STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

Application for the Authority to Replace and Relocate the Segment of Line 5 Crossing the Straits of Mackinac into a Tunnel Beneath the Straits of Mackinac, if Approval is Required Pursuant to 1929 PA 16; MCL 483.1 et seq. and Rule 447 of the Michigan Public Service Commission's Rules of Practice and Procedure, R 792.10447, or the Grant of other Appropriate Relief.	Case No. U-20763 (e-file paperless)

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THE MICHIGAN PUBLIC SERVICE COMMISSION STAFF'S INITIAL REOPENED RECORD BRIEF

MICHIGAN PUBLIC SERVICE COMMISSION STAFF

Nicholas Q. Taylor (P81020)
Daniel E. Sonneveldt (P58222)
Amit T. Singh (P75492)
Assistant Attorneys General
Public Service Division
7109 W Saginaw Hwy
Lansing, MI 48917
Telephone: (517) 241-6680

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I. Introduction

Staff files this brief pursuant to the Commission's September 8, 2022 Order in this proceeding. Staff will address the evidence presented in the supplemental reopened record. (MPSC Case No U-20763, 9/8/2022 Order, pp 1–5.) The September 8 Order presents an appropriate summary of the procedural history of this case that Staff incorporates here by reference.

II. Reopened Record

The Commission issued an order on July 7, 2022 that reopened the record in this case (July 7 Order). The Commission explained additional evidence was required for prongs (2) and (3) of its Act 16[1] analysis. (July 7 Order, pp 27, 47.)

A. Information Required for the Commission to Complete Prong (2) of its Act 16 Analysis

In the July 7 Order, the Commission found the record contained a variety of evidence regarding whether the proposed project was designed and routed in a reasonable manner. However, based on Enbridge's stated purpose for the project, the Commission specifically found that it must be able to determine whether the project is:

> designed and routed in a manner that alleviates the many complications of maintaining and ensuring the safety of the dual pipelines and that the Replacement Project will significantly reduce or eliminate the environmental risk posed by the dual pipelines to the Great Lakes, which is Enbridge's stated purpose for the Replacement Project. [July 7 Order, p 27.]

[1] Public Act 16 of 1929, MCL 483.1 *et seq*.

The Commission noted the existing evidence addressing prong (2) that was included in the initial evidentiary phase of this case. (July 7 Order, pp 9–24.) But the Commission also identified additional documents and information required for it to complete prong (2) of its Act 16 analysis. (*Id.* at 25–27.)

Specifically, the Commission requires various documents and information related to the agreements between Enbridge and the State of Michigan, related reports, plans, pipeline safety and integrity measures, and inspection information regarding the condition of the current dual pipelines. (*Id.*) The Commission instructed Enbridge to file the information and documents "and any other relevant evidence regarding the current condition, safety, and maintenance and the future safety and maintenance of the dual pipelines because this evidence 'is necessary for the development of a full and complete record.' " (*Id.* at 27.) Enbridge sponsored Exhibit A-28 containing responsive materials. (Exhibit A-28.) After reviewing Exhibit A-28, Staff identified and sponsored Exhibit S-33–a report entitled "Evaluation of Identified Underwater Technologies to Enhance Leak Detection of the Dual Line 5 Pipelines"–which is also responsive to the Commission's request[2] for additional evidence on leak detection and other relevant evidence regarding the current dual pipelines. (July 7 Order, p 25–27; Exhibit S-33.)

[2] Enbridge was directed to file additional evidence regarding prongs (2) and (3) of the Commission's Act 16 analysis, including ten specific topics related to prong (3). Staff views these as mandatory directions from the Commission but uses the term "requests" here for consistency with the terminology used throughout the reopened record. (July 7 Order, pp 27, 46–47.)

B. Information Required for the Commission to Complete Prong (3) of its Act 16 Analysis

In its July 7 Order, the Commission explained that, in order to complete prong (3) of its Act 16 analysis, it must determine whether the project meets or exceeds current safety and engineering standards. (July 7 Order, pp 27–28.) However, the Commission found that the initial evidentiary record lacked essential evidence needed to make this determination. (*Id.*) The Commission identified evidence addressing prong (3) that had been, and had not been, included in the initial evidentiary record and directed Enbridge to file evidence on 10 specific topics. (*Id.* at 46–47.) The Commission stated that parties were "also free to submit evidence with other relevant information regarding Enbridge's leak detection system and shutdown process." (*Id.* at 47.)

1. Additional evidence was submitted to the reopened record regarding the pipeline's integrity and ability to meet or exceed safety and engineering standards.

The ten specific topics related to prong (3) of the Commission's Act 16 analysis that the Commission identified include topics regarding the likelihood of release from the pipeline, the tunnel design's ability to meet or exceed safety standards, and the pipeline design's ability to meet or exceed safety standards. (July 7 Order, pp 46–47.) Pursuant to the Commission's order, parties also submitted other evidence relevant to these topics.

a. The reopened record includes evidence addressing the likelihood of a release from the pipeline and the probability of failure.

There are two primary sources Enbridge submitted in the reopened record that address the likelihood of a release from the pipeline. The first is Enbridge's response to the Commission's eighth request for prong (3) information, which sought a description of the data and methodology used to calculate the asserted one in one million likelihood of a release figure presented by Enbridge in the initial evidentiary record. (July 7 Order, p 46.) In responding to the eighth request, Enbridge discussed the achievable integrity performance for the project. (Exhibit A-32.) The second source Enbridge provided in the reopened record addressing the probability of release, is the Probability of Failure ("POF") Analysis prepared by DNV GL USA, Inc. ("DNV") and sponsored by Enbridge witness Godfrey. The analysis considered the potential for pipeline failure that could lead to release within the tunnel. (Exhibit A-29, p 3.)

