline is estimated to be between $350 and $500 million. The environmental and economic risk of a worst-case scenario for a Line 5 leak is estimated at $1.8 billion[3]. This risk number in my view is at the low end of the range of potential impacts since the risk study stated it was unable to quantify a number of aspects of the environmental and economic impacts. The potential petroleum price impacts reflected in this number I believe are also under estimated.

[1] https://mipetroleumpipelines.com/document/enhancing-safety-and-reducing-potential-impacts-line-5-water-crossings
[2] ibid
[3] https://mipetroleumpipelines.com/document/risk-analysis-straits-pipelines

- Virtually all of the other alternatives that were examined were both more costly and did not reduce the risk to the degree that a tunnel would do so. In some instance while the environmental risk were reduced for the Straits of Mackinac, other new risks would be created elsewhere.
- There have been studies to suggest that the US and Canada had sufficient surplus capacity that would allow Line 5 to be shut down and rerouted through the existing pipeline network. Some of the analysis only considered the volumes required for use in Michigan. The "Alternatives Analysis for the Straits Pipelines" [4]report prepared by Dynamic Analysis" concluded this was not feasible and the "Independent Risk Analysis for the Straits Pipeline" (Risk Study) led by Michigan Technological University also indicated there was insufficient pipeline capacity to make up for the immediate shutdown of line 5[5].
- In my experience and professional opinion the price impacts of an immediate shutdown of Line 5 would produce much larger petroleum product and propane price impacts than shown in the alternatives or risk studies due to the relatively in elastic nature of the demand for propane and other petroleum products in the short term. For example, the draft Independent Risk Analysis for the Straits Pipeline, Appendix GI-2 Short-term Impacts on Petroleum Supply from a Line 5 Disruption shows the large price response from two events. BP had to shut down a large part of its Whiting refinery unexpectedly in August of 2015. This caused Chicago retail prices to jump 70 cents per gallon from August 10 to August 17 and did not return to August 10 levels until mid-September[6]. Michigan prices during this time also followed a similar price path. The polar vortex during the winter of 2013/2014 was caused high propane demand for crop drying, followed by severe cold weather and coupled with a reversal of the pipeline that suppled propane in the upper Midwest. The Michigan residential propane price spikes were large. In February 2014 prices peak at $3.76 a gallon compared to $2.02 in October 2013[7], a $1.74 increase. This caused serious hardship for propane customers because both there usage and prices when up dramatically.

I'm also basing my conclusions on my experience during the 36 years I worked for the State of Michigan. I was responsible for energy supply/demand forecasting , energy emergency planning, preparedness and response, and critical infrastructure protection where risk assessment was a critical component of this work. I dealt with many energy supply disruptions over this time and nearly all caused price shocks. Since I left the state of Michigan in 2009 I have served as Director of Energy Assurance for the National Association of State Energy Officials which works with states across the country to help them improve their energy emergency preparedness and response plans and efforts to protect and enhance the resiliency of critical energy infrastructure.

Finally, in a testimony given in 2017 to the Subcommittee on Energy, US House Committee on Energy and Commerce, Ms. Valerie Brader, former Executive Director of the Michigan Agency for Energy well summarizes Michigan's dependencies and vulnerabilities in the event of major energy disruption:

[4] Alternatives Analysis for the Straits Pipelines October 26, 2013, page ES-10 found the use of existing pipeline infeasible. See: https://mipetroleumpipelines.com/document/alternatives-analysis-straits-pipeline-final-report

[5] "Independent Risk Analysis for the Straits Pipeline", Appendix GI-2 Short-term Impacts on Petroleum Supply from a Line 5 Disruption July 20, 2018, pages 75 says, "The supply network generally runs near capacity, which creates challenges in making up for lost volumes. With the loss of Line 5 light crude oil, other pipelines would typically increase their volumes of light crude deliveries, but it would be at the expense of their heavy crude oil deliveries. Thus, a Line 5 shutdown in the short term would not only limit light crude oil, but heavy crude as well to refineries in Illinois, Ohio, Michigan, and Canada."

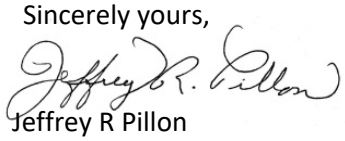
[6] Appendix GI-2 Short-term Impacts on Petroleum Supply from a Line 5 Disruption July 20, 2018, pages 72.

