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Dept. of Attorney General
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**NATURAL RESOURCES
DIVISION**

✓ Honorable Bill Schuette
Attorney General
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525 W. Ottawa Street
P.O. Box 30212
Lansing, MI 48909

Honorable Dan Wyant
Director
Michigan Department of Environmental Quality
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525 West Allegan Street
P.O. Box 30473
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Dear Attorney General Schuette and Director Wyant:

On behalf of Enbridge Energy, Limited Partnership, I am responding to the follow-up questions from the Michigan Petroleum Pipeline Task Force stemming from our September 2014 presentation to the Task Force.

Thank you for the opportunity to provide further details and answer your questions about the safety and operational reliability of Enbridge Line 5 where it crosses the Straits of Mackinac. Should you have any additional questions or need further information, please don't hesitate to contact me directly.

Sincerely,

ENBRIDGE ENERGY, LIMITED PARTNERSHIP
By Enbridge Pipelines (Lakehead) L.L.C.
Its General Partner

Bradley F. Shamla
Vice President, U.S. Operations

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1. *What materials are used and what is the basic design for Enbridge's pipelines in the Gulf of Mexico?*

Response: Enbridge designs pipelines in the Gulf of Mexico oil and gas transportation that are subject to hurricanes and water depths of up to 7,000 feet versus the maximum 220 foot depth in the Straits of Mackinac. For offshore Gulf of Mexico pipelines, Enbridge uses American Petroleum Institute (API) 5L carbon steel line pipe grade X-65 with a few pipe chemistry enhancements. The pipe is designed in accordance with API RP-1111, which is a guidance document for the design of offshore pipelines. The wall thickness is dependent on water depth, pipe diameter, operating pressure, and possible installation loads and spans, and in general varies from 0.562 inches for a 10" diameter line to 0.938" for 20" diameter line in current water depths (up to 6,990 feet in depth)

2. *What materials are used and what is the basic design for the portions of Enbridge's Line 5 and 6B that cross the St. Clair River between Port Huron and Sarnia?*

Response: The materials used for the portion of Enbridge's Line 5 that crosses the St. Clair River are steel pipe of API 5L Grades X52, 30" diameter, 0.500" minimum wall thickness. The materials used for the portions of Enbridge's Line 6B that cross the St. Clair River between Port Huron and Sarnia are steel pipes of API 5L Grade X60, 30" diameter, 0.750" minimum wall thickness. The design followed applicable Enbridge and industrial standards. A variety of materials and construction techniques can be utilized for pipelines. For more information on Line 5, please refer to the Line 5 Operational Reliability Plan publically available on Enbridge Energy, Limited Partnership's website ([http://www.enbridgepartners.com/WorkArea/downloadasset/17375/Enbridge Line 5 Operational Reliability Plan.aspx](http://www.enbridgepartners.com/WorkArea/downloadasset/17375/Enbridge_Line_5_Operational_Reliability_Plan.aspx)).

3. *What materials and basic design would Enbridge use if it were going to replace the existing Mackinac Straits section of Line 5 with a new pipeline(s)?*

Response: The existing pipeline was over-engineered from a material and design standpoint, relative to the actual needs of the pipeline. Regular diagnostics and operating history confirm that the line is in excellent condition and that replacement is not required. In the hypothetical situation of a replacement, the material and design would be similar to the current installation. A likely material design would be API 5L Grade X60, with very similar properties to the existing design for mechanical protection and support.

4. *Please detail the reasons why enclosing the existing pipelines within another set of "pipelines" in the Straits is not feasible and more protective?*

Response: While the concept of a double wall has added a layer of safety to tankers, a significant number of challenges exist for use of that concept on a pipeline. Pipelines have generally been afforded extra protection through greater wall thickness of the pipe and external protection on the outside of the line, both of which were employed on the Line 5 Straits crossing. We are not aware of any double walled pipelines used for the transmission of oil. They do not give the pipe improved resistance to punctures and failures that the above alternatives offer and they would create numerous integrity problems over time. For instance, it would be very difficult to maintain an even separation between the pipes for a variety of reasons, including different expansion/contraction properties. This would create

the risk that the two pipes would come in contact with each other, thereby creating a corrosion risk and also a risk of mechanical damage. Also, it would not be possible to inspect the outside pipe using in-line inspection tools because the signals would not be able to reach that outer pipe and so it would not be possible to know what its integrity condition is. Further, if repairs would be needed on the inside pipe, it would be additionally complex to reach that pipe.