Enbridge's response to the Commission's eighth request discusses Enbridge's experience with modern pipe installation and states that "historical experience demonstrates that better than 1E-05/km-yr failure rate can be achieved." (Exhibit A-32, p 1.) The response also states that "[p]robabilistic modelling of typical potential flaws that might exist over the life of the replacement segment demonstrates that a likelihood of release of 1E-06 or below can be achieved." (*Id.*) The response further supports this model by including a description of the four releases that have occurred since 2000 from transmission pipe installed post-2000 and explains that Enbridge finds the primary causes of those releases (ground

movement and third-party damage) unlikely to apply to the proposed project. (*Id.* at 1–2.)

In order to supplement these historical observations, Enbridge's response to the eighth request states probability of failure of hypothetical applicable threats were also calculated. The response notes that this was not intended "to estimate the actual probability of a failure of the pipe within the tunnel, rather to obtain an upper bound estimate of the probability of a failure in a conservative scenario where there are hypothetical features present in the line considering uncertainties." (*Id.* at 2.) The response states that actual probability of failure would be lower in real operation given regular in-line inspections, visual inspections, and lower actual maximum operating pressure. (*Id.*) The response discusses the calculated ability to maintain a probability of failure at or below 1E-06 for both: 1) dent and 2) corrosion and crack features. (*Id.* at 3.)

Enbridge witness Godfrey sponsored the second source Enbridge provided in the reopened record addressing the probability of release: the POF Analysis, which is discussed further in Section II.B.3.b. below. On rebuttal, witness Godfrey asserts that the "DNV POF Report provides the Commission with the failure probability analysis for the Line 5 Replacement Segment so that the Commission may make the safety comparison between the dual pipelines and the Line 5 Replacement Segment located within the tunnel." (17 TR 2445–46.) This POF Analysis analyzed pipeline failures from what the analysis describes as "publicly available pipeline data." (Exhibit A-29, p 3.) This data comes from sources such as PHMSA and the

Bureau of Ocean Energy Management. (*Id.* at pp 8–9.) Several different probabilities were developed related to five different scenarios: Scenarios 1 and 2 examined external corrosion under disbonded coating; Scenario 3 examined long seam defects; Scenario 4 addressed girth weld defects; and Scenario 5 addressed defects, dents, and deformation related to construction. (Exhibit A-29, pp 8–11.) The analysis concluded that the highest failure probability would be 3.77×10^{-6} failures/mi/year and would be expected to be further reduced by Enbridge's mitigation measures to 3.77×10^{-7} failures/mi/year, an order of magnitude less. (Exhibit A-29, p 11.)

Staff sent a discovery request to Enbridge seeking, in part, a justification that Enbridge's mitigation measures would result in a reduction in the probability by an order of magnitude less, as claimed in the POF Analysis. (Exhibit S-31, p 3.) Enbridge's response acknowledged that quantitative risk assessments do "not fully account for continuous improvement of pipeline designs, materials, and operating practices" but that "it is appropriate to apply factors that align the results of the data analysis with the expected performance characteristics of the new pipeline." (Exhibit S-31, pp 3–4.) Enbridge further explained that "[t]he order of magnitude reduction factor was chosen by DNV subject matter experts based on the unique design attributes of the Line 5 Replacement Segment." (*Id.* at 4.) Staff considers this to be a reasonable assumption for a risk assessment at this time, pending assumptions derived from future integrity assessments during operation and maintenance.

The reopened record does not indicate a standard that sets a specific acceptable probability of release from the pipeline, and Staff does not read the July 7 Order as necessarily seeking one. However, the Commission has made clear that it must be able to evaluate the reduction in environmental risk from the current dual pipeline and that the project meets or exceeds current safety and engineering standards. (July 7 Order, pp 8, 45.) In addition to the evidence evaluating the probability of release from the pipeline, Staff would also note the other evidence in the reopened record addressing the pipeline design's ability to meet or exceed engineering and safety standards, including Staff witness Chislea's recommendations for low-hydrogen welding and testing procedures that exceed applicable standards. (*See* Section II.B.1.b.)

b. **The reopened record indicates the pipeline will be designed to meet or exceed the safety standards, but it should also incorporate Staff's recommendations concerning X-70 pipe and girth weld procedures.**

Enbridge has indicated that it intends to meet or exceed safety recommendations concerning the threat of catastrophic failures related to X-70 pipe and associated girth welds. (17 TR 2450–51.) Potential threats of pipeline failure related to the production of X-70 pipe were identified by BMIC witness Kuprewicz. (17 TR 2631–34.) In his direct testimony in the reopened record, witness Kuprewicz stated that "[t]he risk of failure at the girth welds or heat affected zones in the X-70 pipeline should be addressed through sound Integrity Management analysis and procedures that go well beyond the API Std 1104 for girth welding and heat

treatment of pipe, not dismissed with a probability analysis." (17 TR 2631.) In response, Staff witness Chislea reiterated his recommendations from the initial evidentiary record in this case that:

> for all mainline girth welds, Enbridge should be required to develop low-hydrogen welding procedures and qualify them per the requirements found in 49 CFR 195.214. These procedures should include pre-heat requirements prior to starting welding and inter-pass temperature requirements. In addition, the non-destructive testing of the mainline girth welds should include automatic phased array ultrasonic testing methods. Staff's position is that if these recommendations are met, post-heat treatment is not necessary. [18 TR 2812.]

Witness Chislea notes that these recommendations "exceed procedures required by API STD 1104." (*Id.*)

Enbridge witness Godfrey responded to witness Kuprewicz's testimony that Enbridge has not taken this threat to the girth welds or heat affected zones seriously. (17 TR 2450–51, 2632.) In rebuttal testimony, witness Godfrey testified to multiple reasons why he disagreed with this assertion, stating:

> First, Enbridge was a sponsor of the Joint Industry Report (BMC-43) which [witness Kuprewicz] relies upon to discuss the issue. An Enbridge subject matter expert chaired the committee which produced the Joint Industry Report and the recommendations to address this issue. Second, the Joint Industry Report states that Enbridge has already implemented those recommendations. The Replacement Project is designed to reduce the risk of girth weld and HAZ failure by simplifying weld design and minimizing pipe strain. Far from not taking the issue seriously, Enbridge was and continues to be involved in identifying and addressing the issue. [17 TR 2450–51.]

