Great Lakes Tunnel Project

Alternative Analysis and Minimization of Impacts Report

The Great Lakes Tunnel Project (Project) is an underground tunnel that will be constructed and operated by Enbridge Energy, Limited Partnership (Enbridge) and owned, upon the completion of its construction, by the Mackinac Straits Corridor Authority (Authority). The Tunnel is being pursued in accordance with the "Tunnel Agreement" that was executed by Enbridge and the Authority on December 19, 2018. That Agreement was entered in furtherance of Public Act 359, through which the State of Michigan (State) established the Authority and delegated to it the right to acquire, construct, maintain, improve, repair, and manage a utility tunnel across the Straits of Mackinac (Straits).

The tunnel will cross below the lakebed of the Straits, connecting Point La Barbe in Michigan's Upper Peninsula to McGulpin Point in Michigan's Lower Peninsula in Mackinac and Emmet Counties, respectively. The distance between these two land points is approximately 3.58 miles and represents the shortest distance between Michigan's Upper and Lower Peninsulas. The tunnel would extend as near as practicable to Enbridge's existing Line 5 North Straits Facility located on the north side of the Straits to an opening point as near as practicable to Enbridge's existing Line 5 Mackinaw Station located on the south side of the Straits.

Except for the entrance points on either side of the Straits, the tunnel will be constructed entirely underground, approximately 60 feet beneath the lakebed of the Straits. The tunnel will be approximately 18-21 feet finished inside diameter, or other appropriate diameter determined through final design. The tunnel will accommodate the replacement of that portion of Enbridge's Line 5 pipeline[1] (Line 5) that crosses the Straits and will provide the potential to accommodate other utilities. The tunnel will be constructed with a structural lining, providing secondary containment to prevent any leakage of fluids from Line 5 or utilities into the lakebed or the Straits.

Additional background information is provided below regarding the actions and assessment that led to the Tunnel Agreement. Alternatives, including a no-action alternative and tunnel alignment alternatives, are also described below.

[1] Line 5, in operation since 1953, transports light crude oil, light synthetic crude oil, light sweet crude oil, and natural gas liquids (NGLs). It provides the feedstock for refineries throughout the region that produce petroleum products such as gasoline, propane, diesel and jet fuel used by consumers across Michigan and surrounding regions.

In Michigan, Line 5 crosses the Straits, an approximately 4-mile long span of water that connects Lake Michigan and Lake Huron. At the point of and for the duration of that crossing, Line 5 consists of two 20-inch diameter pipes that rest on or are anchored to the submerged lands located below the Straits (referred to as the "Line 5 Dual Pipelines" or "Dual Pipelines").

Tunnel Agreement Background

The Tunnel Agreement, and the commitment to construct the tunnel, resulted from years of study and negotiation between Enbridge and the State. On November 27, 2017, Enbridge entered into what is referred to as the "First Agreement" with the State concerning Line 5 Dual Pipelines' crossing of the Straits. As relevant here, Stipulation F of the First Agreement required Enbridge to prepare a report assessing the replacement of the Line 5 Dual Pipelines across the Straits.

In accordance with that requirement, on June 15, 2018, Enbridge submitted a report to the State, *Alternatives for Replacing Enbridge's Dual Line 5 Pipelines Crossing the Straits of Mackinac* (Alternatives Report).[2] That Alternatives Report considered installing a replacement segment across the Straits utilizing horizontal directional drilling (HDD) methods or by placing a pipe inside a larger, secondary containment pipe, which would be buried in a trench near the shore and laid on the remaining lakebed covered with rock. The HDD method was rejected in the Alternatives Report because it was not technically feasible. The latter method was rejected because the potential environmental impacts during construction would be much greater than replacing the Dual Pipelines with a pipeline replacement segment within a tunnel.

On October 4, 2018, Enbridge and the State entered into what is referred to as the "Second Agreement." That Second Agreement recognized 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 pipeline, is a feasible alternative for replacing the Dual Pipelines, and that alternative would virtually eliminate the risk of a potential release into the Straits. Under the Second Agreement, Enbridge and the State agreed to negotiate further agreements to construct a tunnel beneath the Straits.