[7] https://www.michigan.gov/energy/0,4580,7-230-73789_83112_83114_85696---,00.html

> "…the petroleum market is highly interconnected. We rely on products produced or refined out of state or across the border in Canada, and other states and Canadian provinces rely on products produced in, or transported through, Michigan. For example, natural gas liquids such as propane are procured in part from western Canada; products are refined in neighboring states and shipped to Michigan via rail, truck, and pipeline; and Ontario's crude oil supplies are largely supplied via pipelines in Michigan. The interconnectivity of the petroleum market means that small events can create regional price shocks, and larger events can quickly cascade into a national crisis requiring federal action and assistance."

I hope you find these comments helpful as you work to make a final determination as to how the State of Michigan can best address the need to reduce the risk of the Enbridge pipeline line 5 to the Straits of Mackinac and improve the overall safety of petroleum pipelines in Michigan. I would be happy to address any questions you or your staff may have.

Sincerely yours,



Jeffrey R Pillon

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August 27, 2018

To: Governor Snyder, Michigan Pipeline Safety Advisory Board Co-Chairs Keith Creagh and Heidi Grether

From: Chris Shepler, President Shepler's Mackinac Island Ferry

Re: Request for Final Recommendations on Line 5

First and foremost, I would like to thank you for your confidence in me to be placed on the Michigan Pipeline Safety Advisory Board. This has been a true honor and privilege to serve under your leadership. Below are my thoughts on how Line 5 has affected our little family business (Shepler's Mackinac Island Ferry) in its decision making as we move forward with economic development, hiring of Cast Members and how we will be doing business in the future. I would also like to acknowledge that I support the comments of fellow Pipeline Safety Advisory Board members Michael Shriberg, Jennifer McKay and Craig Hupp.

Shepler's Mackinac Island Ferry is a seasonal business providing transportation to 550,000 guests yearly to and from Mackinac Island. We have witnessed an extreme amount of growth over the past two years and we continue to see more growth the summer of 2018. As you remember, you help christened the M.V. Miss Margy in 2015 which was built by Moran Iron Works of Onaway, Michigan. This project brought $4,000,000.00 of economic impact into Cheboygan and Presque Isle counties. As stated by Mr. Tom Moran, President and CEO or MIW, this project kept 40 families with a paycheck during the winter of 2014-2015. We are also looking at 4 more projects that will amount to upward of $9.5 million over the next 2 years, while currently finishing two parking lot projects in the amount of $2 million.

During our team discussions we talk about the reinvestment into our company and how that works in regards to timing and expense. The three projects that we are currently discussing include a new ferry boat, expanding our Mackinac Island Dock and finishing two current parking lots under construction in Mackinaw City (I would welcome you to a quick tour of our progression during your visit on Labor Day). We are also looking at purchasing land that's currently considered "blight" in St. Ignace. We are working with the City of St. Ignace to purchase and develop this 1.5 acres of land that would promote a fresher, brighter look of State Street. How does this relate to Line 5 and the decommissioning of the pipeline? Our strategic planning is completely parallel to whether or not oil continues to flow under the Straits of Mackinac through Line 5. The recent anchor strike on Line 5, earlier this summer, was a wakeup call for us. External and regional economic threats, such as Line 5, cause us to question decisions to borrow money and invest in redevelopment projects. Debt does not scare me, reinvesting into

the communities and business that we work and live in is a smart choice. However, business is tough enough when one can control the variables; the unknown variables are the ones that will kill a small company like ours as well as the small banks that we borrow from, not to mention the employment of 200 cast members.

The reinvestment mentioned above provides our company the proper tools to continue to provide a level of customer service that will insure future business for both us and Mackinac Island. Without this reinvestment, I believe our service model of "Quality Service, Every Guest, Every Day" will suffer and when we suffer, Mackinac Island will suffer. The point I am trying to make is…how does Shepler's Mackinac Island Ferry move forward with economic development and making sure our core values continue. Every conversation that we have internally, with our Leadership Team, about building something or expanding something…we always refer back to what is going to happen to Line 5? As we develop our 5 year strategic plan, all things including a new boat, expanding our Mackinac Island Dock (which is partially started) and purchasing property in St. Ignace is all currently on hold. We have stopped progressing as the threat of Line 5 and the serious threat of contamination is real. Instead the confidence we once had in building a ferry business, is now in "small mode" shrinking if you will. We have a responsibility to our banks to pay back the money that we have borrowed, we have a responsibility to our cast members to pay them for their work and we have a responsibility to our guests to provide the best possible service when they start their vacations in Northern Michigan. This responsibility we take very seriously, for a third generational family business, my job is to insure the viability of this business for generations to come. The only way that we can do this is to make sure we set ourselves up for success in a situation of dealing with an aging Pipeline that is 65 years old. Line 5 will not last forever and any tunnel project will take upwards of a decade to complete, so what is the contingency plan now to remove this immediate threat from our way of life?