In addition to Enbridge's stated intentions to meet safety recommendations, another key factor reducing the likelihood of failures at girth welds and heat affected zones is that the documented failures with X-70 pipe that witness

Kuprewicz raises are not applicable to this situation. Mackinac Straits Corridor Authority ("MSCA") witness Cooper notes that he previously testified in his January 24, 2022 Sur-Sur-Surrebuttal testimony that "the issues raised in the Joint Industry Report about girth welds in Grade X-70 pipe are not applicable to the Enbridge pipeline design in the Tunnel." (17 TR 2595.) He outlines two reasons:

> First, the replacement pipe segment in the Tunnel will not experience the same longitudinal strain as a pipeline buried in the ground . . . Second, as set forth in the Joint Industry Report (BMC-43), Enbridge states that it has already implemented the Joint Industry Report's recommendations intended to eliminate under-matched girth welds and minimize weld heat-affected zone softening. [17 TR 2595–96.]

Enbridge's adoption of the recommendations from the Joint Industry Report demonstrates the design's compliance with girth weld integrity standards. Additionally, Staff's welding and testing procedures, if adopted by the Commission, will exceed the standards of API STD 1104, which are incorporated into federal regulation 49 CFR 195.214 by reference. (18 TR 2812; 49 CFR 195.214.)

2. Additional evidence was submitted to the reopened record regarding the tunnel design's ability to meet or exceed safety and engineering standards.

The Commission directed Enbridge to file evidence regarding the tunnel design's ability to meet or exceed safety standards, specifically with respect to the ventilation system.[3] (July 7 Order, p 46.) Pursuant to the Commission's July 7

[3] Other prong (3) information requests in the July 7 Order relate to design elements of the tunnel, such as the feasibility of designing electrical equipment within the tunnel to a more stringent standard and the procedure for replacement of tunnel segments. (July 7 Order, pp 46–47.) These topics are addressed separately below.

Order, parties also filed additional evidence in the reopened record related to this topic.

a. The reopened record shows that the ventilation system for the tunnel was designed to meet or exceed relevant safety standards.

The Commission, in its fourth request for additional prong (3) information, directed Enbridge to file additional information pertaining to the "data and the methodology demonstrating that the ventilation system planned for the Replacement Project is adequate for the diameter of the tunnel." (July 7 Order, p 46.) Enbridge's response to the Commission's fourth information request explains that the ventilation system will not be active during normal operations. The system would only be activated while maintenance personnel are inside the tunnel to provide breathable air while in the confined space. (Exhibit A-31, p 4.)

With respect to underground tunnels, Enbridge explains that OSHA regulations require: (i) a minimum of 200 cubic feet of fresh air per minute ("CFM") be supplied for each person underground, and (ii) a linear velocity of air flow in the tunnel bore, in shafts, and in all other underground work areas to be at least 30 feet per minute ("FPM"). (Exhibit A-31, p 4 (citing 29 CFR 1926.800(k)(2)–(3).)) Enbridge's response to the Commission's fourth prong (3) information request explains that the ventilation system was designed according to the ASHRAE Handbook to achieve the minimum critical velocity of 550 FPM to prevent back-layering of combustion products produced by an assumed fire. To meet this velocity, the system has been sized for a nominal capacity of 183,000 CFM, which exceeds the OSHA requirements. (Exhibit A-31, p 4.) Enbridge provided the calculations

used to develop this design in response to a discovery request from Staff. (Exhibit S-31, p 10–11.) This additional evidence indicates the ventilation system for the tunnel was designed to meet or exceed relevant safety standards.

b. **Additional evidence was presented regarding the concrete's ability to withstand the effect of a high-pressure air impact from an explosion.**

Information pertaining to the concrete's ability to withstand pressure from an explosion was not specifically included in the list of ten prong (3) information requests in the July 7 Order. However, the order does note that the record lacks evidence on the topic and multiple parties filed testimony regarding this topic. (17 TR 2405–06; 18 TR 2671, 2676–78; Exhibit A-35.)

BMIC witness O'Mara filed testimony regarding this topic in his direct testimony. (18 TR 2671, 2676–78.) Although his testimony primarily focuses on damage that could be caused by a fire and does not focus on the technical specifications of the tunnel's ability to withstand an explosion, witness O'Mara does offer his general opinion that an explosion could damage the concrete tunnel liner, pipeline, and other facilities in the tunnel. (18 TR 2671.) Finally, witness O'Mara submits additional testimony that it is his opinion, that if an explosion occurred, product would escape the tunnel and ultimately reach the Straits of Mackinac. (18 TR 2679–82.)

In rebuttal of witness O'Mara's testimony, Enbridge witness Dr. Ferrara sponsored Exhibit A-35, which is a Tunnel Explosion Computational Fluid Dynamics Study that assessed "the severity (in terms of blast overpressures) of a

hypothetical explosion occurring as a result of a release of Natural Gas Liquids (NGLs)." (Exhibit A-35, p 5.) The study modeled four scenarios to determine what it describes as a conservative, worst-case explosion scenario. (*Id.*) The analysis concludes that the report's worst-case scenario would generate an overpressure of 0.386 barg and notes that the tunnel design would allow for overpressure of 3 barg where overburden is least and overpressure of 29 barg where overburden is greatest. (*Id.* at 12; 17 TR 2406.) Witness O'Mara, in surrebuttal testimony, contends that the explosion study is unreliable for a number of reasons, however, Staff does not agree with his assertion regarding the report's value for addressing this topic. (*See* 18 TR 2702.)