In December 2018, and following the enactment of Public Act 359, Enbridge and the Authority entered into the Tunnel Agreement. That Agreement sets forth the process by which Enbridge will construct and provide to the Authority a tunnel so as to allow for the discontinuation of service on the existing Line 5 Dual Pipelines' crossing of the Straits upon the replacement segment being placed into service within the tunnel. The tunnel will also allow for the possibility of other third-party companies to locate utilities within the tunnel. Also pursuant to the Tunnel Agreement in December 2018, the Michigan Department of Natural Resources (the agency responsible for administering the State of Michigan's subsurface land rights) issued an easement (MDNR Easement) to the Authority, authorizing the Authority to access, occupy, and use such subsurface lands for purposes of constructing, operating, and maintaining the tunnel. The Authority subsequently assigned certain rights under that MDNR Easement to Enbridge to allow Enbridge to access, occupy, and use such subsurface lands for purposes of constructing, operating, and maintaining the tunnel.

No Action Alternative

Under the no action alternative, the tunnel would not be constructed, operated, and maintained in accordance with the Tunnel Agreement to accommodate the replacement of that portion of Enbridge's Line 5 or other utilities. Enbridge's Line 5 Dual Pipelines would continue to be operated and maintained

[2] *Available at* https://www.enbridge.com/~/media/Enb/Documents/Projects/line5/ENB_Line5_AltEvaluation_Report_June15.pdf.

on the lakebed of the Straits. Utilities, such as electric and broadband cables, would also continue to be located on the lakebed of the Straits or on the Mackinac Bridge.

Tunnel Alignment Alternatives

Line 5 currently crosses the Straits from Point La Barbe in Michigan's Upper Peninsula to McGulpin Point in Michigan's Lower Peninsula (Figure 1). The distance between these two land points is approximately 3.58 miles and is the shortest distance between the upper and lower peninsulas.

Currently a single, 30-inch-diameter pipeline crosses Michigan's Upper Peninsula, enters Enbridge's North Straits Facility on Point La Barbe and splits into two, 20-inch-diameter pipelines. These two pipelines run south across the Straits and enter Enbridge's Mackinaw Station on Point McGulpin. A single, 30-inch-diameter pipeline exits the Mackinaw Station to the south (Figure 1).

Minimizing the length of tunnel by utilizing the shortest crossing distance between the upper and lower peninsulas is preferred as it helps reduce construction, operation and future maintenance costs of the tunnel. A shorter tunnel also requires less handling and transporting of the sediment and rock removed (known as muck) as the tunnel is built and shortens the construction duration. Locating the tunnel entrances as close as practical to the existing stations minimizes the need for constructing additional pipeline (known as a tie-in) to connect the replacement segment within the tunnel to the existing Enbridge facilities. Therefore, Enbridge focused on the areas of Point La Barbe and McGulpin Point as the preferred locations for the tunnel entrances. This alignment, given its length, is the least impactful feasible and prudent alternative for the Tunnel alignment. Other alignments would be longer in length, thereby leading to increased construction impacts and costs.

Tunnel Entrance Location Alternatives

North Side

Enbridge considered multiple locations for siting of the north side tunnel entrance. Locating the tunnel entrance to the northwest of the North Straits Facility would not be preferred as there are residential homes, a county road and overhead electrical infrastructure in this area (Figure 2). Also, U.S. Highway 2 approaches the shoreline of Lake Michigan in this area, limiting the area available for construction activities. There are also significant topographic features in this area that would require substantial grading to produce the needed, relatively level construction area (Figure 3).

Locating the tunnel entrance to the north or northeast of the North Straits Facility is also not preferred. Significant wetland and hydric soil features are present in these areas (Figure 3). There also is an existing below ground natural gas pipeline in the area, limiting the area available for construction activities.

Locating the tunnel entrance east toward the Mackinac Bridge is also not preferred as this area has significant infrastructure including residences, commercial buildings, and areas used for tourism.