Governor Snyder, thank you for your time in reading this correspondence. Thank you for being our leader over the past two terms. You have been an inspiration to all of us in Michigan, especially those that saw some tough times prior to you being elected as our Governor. I write to you from the heart, my technical knowledge is not up to speed with my peers, my policy knowledge is certainly lacking even though I try my best to stay on top of everything. The above is what I know and so I write what I know. We have an opportunity to mitigate our future of what Michigan is known for…clean water, beautiful beaches and an Island that is the most beautiful Island in the world. I call this PURE MICHIGAN.

Sincerely,

Christopher B. Shepler
President
Shepler's Mackinac Island Ferry.

National Wildlife Federation
Great Lakes Regional Center
213 W. Liberty Street, Suite 200 • Ann Arbor, MI 48104-1398 • 734-769-3351

August 27, 2018

To: Governor Snyder, Michigan Pipeline Safety Advisory Co-Chairs Grether and Creagh

From: Mike Shriberg, Ph.D.
Great Lakes Regional Executive Director, National Wildlife Federation
Member, Michigan Pipeline Safety Advisory Board

Re: Response to Request for Final Recommendations on Enbridge Energy's Line 5

Thank you for the continuing privilege of serving as a member representing conservation organizations on the Michigan Pipeline Safety Advisory Board (PSAB). As per the request of co-chairs Grether and Creagh, this memo provides written recommendations on the future of Line 5. While these comments are being submitted individually and on behalf of the National Wildlife Federation (NWF), I also support the comments of Jennifer McKay and Chris Shepler.

I appreciate that the state has solicited formal and informal input before making a "final" agreement with Enbridge Energy on the Line 5 Straits crossing. The process to derive the original agreement led to a lack of trust in the outcome given the closed door nature of the original agreement, consulting only one non-governmental member of the PSAB – Enbridge Energy.

The most important consideration in the future of Line 5 and in the future of any agreement is one which has not received attention thus far in a process where all of the information and reports have been funded by Enbridge Energy: What is in the best interests of the state of Michigan?

The risk analysis conducted by the consortium of universities did an outstanding job of modeling a range of scenarios. Even with unrealistically optimistic "worst case scenarios", the outcomes speak for themselves and equate to devastation for the Great Lakes, our economy and our way of life. These results should be weighed against the Coast Guard's admission during Congressional testimony that it is not "semper paratus" Moreover, as the PSAB process has unfolded, Enbridge has proven itself to not be a reliable and transparent partner, as the state pointed out specifically in multiple PSAB meetings. What we know is that the Straits section of Line 5 was designed for 50 years and is currently in its 65th year of operation. We also know that Line 5 has lacked the necessary structural supports for significant lengths of times, that coating has been damaged and still not repaired, that Line 5 has been hit by an anchor just recently, that visual images show a rusty pipeline encrusted in biota, and that Line 5 has multiple incurable easement violations.

Unfortunately, the alternatives analysis by Dynamic Risk – which has been largely discredited by all parties – made major errors in perspective, assumptions, data acquisition and outcomes. As detailed in a letter to the PSAB at the time from 5 members

(Shriberg, McKay, Hupp, Meadows and Shepler), Dynamic Risk's report had severe methodological flaws (such as miscalculation of "worst case spill" scenario and failure to accurately assess spill risk and impacts), lacks key information and came to incorrect or inadequate solutions. However, the most significant error was one of perspective: Dynamic Risk assumed, for reasons that are not clear, that the state had a responsibility to ensure that all of Enbridge's product was still transported through Michigan even if Line 5 was no longer in the service. In other words, Dynamic Risk did not assess what products and services of Line 5 are actually utilized in the state. Therefore, Dynamic Risk ignored alternatives that are beneficial for Michigan and provide substitutes for the services that Line 5 provides to the state if they were not easily scalable for all of Line 5's products.