One of witness O'Mara's primary concerns appears to be that the study does not account for the possibility of a fire. (18 TR 2702.) Yet, addressing the possibility of a hypothetical explosion event coinciding with a fire was not the intent of the report. (Exhibit A-35, p 5.) The July 7 Order already provided a description of the evidence on the record pertaining to fire damage, and additional evidence has been submitted since the record was reopened. Staff does not agree with the assertion that Exhibit A-35 has "no value as an assessment of the worst-case scenario for a release and explosion in the" tunnel project simply because it is focused on the impact of an explosion on the concrete. (18 TR 2702.) Moreover, Staff does not take the underlying assumption that a full bore rupture would inherently constitute the worst-case scenario for granted. (*See* 18 TR 2703.) For example, there is already evidence on the record regarding the existing dual

pipelines that indicates the outcomes from a 3-inch hole release could be more severe than those from a full-bore rupture. (*See* ELP-24, p 253.)

Even if the chain of events described by witness O'Mara occurred, the record indicates that the tunnel design would effectively serve to protect from product reaching the Straits of Mackinac. The Commission already referenced the evidence presented on this topic in the initial phase of this proceeding. (July 7 Order, pp 33–37.) Notwithstanding, witness O'Mara's testimony includes multiple assumptions that are not supported by the record, including the assumption that if the pipeline fails, product will be discharged at the maximum operating pressure of 1440 psi. (18 TR 2680.) The normal operating pressure of the replacement pipeline segment will be approximately 480 psi, not 1440 psi. (17 TR 2458.) Moreover, the evidence on the record indicates that the pressure inside the tunnel and against the surrounding geology could not match the pressure within the pipeline and overcome the hydrostatic pressure unless the pipeline continued to operate even after the tunnel filled with product. (Exhibit S-16, pp 2, 5–6.) The record indicates this would require at least two full days of continued pipeline operation for this to become possible. (17 TR 2459; Exhibit S-16, pp 5–6.)

Staff further posits that the report in Exhibit A-35 is significant because it shows the anticipated pressure from an explosion is approximately seven times less than that which the tunnel is designed to withstand at areas with the lowest overburden pressure, near each end of the tunnel. (Exhibit A-35, p 12; 17 TR 2406.) In areas near the bottom of the tunnel (i.e., near the midway point of the tunnel

path), where witness O'Mara points out crude oil and natural gas liquid vapors are most likely to accumulate, the tunnel is designed to withstand approximately 70 times the blast pressure that was modeled. (15 TR 2092–93; 18 TR 2702.) Even considering potential uncertainties with the explosion study as purported by witness O'Mara, Exhibit A-35 demonstrates there is a significant factor of safety in what the tunnel can withstand while preserving structural integrity. Released product would also remain within the tunnel and could be recovered. (15 TR 2093.)

Ultimately, the reopened record indicates the tunnel is designed such that the possibility of an explosion occurring that could cause damage is remote, and that the design has the ability to limit the consequences of such a scenario. As with any engineering project, the applicable standards and design cannot completely eliminate the possibility of all conceivable scenarios. (*See* 17 TR 2589 (witness Cooper discussing how 49 CFR Part 195 cannot anticipate every situation encountered in pipeline design and construction.)) In this case, the current design appropriately mitigates the likelihood and consequences of an explosion and is consistent with engineering and safety standards.

c. **The additional evidence supports the concrete's ability to withstand a high-intensity fire.**

The July 7 Order noted that Enbridge provided evidence that the precast concrete tunnel lining ("PCTL") is designed to resist spalling during a fire. (July 7 Order, p 45.) In the reopened record, witness O'Mara provided additional testimony regarding his opinion that while an explosion can cause considerable damage, a fire

is more likely to cause widespread failure of the tunnel liner and lead to total collapse of the tunnel than an explosion. (18 TR 2671.) Witness O'Mara provided examples of fires that have occurred in other tunnels in the past. (18 TR 2671–73.) As discussed in more detail above, witness O'Mara also reiterated his concern regarding a fire in the tunnel in his surrebuttal testimony. (18 TR 2702.) In his rebuttal testimony, Staff witness Adams notes that all of the examples provided by witness O'Mara are tunnels built before the year 2000. The proposed project in this case incorporates the advances in analysis and design considerations for large fire events for tunnel lining design that were not in practice prior to 2000. (17 TR 2570–71.) Specifically, witness Adams refers to the inclusion of polypropylene fibers into the concrete mix design for the tunnel lining, which has been found beneficial in protecting against spalling. (*Id*.) Witness Adams explains that the Line 5 Tunnel has been designed for the Rijkswaterstaat ("RWS") fire event, which is the current "standard-of-practice" for tunnel design. (17 TR 2570, 2577, 2583.)

Witness O'Mara also suggests that Enbridge should incorporate a Fixed Fire Fighting System ("FFFS") within the tunnel. (18 TR 2674.) Witness Dennis explains the rationale for why an FFFS is not appropriate for the proposed tunnel. The two main reasons are that that the risk of a fire is low, and that the tunnel is a confined space with restricted access by humans. (15 TR 2091–92.) In short, an FFFS would increase the amount of time people would need to be in the tunnel. (*Id.*)

3. Additional evidence was submitted to the reopened record regarding the electrical equipment and risk of fire or explosion.

In the ninth request for additional prong (3) information, the Commission directed Enbridge to file information regarding the "feasibility of designing the electric equipment in the tunnel to a more stringent standard, such as Class 1, Division 1." (July 7 Order, p 46.) The Commission noted that the record included evidence on the electrical equipment and risk of fire and/or explosion. (*Id.* at 37–41.) Nonetheless, additional evidence was also submitted on this topic in the reopened record by multiple parties. Staff discusses the feasibility of exceeding the OSHA standards as well as the additional evidence regarding the risk of fire or explosion in turn below.

a. Staff supports a Commission recommendation to exceed the minimum OSHA standards for certain components of the design as discussed below.