5. *The addition of new supports was described as an “ongoing program.” Please explain what this means. Does this mean that Enbridge anticipates the need for additional anchors/supports?*

Response: We continually conduct underwater inspections, at frequencies significantly more often than required by federal regulations, to check if additional anchors are needed. After our 2014 project, we confirmed that there were no spans that were greater than 75 feet, which provides a two times safety factor required for a safe span length. The average span length presently is approximately 50 feet, which provides a three times safety margin. The 2014 program identified and installed sufficient engineered supports to exceed this level of safety, reducing average span lengths to 50 feet. We will continue to conduct the underwater inspections every two years and check for any new spans that could be created by erosion or failure of engineered supports and, where required, we will add additional engineered supports.

6. *It was asserted that the Straits pipelines were designed to have sandbag supports. Please explain why the designed sandbag supports are deemed inadequate/obsolete but the pipelines themselves are not?*

Response: Sandbags were the common method when the line was originally installed and for some period afterwards. Sandbags could continue to serve that role today but, we designed anchors to provide a more permanent way of securing the pipe. The anchors are drilled deep into the bed so are not as affected by erosion from the water currents and hence each span repair is less likely to require upkeep. Secondly, the anchors allow a more consistent, engineered installation than what is achievable with sand bags. Regarding the pipeline itself, we know from the many levels of inspections and diagnostics that the line is in very good condition and can continue to safely operate indefinitely so obsolescence is not a factor.

7. *In reference to Slide 11 of your presentation, please confirm that visual inspections are not conducted on the Straits pipeline, and these inspections are only conducted for underground pipelines when a potential anomaly is detected?*

Response: Visual inspection of the Straits is conducted every two years using divers and/or underwater remotely operated camera. During these inspections the pipe is examined for coating damage, debris near or on the pipe, damage to the pipe, and the condition of the supports. As with Slide 11, whenever there is a feature identified by in-line inspection or other survey techniques that requires investigation, then the pipe would be visually examined whether the pipe is on land or under water including the Straits. For more information on Enbridge’s inspection program, please see the responses to questions 8 and 9.

8. *In reference to Slide 15 of your presentation, please explain what portions of Line 5 are “visually patrolled at least 26 times a year,” what a “visual patrol” entails, and how this is conducted in the Straits?*

Response: Enbridge's integrity management program is focused on minimizing the risks and consequences of a potential pipeline failure that could impact populated areas and surrounding environments. Slide 15 references the minimum frequency of aerial and/or ground patrol for the entire Line 5 corridor which includes the aerial surveillance of the Straits. Aerial patrols are performed in an Enbridge aircraft by an Enbridge pilot trained to inspect our right-of-way. Personnel conducting aerial patrols at the Straits are looking for abnormal surface conditions including any signs of surface disturbance, sheen, bank erosion, ice effects, scour and evidence of leaks. In addition Enbridge conducts underwater visual surveillance by Remotely Operated Vehicles (ROVs) every two years to investigate the screw anchors, spans, debris around or in contact with the pipelines, scouring or any other condition that could affect the safety of the pipeline crossings

9. *How often is the interior of the Straits pipelines inspected using In-Line Inspection Tools?*

Response: The Straits crossings have been inspected regularly for many years, utilizing a variety of different technologies. These in-line inspection technologies examine both the interior and exterior of the pipe. The re-inspection interval is dependent on the integrity feature that is being monitored, since different tools are used to inspect for specific features. Since 1998 there have been 11 in-line inspections (ILI) each on both the East Straits line and the West Straits line. Within every five-year interval, at least two different tool technologies are utilized on each line. Those inspections are part of Enbridge's robust, multi-faceted integrity management program.

10. *What decision criteria would be used for determining when a segment of the Straits pipeline is in need of repair and/or replacement?*

Response: Enbridge conducts pipeline repairs as defined within regulations and code. Each type of integrity feature; denting, metal loss and cracking have a specific requirement for acceptance and repair. The requirement is met (and repair is indicated) when measured length and depth parameters exceed engineered values, as well as calculated failure pressures do not meet specific safety margins with respect to the licensed maximum operation pressure (MOP). For example: dents are repaired if they are deeper than 6% outside diameter (OD) and on the bottom-side of the pipe or are deeper than 2% OD. To date, there have been no features requiring repair other than the addition of additional supports of the laterals, demonstrating that the pipeline design has been performing exceptionally well. Replacement for our pipelines occurs when it is more efficient to replace the pipe in comparison to repairs or when there is a constructability challenge that precludes the ability to repair. The pipe across the Straits is in excellent condition with few repairs likely to be needed so replacement is also not needed.