The sum of the Enbridge-funded analyses are a low probability of a very high consequence event. The PSAB has debated the error bars around the probabilities and consequences but not the basic premise. The question that was never addressed by the Enbridge-funded reports are what are the benefits and costs of Line 5 to the state of Michigan. Therefore, NWF – with funding from the C.S. Mott Foundation – contracted with the leading independent experts (London Economics International - LEI) to analyze what the impacts to Michigan would be if Line 5 were to be decommissioned. These three reports are now submitted for the record and can be summarized as follows:

1) *Assessment of alternative methods of supplying propane to Michigan in the absence of Line 5*: LEI found that the lowest cost alternative to Line 5 to supply propane to the Upper Peninsula is to either truck product or utilize rail from Superior, WI to Rapid River, MI. The cost impacts to consumers would be "lost in the noise of typical propane price volatility" and would be in the range of $.05/gallon. The impact on the Lower Peninsula "may be negligible". There would be no likely risk to energy security or long-term propane supply as supply is growing faster than demand in the U.S. The potential small price increase for the Upper Peninsula could, in NWF's analysis, be easily made up for with a small increase in energy assistance dollars so that Michigan propane consumers wind up with a positive impact from Line 5 decommissioning. The LEI report is the detailed and authoritative source on propane, and directly contradicts the improper assumptions and calculations in Dynamic Risk's report, which did not focus on propane alternatives for Michigan.

2) *Michigan's crude oil production: Alternatives to Enbridge Line 5 for transportation:* LEI found that the small volume of Michigan crude oil production that utilizes Line 5 to get to market could utilize trucking directly to Marathon refinery instead. While this could increase costs by approximately $1.31/barrel for northern Michigan oil and less for central Michigan oil. This change is small compared to normal price volatility and "would be lost in the noise of typical crude oil price volatility". Moreover, if Line 5 were decommissioned, this oil would be in higher demand and, therefore, producers may be able to pass along the cost increase to refineries or other buyers.

3) *Michigan's refining sector: Alternatives to Enbridge Line 5 for transportation:* LEI found that there is enough excess capacity in other crude oil pipelines to make up for any losses at Detroit and Toledo-area refineries if Line 5 were to be decommissioned. However, downstream users have apportionment rights so the Detroit and Toledo-area refineries would need to supplement current supplies

with Michigan-produced crude oil as well as Bakken crude oil delivered by rail. The total cost increase to customers would be a fraction of a cent/gallon for consumers, which would be "lost in the noise of typical weekly gasoline price volatility".

These new analyses come to an important conclusion: Michigan has substitutes for the services provided by Line 5. When compared with the $2 - $6 billion or more in costs plus inestimable cultural and aesthetic losses due to a spill, the choice is clear. There is no substitute for the Great Lakes and our way of life but there are clear and easy substitutes for the services that Line 5 provides to Michigan. Therefore, the state must begin the process of decommissioning Line 5. The Governor has the authority and responsibility to initiate this process immediately. NWF's recommends a phased approach:

Phase I – October 2018 – May 2019: Protect Michigan's interests while initiating decommissioning

The state should immediately begin the process to revoke the easement based on multiple incurable violations and lack of "due care". By beginning this process while preparing the alternatives outlined by LEI, the state would minimize any potential economic disruption. While initiating procedures to terminate the easement, the state could reach a stronger agreement with Enbridge for the next 8 months. As recommended by the majority of non-governmental stakeholders on the PSAB, the new agreement should:

1) Replace the definition of "Sustained Adverse Weather Conditions" with a new term "Significant Adverse Maritime Conditions" defined to include all maritime conditions based upon the identified sea state capabilities and operational limitations of watercraft and equipment that would prevent or significantly impair the effective containment and recovery of spilled oil or significantly exacerbate the spread of spilled oil. This should include "conditions in which median wave heights in the Straits of Mackinac over a continuous 60-minute period are greater than 3 feet based on 'Near-real Time Data' or in its absence 'Modeled Data,'" because this is the limit of emergency response equipment.
2) Add in a clause that Line 5 cannot operate until it is independently verified that all damage from the anchor strike has been repaired and that there are no remaining gaps in coating, including from new structural supports.

These changes need to be made under a revised agreement while proceeding with terminating the current easement. Under no circumstance should the state agree to a new easement.