Given these constraints and the desire to minimize potential impacts to the human and natural environments, Enbridge selected the area adjacent to the existing North Straits Facility as the preferred location for the north side tunnel entrance. This location will minimize impacts to residential and commercial areas. In addition, Enbridge owns approximately 61 acres of land around the station, eliminating the need to acquire land from private landowners.

South Side

Enbridge considered multiple locations for siting of the south side tunnel entrance. There are significant constraints locating a tunnel entrance on the south side. Many residential homes, the historic McGulpin Point Lighthouse, Headlands International Dark Sky Park and multiple overhead electric transmission corridors and facilities are present in the vicinity of the existing Mackinaw Station (Figure 4).

Similar to the north side, a pipeline tie-in will be required from the tunnel entrance to Enbridge's existing Mackinaw Station. Minimizing the length of this tie-in helps reduce additional potential impacts to the human and natural environments.

Locating the tunnel entrance south or west of the existing station would place it within Headland International Dark Sky Park. This is not preferred as above ground operational facilities are required which could impact the benefits that portion of the park provides the public and natural communities.

Locating the tunnel entrance to the east of the existing station is not preferred as there are multiple residential homes and associated infrastructure as well as the McGulpin Point Lighthouse in this area. In addition, there is not sufficient area available to safely conduct construction activities in this area without disturbing some of these features.

There are relatively level open spaces with few existing homes southeast of the existing station. However, there is overhead electric transmission and underground natural gas infrastructure along the boundaries of the open areas (Figure 4). Additionally, there is an electric transmission substation to the north of these open areas. While there is sufficient space for construction in this location, the tunnel alignment would need to be located under the existing homes to the north. This area would also require an approximate one-half mile tie-in back to the substation and an associated new right-of-way (ROW) on private property and/or within a portion of the Headlands International Dark Sky Park. Therefore, Enbridge determined this area was not preferred for locating the tunnel entrance.

Given these constraints and the desire to minimize potential impacts to the human and natural environments, Enbridge selected the area adjacent to the existing Mackinaw Station as the preferred location for the south side tunnel entrance. In addition, Enbridge owns approximately 17 acres of land around the station, minimizing the amount of land which would need to be acquired from private landowners.

Construction Methods Alternatives

The proposed tunnel would be excavated with a Tunnel Boring Machine (TBM). TBMs are technically sophisticated pieces of equipment used to excavate tunnels in all types of ground conditions. TBMs can be configured so that they are suited to conditions with high groundwater pressure.

Constructing a tunnel using a TBM has two general approaches: launching the TBM from a portal entry or a shaft entry. A portal entry is a sloping "ramp" design starting at ground level and progressing to a point below ground that the TBM will initiate or complete boring (Figure 5). The side walls of the portal entry are typically supported using sheet piles. A shaft entry is a vertical excavation down to a depth below ground that the TBM will initiate or complete boring (Figure 6). Based on preliminary design, Enbridge proposes boring the tunnel from the south side using a portal to launch the TBM. The north side would have a TBM receiving shaft.

Construction Workspace Alternatives

Tunnel construction techniques and sequencing are well established, worldwide. Generally, a portal or shaft is constructed from the surface to the tunnel entrance, the TBM is assembled at the entrance and it moves forward, boring the tunnel using cutting tools on its front. Rock cut (muck) by the TBM is conveyed to the back of the TBM and transported out of the tunnel. As the TBM advances, a pre-cast concrete lining is installed around the inside of the tunnel and the annulus (the space outside the concrete lining) would be filled with cement grout to help support it and reduce water inflows. Ventilation and lighting are placed in the tunnel. After the tunnel is constructed, the Line 5 pipeline replacement segment will be installed within the tunnel.

At the surface, support equipment and facilities are needed to manage the tunnel boring process. Areas for the lining segments, muck storage, operating crane, power station, mechanical buildings, water management, and other needs surround the portal or shaft. Enbridge has designated the total area required for construction on each side within a defined limits of disturbance (LOD). All the required surface equipment and facilities will be contained within the LOD.