In response to the ninth request for information regarding the electrical equipment, Enbridge stated that designing the equipment to the more stringent Class 1, Division1 standard:

> (1) is inconsistent with the NEC, (2) may not be feasible, and, (3) more importantly, would create other safety concerns that are inconsistent with the design philosophy of the tunnel. [Exhibit A-31, p 6.]

A Class 1, Division 1 location is a location:

> (1) In which ignitible concentrations of flammable gases or vapors may exist under **normal operating conditions**; or (2) In which ignitible concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) In which breakdown or faulty operation of equipment or processes might release ignitible concentrations of flammable gases or vapors, and might also

> cause simultaneous failure of electric equipment. [29 CFR 1926.449 (emphasis added).]

A Class 1, Division 2 location includes a location:

> In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases **will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture** or breakdown of such containers or systems, or in case of abnormal operation of equipment. [*Id.* (emphasis added).]

In response to a discovery response from Staff, Enbridge indicated that it has not yet acquired the equipment that will be located within the tunnel. As such, Enbridge stated that it cannot yet make a precise comparison between the components that would be larger and bulkier if they were to adhere to the more stringent Class 1, Division 1 standard. (Exhibit S-31, p 13.) The response also indicates that meeting this more stringent standard for certain equipment, such as the Tunnel Service Vehicle, may never be feasible. (*Id.*)

Staff recognizes that the proposed project appears to meet the definition of a Class 1, Division 2 location in which flammable liquids and gasses are handled, but will normally be confined within the pipeline, unless there is an "accidental rupture" or other abnormal operation of equipment. (Exhibit A-31, p 6.) However, the reopened record also indicates there may be opportunities to design to the more stringent Class 1, Division 1 standard when finalizing the design. (Exhibit S-31, p 13; 16 TR 2187.) If the application is approved and the Commission deems it appropriate, Staff supports a Commission recommendation that certain equipment be designed to the more stringent Class 1, Division 1 standard to the extent such

equipment is feasible, beneficial,[4] safe, and permitted by the agreements and other permitting authorities governing the project.

b. The additional evidence regarding the risk of fire or explosion indicates the project is designed to minimize the likelihood of fire or explosion.

The Commission noted the evidence in the initial evidentiary record regarding the risk of fire and explosion in the tunnel. In the reopened record, Enbridge sponsored a POF Analysis[5] prepared by DNV, which utilized a Failure Modes and Effects Diagnostic Analysis ("FMEDA") risk assessment. The FMEDA risk assessment included looking at threat categories that could result in the release of product inside the tunnel with potential for forming an explosive mixture and creating the potential for fire or explosion. (Exhibit A-29, pp 19–52.) The report included an analysis of the probability of ignition, assuming an undetected leak achieved the required vapor concentration at the same time and location as an equipment failure that could result in ignition. (Exhibit A-29, p 16–17.) The DNV POF Analysis ultimately estimated "no greater than 3.77×10^{-7} failures per year per mile and the probability of ignition is 5.93×10^{-9} events per year for the four-mile [tunnel project]." (*Id*. at 17.)

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[4] Staff recognizes that technical feasibility should not be the only consideration. For example, it may be possible to design components to the Class 1, Division 1 standard, but the benefits may not outweigh other negative design, construction, or operational effects.

[5] Based, in part, on the POF Analysis, DNV also prepared a Tunnel Explosion Computational Fluid Dynamics Study, which ultimately modeled the overpressures expected from a hypothetical explosion and which is discussed in more detail above. (Exhibit A-35; *See* Section II.B.2.b.)

BMIC witness Kuprewicz addressed the DNV POF Analysis sponsored by witness Godfrey, as well as testimony of Enbridge witnesses Dennis and Bott, by stating that "all assign a numeric probability to various events that could cause a pipeline failure, fire, and explosion." (17 TR 2622.) While witness Kuprewicz recognizes that "federal regulations do allow an operator to use quantitative risk assessment as a tool in its Integrity Management program to manage risks,"[6] he takes issue with Enbridge's "assignment of probability estimates to known, identified risks during a permitting process" and states that "the federal regulations do *not* permit an operator to use quantitative risk assessment to conduct a probability analysis that dismisses known risks as highly unlikely and essentially suggests that the risks can be ignored." (17 TR 2622, 2626 (emphasis in original).) Witness Kuprewicz also expressed concern with the use of PHMSA data for purposes of conducting a probability analysis during the permitting process and the selection of data, which witness Kuprewicz describes as "cherry-picking." (17 TR 2627–28.)

MSCA witness Cooper disagrees with witness Kuprewicz's assessment that Enbridge is minimizing the engineering risks of the proposed tunnel project by assigning what witness Kuprewicz describes as "misleading numeric probability values." (17 TR 2622, 2592–97.) Witness Cooper also disagrees with witness

[6] Staff witness Chislea noted that witness Kuprewicz acknowledges the role of quantitative risk assessment in federal integrity management regulations and provided Staff's understanding of those regulations, which are administered by the Pipelines and Hazardous Materials Safety Administration ("PHMSA"). (18 TR 2809–11.)

Kuprewicz's assertion that witness Godfrey "cherry-picked data to support his conclusions." (17 TR 2594–95.) While the DNV POF Analysis does not appear to be directly responsive to one of the ten specific requests for additional prong (3) evidence, Staff recognizes the relevance to the July 7 Order and notes that findings showing an explosion is a relatively low-probability event does not, on its own, equate to ignoring a risk. (*See* July 7 Order, pp 8, 46–47; 17 TR 2626.)