Phase II – June 2019 – May 2024: Implement alternatives to Line 5 while continuing assessment of long-term solution to Enbridge's export desires

The substitutes for Line 5 should be in place by June 2019, thus allowing for a decommissioning prior to the winter of 2019/2020. During this next phase, the state should continue any finalization of plans for an alternative for Enbridge's export plans to transport oil and natural gas liquids through the state, including an assessment of a "utility tunnel". This assessment is best conducted when the state is already utilizing alternatives for state needs and, thus, is in a strong negotiating position with the utility companies for their non-Michigan needs.

Phase III – June 2024 – 2050: Implement long-term solution if needed

If the state and utility companies determine there is a public benefit and safe plan for a "utility tunnel" or other solution that does not cross the Great Lakes bottomlands, this is a reasonable timeframe for completion. Currently, the debate over a tunnel or trench is a diversion from the short-term and medium-term interests of the state, which are clearly not served by the Straits section of Line 5.

I look forward to a robust discussion of these recommendations. Thank you for your consideration.

Sincerely,

Mike Shriberg

BILL SCHUETTE
ATTORNEY GENERAL
STATE OF MICHIGAN

August 23, 2018

The Honorable Rick Snyder
Governor of Michigan
George W. Romney Building
P.O. Box 30013
Lansing, MI 48909

Dear Governor Snyder:

In 2014, I called for a comprehensive review of petroleum pipelines in the State of Michigan, with a focus on Enbridge's Line 5 where it crosses the Straits of Mackinac. I co-created and co-chaired the Michigan Petroleum Pipeline Task Force, which brought together several state agencies and sought input from the public and other interested parties. The Task Force's Report, issued in July 2015, made specific recommendations directed to Line 5, including preventing the transportation of heavy crude through the Straits, and conducting two studies critical to evaluating the future of Line 5 – a study to evaluate alternatives to Line 5 and a study to evaluate the economic risk presented by a leak from Line 5.

I took swift action on the first recommendation. Less than two months after the Task Force Report was issued, my office negotiated an agreement with Enbridge providing that the company would not transport heavy crude through the Straits under the current operating conditions set by the federal government. It was heavy tar sands crude oil that fouled the Kalamazoo River when Enbridge's Line 6B ruptured. The prohibition on Line 5 transporting heavy crude was an important first step because the Coast Guard has publicly stated that a spill of heavy crude oil could not be contained in the open waters of the Great Lakes.

The two studies unavoidably took longer. The process required to ensure that those reports were done right, and with adequate public input, took longer than I hoped. But the completion of those reports is near, with the recent release of a draft of the second of the two reports: an Independent Risk Analysis for the Straits Pipelines, a report from a group of experts led by Michigan Technological University professor, Guy Meadows. That report estimates the total damages from a Line 5 spill at almost $2 billion.

The first report, the Alternatives Analysis for the Straits Pipeline by Dynamic Risk, was made available for public comment in 2017. When that report was released, I issued a statement establishing five points that would govern my position on the future of Line 5:

- **Nothing Lasts Forever** – Line 5 is 65 years old, and there should be a specific and definite timetable for closing the pipeline. The alternatives analysis identified a tunnel as a viable option that would allow for the closure of the pipelines in the open water of the Straits.
- **Legislative Ban on Heavy Crude and Tar Sands** – while the agreement with Enbridge prevents transport of heavy crude under current operating conditions imposed by the federal government, it leaves open the possibility that Enbridge could request changes to those conditions. The legislature can make that ban ironclad.
- **Propane for the Upper Peninsula** – any action must ensure there is an adequate, seamless and reasonably priced supply of propane for U.P. households.
- **Michigan Energy** – Michigan's energy industry, and its associated jobs, must be protected.
- **Creation of the Michigan Pipeline Authority** – an authority should be established that would, among other things, oversee the eventual closure of Line 5 and address related issues, like propane supply and Michigan's other energy needs.

The recently released draft Risk Analysis has confirmed what most expected – a release from Line 5 in the Straits would be a catastrophe, environmentally and economically. That risk cannot be allowed to continue indefinitely. But the Alternatives Analysis demonstrates there are paths to address that risk. And my position remains that the most viable path is a tunnel that would remove the Straits portion of Line 5 from waters of the Great Lakes.