Typically, utilities to be placed in a tunnel would be assembled at the surface in a long corridor and then pulled or pushed into the tunnel. To help reduce the amount of area needed for construction and the associated potential impacts to environmental features, Enbridge has committed to segmentally assembling the pipeline within the south side LOD, and then pushing or pulling the pipeline into the tunnel. Enbridge will also utilize off-site, existing commercial or industrial locations for some required construction activities, such as pipe storage, materials fabrication, and management offices to minimize the size of the LODs and the associated potential impacts to environmental features.

Limits of Disturbance (LOD) Siting and Configuration

Enbridge conducted environmental and cultural surveys in the areas surrounding both the North Straits Facility and Mackinaw Station to help site and configure the LODs in ways to avoid and minimize potential impacts to sensitive features while still allowing safe and efficient construction of the tunnel.

North Side LOD

Surveys identified multiple types of wetlands around the North Straits Facility and the existing Line 5 ROW to the north of the Facility (Figure 7). To help minimize the extent of impacts to natural resources, Enbridge has sited the north side LOD in primarily upland areas (Figure 7). The total size of the LOD is approximately 16 acres. Forested wetlands to the north of the LOD will be avoided. Wetlands within the LOD consist of medium quality forested and emergent vegetation. Other than vehicle entranceways off the existing Boulevard Drive, Enbridge has located the LOD at least 50 feet from the shoreline of Lake Michigan (Figure 7). The LOD utilizes upland areas, previously disturbed areas, and the existing station to the extent practical. No significant cultural resources exist within the LOD.

The LOD generally slopes downward to the west. This area will have perimeter berms installed to help prevent stormwater runoff. A water management system will be located in the LOD as well to help manage stormwater and water generated from the tunnel. The system will include an oil-water separator, a sediment basin, and an infiltration basin.

Access to the LOD will utilize Boulevard Drive south and east of the North Straits Facility. Segments of the unpaved portions of Boulevard Drive may need to be improved or widened to accommodate

construction traffic. To help minimize potential impacts to the shoreline of Lake Michigan, widening/improvements would take place on landward side (north and west) of the road.

Houghton's goldenrod and dwarf lake iris, both federally listed Threatened species, are present on the north side (Figure 8). The greatest concentrations of these species are in upland areas that do not contain woody vegetation. This coincides generally with the area within several hundred feet of the Lake Michigan shoreline. Enbridge is willing to consider potential mitigation measures, within and/or outside of the LOD, to help compensate for effects to protected plant species within the LOD. It may be practical to relocate some plant populations to off-site areas nearby to enhance existing populations or establish new ones.

South Side LOD

Enbridge has designed the LOD to avoid private residential properties, Headlands International Dark Sky Park and McGulpin Point Lighthouse (Figure 9). The LOD includes areas adjacent and within Enbridge's existing Mackinaw Station and one area southeast of the Station. The total size of the LOD is approximately 25 acres. There are no wetlands, protected species or significant cultural resources within the LOD. Enbridge will maintain a 115-foot buffer from the shoreline of Lake Michigan with the exception of a water discharge structure. Access to the LOD will utilize existing public roads and no improvements to them are anticipated.

The LOD generally slopes downward to the northwest corner. This area will have perimeter berms installed to help prevent stormwater runoff. A water management system will be located in the LOD as well to help manage stormwater and water generated from the tunnel. The system will contain an oil-water separator, a sediment and infiltration basin.

Summary

The tunnel is being pursued by Enbridge and the Authority in accordance with the Tunnel Agreement and related legislation. The tunnel will accommodate the replacement of a portion of Enbridge's Line 5 and will also provide the potential to accommodate use by other utilities. Placing Line 5 into the underground tunnel will virtually eliminate the risk of a potential release from Line 5 into the Straits. Various alternatives were identified and considered for the alignment of the tunnel across the Straits, including alternative tunnel entrances on either side of the Straits and LOD configurations around the entrances. The preferred tunnel alignment identified above will minimize potential effects to the human and natural environments while allowing for the safe construction, operation, and maintenance of the tunnel in accordance with the Tunnel Agreement.