BMIC witness O'Mara also testified that groundwater entering the tunnel containing methane could be a source of an explosion within the tunnel during operation of the pipeline. (18 TR 2675–76.) To support this idea, witness O'Mara references that, per Enbridge's Geotechnical Data Report, methane was found in 19% of the groundwater samples tested that that methane is likely present in additional areas that were not tested. (18 TR 2677.) Witness O'Mara testified that "methane exposed to an ignition source will ignite between a concentration of 5 to 15 percent methane in air." (18 TR 2676.) On rebuttal, Staff witness Daniel Adams[7] sponsored testimony and a memorandum analyzing the potential for an explosion event from naturally occurring methane. This analysis used a lower explosive limit ("LEL") of 5%, which is consistent with the conservative ignition concentration cited by witness O'Mara. (17 TR 2572–73; 18 TR 2676; Exhibit S-37, p 1.)

[7] Staff witness Daniel N. Adams is a tunnel engineer and CEO of Delve Underground (formerly known as McMillen Jacobs Associates). (17 TR 2569.)

By accounting for both the allowable leakage rates included in the joint specifications developed by Enbridge and the MSCA, and the methane data in the Geotechnical Data Report (Exhibit MM-4), witness Adams concludes that, using conservative assumptions, it would take hundreds (if not thousands) of years[8] to reach methane concentrations necessary for ignition. (17 TR 2572–73; Exhibit S-37, p 3.) On cross examination, there were several questions asked regarding the quality and depth of the samples in the Geotechnical Data Report, upon which Exhibit S-37 is based. (*See* 17 TR 2528–31, 2536; *See also* 18 TR 2756–58.) While Staff did not submit testimony addressing the adequacy of the Geotechnical Data Report samples, it does note that witness Adams' sponsored analysis assumed the highest recorded maximum measured methane concentration and also incorporated several conservative assumptions throughout the analysis. (Exhibit S-37.) The conservative assumptions used in preparing Exhibit S-37 include assuming that: (1) no tunnel ventilation occurs, (2) all inflows contain the maximum methane concentration detected along the tunnel alignment; (3) all dissolved methane is released into the tunnel atmosphere; and (4) methane would accumulate in only 5% of the overall tunnel length. (17 TR 2572–73; Exhibit S-37, p 1.) The calculated durations needed to reach LEL in Exhibit S-37 were based on these conservative assumptions and, as witness Adams concludes, "are well beyond the design life of the tunnel." (17 TR 2573.)

[8] The calculations suggest it would require between approximately 800 and 2,400 years for methane to reach the LEL in the tunnel, depending on the assumed inflow rate. (17 TR 2572–73; Exhibit S-37, p 3.)

Finally, witness O'Mara also raises the possibility of methane being introduced into the tunnel "during the excavation of saturated rock and sediment by the tunnel boring machine." (18 TR 2675.) While Enbridge does not expect methane to exist at concerning levels, witness Dennis testified that the tunnel boring machine "will be equipped with monitors to detect methane" in accordance with OSHA requirements. (15 TR 2090.) Enbridge witness Dr. Vitton also testified in response to the concerns witness O'Mara raises with respect to methane. Witness Vitton disagrees that "methane present[s] a risk of an explosion during either the construction or operation of the tunnel as claimed by Mr. O'Mara" and testifies that, under the National Institute for Occupational Safety and Health standards for methane, the detected levels of methane in the project area fall under the "No Immediate Action" levels of those standards. (17 TR 2465, 2467–68.)

c. The reopened record now contains additional information on the procedure for repair or replacement of PCTL segments.

In its tenth information request, the Commission asked for information regarding the procedure for repair or replacement of PCTL segments in the event of severe cracking or acute damage from a high-intensity fire or explosion. (July 7 Order, p 47.) The Commission also asked for information on how repair or replacement procedures "might affect the Line 5 pipe segment within the tunnel." (*Id.*)

Enbridge responded to the tenth information request by stating that, in the unlikely event of a high-intensity fire or explosion, there would be a detailed

inspection of the tunnel lining to identify the need for any repairs or replacement of PCTL segments. (Exhibit A-31, pp 8–9.) Enbridge explained that the procedures would be developed based on the particular facts of the situation and in accordance with the Tunnel Operation and Maintenance Plan to be provided to the MSCA. With respect to methods of repair, Enbridge responded they would be the same methods used during the normal maintenance of the tunnel. (Exhibit A-31, p 8.)

Enbridge also explained the plan to conduct routine inspection of the tunnel as part of normal maintenance and that it has developed procedures to repair PCTL segments "in accordance with ACI 546R-14 Guide to Concrete Repair and ACI 546.3R-14 Guide to Materials Selection for Concrete Repair." (*Id.*) The response goes on to explain specific procedures that will be included in the repair methods. In response to a Staff discovery request, Enbridge further explained:

> [R]epair or replacement procedures for the tunnel will have no effect on the operations, safety, and maintenance of the Line 5 replacement segment. All repair and replacement procedures will be undertaken based on the facts and circumstances then existing and at all times consistent with the safety of the environment, the public, the maintenance personnel and the Line 5 replacement segment. [Exhibit S-31, p 14.]

Enbridge subsequently clarified that this response was meant to indicate "that Enbridge will not undertake repairs or replacement of the tunnel in a manner that could impair or adversely affect the safe operation of the Line 5 replacement segment." (Exhibit S-32, p 2.) Enbridge also confirmed there could be scenarios in which the Line 5 replacement segment would be shut down temporarily to repair or replace portions of the tunnel. (Exhibit S-32, pp 1–2.) Enbridge explained that this

would occur any time the circumstances warrant temporary shutdown in order to safely conduct the repair or replacement. (*Id.*) Finally, Enbridge notes that repairs and replacements will be conducted consistent with the requirements of PHMSA, the Tunnel Agreement, and the eventual lease with the MSCA. (*Id.* at 2.)

4. The July 7 Order reopened the record for additional evidence regarding the leak detection design and shutdown procedures.

In the July 7 Order, the Commission directed Enbridge to file a variety of information related to the project's leak detection design and shutdown procedures. (July 7 Order, p 46.) Enbridge filed responses to these requests, which are discussed in turn below.

a. The reopened record now contains additional information about the leak detection system.