Simply shutting down Line 5 without ensuring a reasonably priced and reliable supply of propane for Upper Peninsula residents, and allowing continued energy production in Northern Michigan, is not a viable option. Even in the best case, it is undisputed that replacing Line 5 will impose hundreds of dollars a year in additional costs on U.P. residents. Likewise, there is no assurance of an alternate delivery system for oil produced in Northern Michigan, and any replacement system would also impose additional costs on Michigan oil producers (according to the Alternatives Analysis for the Straits Pipelines, approximately $2.40 a barrel). Those increased costs will likely cause many oil producers to cease production in Northern Michigan, causing a commensurate loss in Michigan jobs.

Constructing a tunnel in the bedrock under the Straits for Line 5 would preserve the existing systems for propane delivery and oil distribution in Michigan, and, in the words of the Alternatives Analysis, render the possibility of a spill from Line 5 "negligible." A tunnel also provides an opportunity to remove the other utilities (electric and natural gas) that currently run along the bottom of the Straits. As the recent anchor dragging incident in the Straits demonstrates, these wires and pipelines also present risks to the environment and the potential for significant costs to the customers they serve if damaged. Finally, a large infrastructure project like the tunnel would have the added benefit of bringing good paying jobs to Michigan workers.

But such a tunnel must be constructed as quickly as possible. That timeline needs to be compressed as much as possible. In addition, as outlined in my five points, there needs to be an authority or other entity that is singularly focused on and responsible for overseeing the construction of the tunnel, the decommissioning of Line 5, and ensuring that the impacts to U.P. residents and Michigan's energy producers is minimized.

The waters of the Great Lakes define our state's borders, provide jobs and opportunities for tourism and give parents a chance to teach their children to swim in their salt-free waters.

I encourage you to continue working towards a tunnel under the Straits as the best solution to ensure a path forward that protects our waters and residents.

Sincerely,

Bill Schuette

Bill Schuette
Attorney General

WDS/ab

cc: Director Keith Creagh
Director C. Heidi Grether

STATE OF MICHIGAN
RICK SNYDER
GOVERNOR
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
MICHIGAN AGENCY FOR ENERGY
ANNE ARMSTRONG CUSACK
EXECUTIVE DIRECTOR
SHELLY EDGERTON
DIRECTOR

Memorandum

DATE: October 3, 2018

TO: Pipeline Safety Advisory Board Members

FROM: Anne Armstrong Cusack, Executive Director, MI Agency for Energy

SUBJECT: Straits Pipeline Legislation – House Bill 6201(H-5)

The following information provides a summary of House Bill 6201, introduced on June 12, 2018. This summary is provided to assist in your review of the legislation and is not intended to provide a comprehensive overview of the legislation. This is a summary only and nothing in this document should be interpreted as a position statement by the Agency.

On June 12, 2018, Representatives Chatfield, Cole, Allor, and LaFave introduced House Bill 6201 which amends the Natural Resources and Environmental Protection Act. The bill requires straits pipeline operators to file spill prevention plans and spill contingency plans with the state. The legislation also sets up the parameters for reporting releases from straits pipelines and imposes fees and fines for any release of oil or gas from a pipeline or vessel operating within the straits.

On October 3, 2018, the Michigan House of Representatives approved a substitute version of HB 6201 (HB 6201 (H-5)). The following provides a summary of the changes between the introduced version of HB 6201 (detailed in the July 20, 2018 memo to the PSAB) and the H-5 passed by the House.

The H-5:

- Adds a new subsection 3 to section 3111c which requires that, in the event of a release, the person required to report the release meet with representatives from the DEQ, State Police, and MPSC to discuss the nature of the release and response measures that have been, and will be, taken with regard to the release.

- Modifies the fees that are to be paid to the DEQ for review of both the spill prevention and contingency plans by requiring annual payments based on the geographic area covered by the plan rather than a single one-time review fee similarly calculated.

- Requires that the contingency plan include the name and contact information for any contracted spill response organization.

- Requires that the contingency plan include the name and contact information of any subcontractors.

- Adds to the contingency plan requirements a provision that the personnel identified to implement the contingency plan be trained in accordance with Federal Emergency Management Agency protocols by National Incident Management system certified instructors.

- Adds a requirement that the owner/operator of a Straits gas or oil pipeline meet annually with local emergency responders to review the spill prevention and contingency plans for the pipeline.

House Bill 6201 now moves to the Senate for consideration.