11. *What level of drop in pressure triggers the automatic shut-off valves for the Straits pipelines? Assuming the requisite pressure drop occurred due to an actual leak, what would be the size of the breach in the pipeline(s)?*

Response: Line 5 diverges from a single 30-inch pipeline into two heavy-walled parallel 20-inch pipeline loops located on the north bank of the Straits of Mackinac. The two lines are

called the West Line and the East Line, and the low pressure thresholds that trigger the automatic shutdown sequence are 65 psi and 45 psi respectively.

The calculation required to estimate the breach size required to drop the pressure below the shutdown threshold values is complex in nature and highly dependent on the operating condition of the line before the rupture occurs. The size of the rupture will vary depending on the operating pressure of the line, the location of the rupture relative to the north bank of the Straits, the physical properties of the commodity in the line, and the flow condition (static versus flowing) prior to the breach. In general, the automatic shutdown pressure is below what the normal operating pressure could be during normal operations, and if present would represent a sudden and abnormal condition that would warrant and automatic shutdown.

12. *Assuming the automatic shut-off valves closed correctly due to a leak in the Straits pipelines, but that leak could not be contained, what is the maximum amount of product that would be released from the pipelines?*

Response: Based on the automatic shut-off valves closing correctly, the approximate volume of oil released from a single pipeline between the valves would be 4950 barrels. However, that overestimates the maximum volume out of the pipeline because it does not take into account several factors such as leak location, hydrostatic pressure from the water depth that would restrict escaping product, and the likelihood that product would be trapped in the lateral above the rupture location. Once isolated any residual pressure will displace oil until the pipeline reaches a state of equilibrium where external water pressure would impede oil flowing from the pipeline.

13. *What back-up systems are in place for the automatic shut-off valves, e.g., back-up power supplies or redundant shut-off valves?*

Response: The pipelines enter the Straits immediately downstream of the North Straits Site and exit into Mackinaw Station. The North Straits bank site is equipped with redundant systems that will ensure valve power and communications are available in the event of a main power interruption. Mackinaw Station is equipped with redundant communication systems and has backflow check valves to provide automatic protection in the event of power loss.

14. *Assuming a leak takes place in the Straits pipelines, and any automatic or remote shut-off systems fail, approximately how long would it take Enbridge workers or contractors to manually close the pipeline on both ends of the Straits?*

Response: Enbridge has back-up power generators installed at the valve locations, which makes the scenario posed in the question extremely unlikely to occur. However, in the event that valves could not be controlled at the Straits, other valves would be remotely closed on Line 5, upstream and downstream of the Straits. In addition, our practice is to dispatch staff to site to control any manual valves in the area, which would include closing the valves at the Straits. Such actions would take between 15 minutes to 2 hours depending on the time of day and location of existing personnel.

15. *Assuming the shut-off valves on the Straits pipelines were closed, but a leak was occurring, can Enbridge remove the product that remains in the closed-off section? If so, how would that occur?*

Response: Yes, we would be able to evacuate the majority of the trapped product through operation of the existing pipeline pumps, located on the south side of the Straits. These pumps are used for routine operating purposes, but could be configured to suck out the remaining product in the pipeline in addition to water from the lake. We are also able to install a pipeline “pig” that could be propelled through the pipeline by injecting nitrogen to displace all remaining product from the north side of the Straits to the south side, leaving the compromised pipeline evacuated.