Several information requests in the July 7 Order directly related to recommendations referenced by witness Kuprewicz pertaining to leak detection and shutdown procedures. (July 7 Order, p 44.) The Commission's first, second, and third prong (3) information requests specifically pertain to the design of the leak detection system. (*Id.* at 46.) Enbridge's response to the Commission's first request summarizes that the design of the CPM system consists of three methods, providing overlapping leak detection capabilities: the Material Balance System, the Rupture Detection System, and a 24-hour alarm automated volume balance system. (Exhibit A-30, pp 1–2.) Additionally, Enbridge notes that complementary leak detection systems include controller monitoring, line balance calculations, visual surveillance,

automated pressure deviation system, and external sensor-based leak detection. (*Id.* at 2–3.) Witness Philipenko describes how the systems function in his rebuttal testimony, specifically that the variety of approaches ensures there is not reliance on any one technology or human factor. (16 TR 2259–62.) Witness Philipenko also details the testing that the CPM system undergoes. (16 TR 2260–61.)

Enbridge's response to the Commission's second prong (3) information request provides detail regarding the models, locations, and quantity of gas and liquid hydrocarbon detectors within the tunnel. (Exhibit A-31, pp 1–2.) Three hydrogen sulfide detectors and three gas hydrocarbon detectors will be located at nineteen separate locations in the tunnel. Each detector will operate independently, and the system will function on a voting basis to avoid false alarms. (*Id.* at p 2.) Three liquid hydrocarbon detectors will be placed at four locations. In the event that a leak alarm is generated, Enbridge's Control Center would initiate an investigation and shut down the pipeline if unable to rule out the possibility of a release within ten minutes. (*Id.*) Enbridge further described the rationale for the selected locations for the gas detectors and provided a schematic showing the locations in a discovery response to Staff. (Exhibit S-32, pp 3–4.)

Enbridge's response to the Commission's third prong (3) information request explains that the gas detectors will be set to detect a threshold level of 20% of the LEL. (Exhibit A-31, p 3.) If the threshold is reached, the Control Center would initiate a response that includes evacuating any personnel within the tunnel, ensuring the ventilation system is deactivated immediately or once any personnel

are evacuated, shutting down the pipeline, and sealing the airlock doors on each end of the tunnel. (*Id.*) Staff requested additional information regarding technical aspects of the gas detectors with respect to the ability to detect gas. (Exhibit S-32, p 5.) Enbridge's response explains that the detectors can detect multiple types of flammable hydrocarbon vapors, however, they will be calibrated to detect propane as it is similar to the products transported on Line 5. Although calibrated for propane, other gases will be subject to detection. Enbridge explains that the 20% threshold is an industry standard and provides a sufficient safety factor to account for minor variances in product types or inaccuracy of the detectors. (*Id.* at 6.) The liquid hydrocarbon detectors can detect numerous products and any presence will trigger an alarm within minutes depending on temperature (approximately 6–8 minutes at 68 degrees Fahrenheit). (Exhibit S-32, p 7.) Witness Philipenko also describes the automatic shutoff valves on both sides of the Straits, which are pressure-sensitive and operate without the need for human intervention. (16 TR 2264.)

b. **The reopened record now contains additional information about the shutdown procedures.**

The Commission's fifth, sixth, and seventh prong (3) information requests relate to Enbridge's shutdown procedures in the event of a potential release. (July 7 Order, p 46.) Enbridge's response to the fifth information request describes the process for activation of the ventilation system in the event of a release. (Exhibit A-31, p 5.) The purpose of the ventilation system is to provide air for personnel within

the confined space of the tunnel. The ventilation system is not designed to respond to or mitigate a release and will not be operated during a release unless there are personnel within the tunnel. In this scenario, the system would only operate to the extent needed to safely evacuate personnel. (*Id*.) Enbridge further explained, through discovery responses, that the ventilation system is designed to be bi-directional such that air flow can be directed in either direction of the tunnel, allowing personnel to evacuate in either direction. (Exhibit S-31, p 10–11.) Once that occurs, the ventilation system would be deactivated and the airlock doors would be sealed so that the tunnel would serve as a containment facility. (Exhibit A-31, p 5.)

Enbridge's response to the sixth information request explains how quickly the Straits replacement segment would be manually closed in the event of power loss or if communication is lost with the Control Center. Appendix 4 to the Second Agreement describes that automatic shut-off valves will close within three minutes if a threshold pressure loss occurs in the pipelines. (Exhibit A-10, p 20; Exhibit A-30, p 4.) If power (including backup generation) or communication fails, these valves would be manually closed within a target time of no more than 45 minutes per the Second Agreement. (Exhibit A-10, p 19; Exhibit A-30, p 4.) Enbridge provides that the threshold pressure loss for automatic closure of the valve occurs if the pipeline pressure is less than 45 psi for more than 60 seconds. (Exhibit S-31, p 12.)

Enbridge's response to the seventh information request describes the conditions, thresholds, and activation points for the shutdown of the pipeline. In general, the conditions for shutdown are the same as the current procedures for shutdown of the existing dual pipelines. The conditions for shutdown may include CPM alarms, leak triggers identified via the Supervisory Control and Data Acquisition system, visual surveillance, commodity movement tracking imbalances, and reported emergencies. (Exhibit A-30, p 5.) Additional details regarding pipeline shutdown were provided in the reopened record, including in witness Philipenko's rebuttal testimony. (*See* 16 TR 2262.)

III. **Conclusion**

In light of the reopened record in this case, Staff continues to recommend the Commission approve Enbridge's application, with certain conditions and consistent with the recommendations discussed above. The additional evidence addressing prong (2) of the Commission's Act 16 analysis, including Exhibit S-33, has been submitted to the reopened record. Staff submits that the record as a whole supports a finding that the proposed project "fulfills the alleged purpose of reducing the environmental risk to the Great Lakes posed by the dual pipelines." (July 7 Order, p 8.) The additional prong (3) evidence in the reopened record indicates the proposed project meets or exceeds current safety and engineering standards.