16. *Have you evaluated a worst case scenario leak in the Straits pipelines, i.e., a major rupture and the failure of back-up systems requiring the pipeline to be manually closed-off? If so, what would be the maximum amount of product released into the Straits? What would be the maximum expected clean-up and other costs from such a release?*

Response: In June 2014, Enbridge provided a response to a question posed by Michigan Attorney General Schuette and MDEQ Director Wyant that identified the worst case discharge at the Straits as 8,583 barrels, a number which takes into account pipe elevation as opposed to flat ground elevation, but does not take into account factors set forth in the response to question 12, which would reduce the volume out, making the 8,583 barrel estimate overly conservative. That estimate accurately reflects a worst case discharge that could occur at the Straits in a real world case scenario. The approximate expected clean-up costs from this scenario is estimated to be \$400 Million That is less than the cleanup costs for the 2010 release in Marshall, Michigan due to improvements in emergency response. Specifically Enbridge has developed an Integrated Contingency Plan and Tactical Plan for the Straits that identify response zones to protect and contain a release. We have also implemented an Incident Command System training which allows us to function more efficiently within the National Incident Management System and augments our emergency response equipment.. Costs are also lower due to access to the shoreline of the lake versus a total of approximately 70 miles of left and right descending banks of the Kalamazoo River.

17. *Do you have a spill response plan for addressing a potential spill when there is ice cover?*

Response: Enbridge maintains a detailed PHMSA-approved Integrated Contingency Plan/Emergency Response Action Plan, together with detailed tactical plans which outline response strategies for the Straits. Enbridge also has a Tactical Training Program that includes courses and specifics of ice response and ice-tactics. In addition, spill response tactics for ice-covered conditions are specified in the Enbridge Inland Spill Response Tactics Guide that is utilized across our company’s responders. Enbridge also maintains contracts with Oil Spill Response Organizations (OSROs) that are certified by the U.S. Coast Guard to a daily oil recovery rate. These OSROs would also be activated in ice cover response scenario. Finally, Enbridge conducted a spill response exercise at the Straits with the U.S. Coast Guard in January 2012 which simulated a response effort during ice cover conditions.

18. *Do anchor strikes from freighters or other large ships pose a hazard to the Straits pipeline?*

Response: The Straits pipelines are located in a no anchor zone which is identified in the National Oceanic and Atmospheric Administration (NOAA) navigation charts. There are also lighted “No Anchor Zone” signs near both shores as a public warning. As well, there are several high voltage electric lines that cross the Straits near Line 5, and additionally the water current at the Straits is relatively fast, all of which discourages ships from anchoring near the pipeline. Most importantly, the heavy pipe wall thickness, high ductility, low diameter/wall thickness ratio, and the low operating stresses provide a substantial margin of safety against the anchor strike threat. The likelihood of an anchor strike event occurring is low as evidenced by the absence of damage having occurred in the 60+ years of operation. Enbridge will continue to work with the U.S. Coast Guard and merchant shipping administrations to determine if additional prevention actions can be employed.

19. *How many anchor strikes occur each year? Is there a way to know? Any reporting that occurs?*

Response: The in-line inspection tools can very accurately identify and measure if the pipe is damaged by strikes. As described in Question 18, in 60+ years of operation, there has never been any damage.

20. *Is there a prohibition on dropping or dragging an anchor in the vicinity of the pipelines? If so, is there signage or other information available to boaters that identifies the location of the pipelines?*

Response: The area is strictly prohibited for anchoring. NOAA-14880 Chart identifies the area as a ‘Cable and Pipeline Area’ on the navigation chart. Signage is also in place to alert and warn boaters. For further information, please refer back to the response to question 18.

21. *Does Enbridge have a long term comprehensive outreach and public engagement strategy for the company in Northern Michigan and the UP?*

Response: Yes. Developing and maintaining good relationships with our stakeholders is important to us. Through Enbridge’s public awareness program, we regularly provide pipeline safety information to the people who live and work along our pipeline routes, as well as public officials, emergency responders, school officials, farmers, and excavators. In addition, our community relations and stakeholder outreach engagement plan is designed to increase public knowledge of Enbridge and of our role in moving the energy that fuels daily lives.

22. *Please confirm that no “tar sands” or other heavy crude has been transported through Line 5, and that there are no current plans to convey heavy crude through Line 5.*

Response: Line 5 carries light crude oil and natural gas liquids (NGLs) along 645 miles from the Enbridge Terminal in Superior, Wisconsin across the northern portions of Wisconsin and Michigan to an Enbridge terminal in Sarnia, Ontario. Line 5 has always been a pipeline whose sole purpose was to transport light products. In the 1980s, NGLs and light synthetic crudes were also moved on the line. Line 5 has never moved heavy oil sands crude, and Enbridge can also confirm that there have never been any prior, current, or future plans to move heavy crudes through Line 5.