As discussed above, Staff recommends Enbridge be required to implement certain welding and testing procedures and, to the extent the Commission deems it appropriate, Staff supports a Commission recommendation that certain equipment

within the tunnel be designed to the more stringent Class 1, Division 1 under the circumstances described above. Finally, Staff maintains the conditions and recommendations it articulated in the initial evidentiary phase of this proceeding, which Staff incorporates here by reference.

Respectfully submitted,

MICHIGAN PUBLIC SERVICE COMMISSION STAFF

Nicholas Q. Taylor (P81020)
Daniel E. Sonneveldt (P58222)
Amit T. Singh (P75492)
Assistant Attorneys General
Public Service Division
7109 W. Saginaw Hwy., 3rd Floor
Lansing, MI 48917
Telephone: (517) 284-8140

DATED: May 5, 2023

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

Application for the Authority to Replace and Relocate the Segment of Line 5 Crossing the Straits of Mackinac into a Tunnel Beneath the Straits of Mackinac, if Approval is Required Pursuant to 1929 PA 16; MCL 483.1 et seq. and Rule 447 of the Michigan Public Service Commission's Rules of Practice and Procedure, R 792.10447, or the Grant of other Appropriate Relief. /	Case No. U-20763 (e-file paperless)

PROOF OF SERVICE

STATE OF MICHIGAN)
) ss
COUNTY OF EATON)

Cherie A. R. Shea, being first duly sworn, deposes and says that on **May 5, 2023,** she served a true copy of **Michigan Public Service Commission Staff's Reopened Record Initial Brief** upon the following parties **via email only**:

ENBRIDGE ENERGY, LIMITED PARTNERSHIP
Michael Ashton
Shaina Reed
Jennifer Heston
Sean Gallagher
mashton@fraserlawfirm.com
sreed@fraserlawfirm.com
jheston@fraserlawfirm.com
sgallagher@fraserlawfirm.com

ADMINISTRATIVE LAW JUDGE
Hon. Christopher Saunders
saundersc4@michigan.gov

FOR LOVE OF WATER
James M. Olson
jim@flowforwater.org

MICHIGAN ENVIRONMENTAL COUNCIL
Christopher M. Bzdok
Karla Gerds
Kimberly Flynn
Breanna Thomas
chris@envlaw.com
karla@envlaw.com
kimberly@envlaw.com
breanna@envlaw.com

BAY MILLS INDIAN COMMUNITY
Christopher M. Bzdok
Kathryn Tierney
Deborah Musiker aka Debbie Chizewer
Christopher R. Clark
David L. Gover
Mary K. Rock
Adam Ratchenski
Julie Goodwin
Ariel Salmon
Dulce Mora Flores
Rebecca Liebing
Wesley James Furlong
chris@envlaw.com
candyt@bmic.net
dchizewer@earthjustice.org
cclark@earthjustice.org
dgover@narf.org
mrock@earthjustice.org
aratchenski@earthjustice.org
jgoodwin@earthjustice.org
asalmon@earthjustice.org
dflores@earthjustice.org
rliebing@baymills.org
rfurlong@narf.org

GRAND TRAVERSE BAND OF OTTAWA AND CHIPPEWA INDIANS
William Rastetter
Christopher M. Bzdok
Karla Gerds
bill@envlaw.com
chris@envlaw.com
karla@envlaw.com

TIP OF THE MITT WATERSHED COUNCIL
Abigail Hawley
Christopher M. Bzdok
Karla Gerds
Kimberly Flynn
Breanna Thomas
abbie@envlaw.com
chris@envlaw.com
karla@envlaw.com
kimberly@envlaw.com
breanna@envlaw.com

NATIONAL WILDLIFE FEDERATION
Christopher M. Bzdok
Karla Gerds
chris@envlaw.com
karla@envlaw.com

ENVIRONMENTAL LAW & POLICY CENTER AND MICHIGAN CLIMATE ACTION NETWORK
Rebecca Lazer
Howard A. Learner
Ariel Salmon
Alondra Estrada
rlazer@elpc.org
hlearner@elpc.org
asalmon@elpc.org
aestrada@elpc.org

MICHIGAN ATTORNEY GENERAL DANA NESSEL
Daniel Bock
bockd@michigan.gov
ag-enra-spec-lit@michigan.gov

NOTTAWASEPPI HURON BAND OF POTAWATOMI INDIANS
Amy Wesaw
John S. Swimmer
amy.wesaw@nhbp-nsn.gov
john.swimmer@nhbp-nsn.gov

MICHIGAN CLIMATE ACTION NETWORK (MiCAN)
Howard Learner
Rebecca Lazer
hlearner@elpc.org
rlazer@elpc.org

MICHIGAN PROPANE GAS ASSOCIATION (MPGA)
Daniel Ettinger
Troy Cumings
Margaret Stalker
dettinger@wnj.com:
tcumings@wnj.com
mstalker@wnj.com

LITTLE TRAVERSE BAY BANDS OF ODAWA INDIANS
James Bransky
Su Lantz
jbransky@chartermi.net
slantz@ltbbodawansn.gov

MACKINAW STRAITS CORRIDOR AUTHORITY (MSCA)
Leah Brooks
Raymond O. Howd
brooksl6@michigan.gov
howdlaw@outlook.com

MICHIGAN LABORERS' DISTRICT (MLDC)
Christopher Legghio
Stuart Israel
Lauren Crummel
Megan Boelstler
cpl@legghioisrael.com
Israel@legghioisrael.com
crummel@legghioisrael.com
mbb@legghioisrael.com

Cherie A. R. Shea

Subscribed and sworn to before me
this **5th** day of **May, 2023**.

Pamela A. Pung, Notary Public
State of Michigan, County of Clinton
Acting in the County of Eaton
My Commission Expires: 5-7-2025