8.0 PROJECT DESCRIPTION

Minn. R. 7853.0530

Description of Proposed Facility

Subpart 1: Design

The applicant shall provide the following information pertaining to the design of the proposed construction of a large petroleum pipeline:

A. Engineer

If known, the complete name and address of the engineer and firm responsible for the design:

Company Engineering Managers	
Mainline	**Facilities**
Mitch Repka	Mark Newman
Enbridge Energy, Limited Partnership	Enbridge Energy, Limited Partnership
1409 Hammond Avenue, Ste. 200	1409 Hammond Avenue, Ste. 200
Superior, WI 54880	Superior, WI 54880

B. Tariffs, Costs, and Economic Life

The estimated tariffs, capital cost, annual operating and maintenance costs, and economic life:

Enbridge operates as a common carrier pursuant to federal law. As a common carrier, Enbridge's applicable rates, tariffs, and accounting practices are subject to the regulatory authority of the FERC. Enbridge's currently-effective FERC tariffs regarding transportation of crude oil by pipeline are available at http://www.enbridge.com/Informational-Postings.aspx.[1] Enbridge's FERC tariffs do not address transportation by specific lines within the Enbridge pipeline system (for example, Line 3). Rather, they apply to the transportation of crude petroleum by pipeline from various receipt points specified in the tariff to various delivery points specified in the tariff. Line 3 is one of a number of separate pipelines that transport crude petroleum between the International Boundary near Neche, North Dakota, and Superior, Wisconsin, with intermediate receipts and deliveries in Clearbrook, Minnesota. Thus, the rates, terms, and conditions specified for transportation originating at the International Boundary

[1] Tariffs for the Enbridge Mainline System, including Line 3, are available at the link to the "Lakehead Tariffs and Tolls" under the "Liquids Pipelines and Storage" section (http://www.enbridge.com/Informational-Postings/Lakehead-Tariffs-and-Tolls.aspx).

near Neche, North Dakota, or at Clearbrook, Minnesota, are applicable to those volumes of crude petroleum transported on Line 3. Because the applicable rate is the same regardless of which specific pipeline is used between those points, Enbridge determines which volumes move on which specific pipeline as an operational matter, considering the overall efficiency of the pipeline system and other relevant operational factors.

Given that Enbridge's rates are subject to the jurisdiction of the FERC, Enbridge has not supplied operating and maintenance costs in its application. The rates for the Project will be recovered based on surcharges negotiated with Enbridge's shippers, pursuant to the applicable tariffs on file at the FERC. The capital cost of the Project is approximately $2.1 billion.

The economic life of the Project can be described as the length of time over which the continued operation of the Project will be financially feasible. The anticipated economic life of the Project will be no less than 30 years. Conversely, the physical life of the Project – defined as the length of time over which the Project will be capable of transporting product – will be indefinite with proper construction, maintenance, and integrity management systems.

C. Products Transported

A list of the categories of petroleum products the large pipeline is intended to transport:

As defined in its FERC Rules and Regulations, Enbridge currently transports the following commodities within its multi-pipeline system:

Condensate (CND)
Light Crude Petroleum (LGT)
Heavy Crude Petroleum (HVY)
Natural Gas Liquid (NGL)

The Project will transport the following liquid petroleum commodities:

Light Crude Petroleum (LGT)
Heavy Crude Petroleum (HVY)

D. Design Capacity, Pipe Diameter, Project Length, and Pumping Stations

Its initial and ultimate design capacities in barrels per day.

Two definitions are used to describe pipeline capacity: Design Capacity and Annual Capacity.

- **Full Design Capacity**: The capacity of the pipeline and pump facilities, at its current or proposed design state for given types of liquids and their batch sequence. Full Design capacity is calculated assuming ideal operating conditions. The Project's full design capacity is 844 kbpd.
- **Annual Capacity or Nameplate Capacity**: The average sustainable pipeline throughput over a year. Annual capacity is calculated assuming historic average annual operating conditions. These operating conditions include scheduled and unscheduled maintenance, typical operating issues that arise, and crude supply availability. Annual capacity of a pipeline is typically 90% of design capacity, and represents the capacity requested in this Application. The Project's annual average capacity is approximately 760 kbpd.

Pursuant to the requirement of Minn. R. 7853.0530, Enbridge is providing for the Commission's information the ultimate design capacity for the pipeline considering its diameter, wall thickness, steel grade, and crude slate (irrespective of the number of pump stations proposed for the Project), which is 1,016 kbpd. This figure in turn, yields an ultimate annual average capacity of 915 kbpd. Further engineering design studies would be required to determine the number of pump stations needed to achieve the ultimate design capacity level, but that is not the level sought in this Appliction.

Its diameter:

The Project will be constructed with 36-inch diameter pipe.

Length in Minnesota:

The Project will replace approximately 282 miles of existing pipeline with 337 miles of pipeline. The increased length is primarily a result of the changed location of the ROW east of the Clearbrook Station.

Maximum number of pumping stations in Minnesota, and nominal station spacing:

As part of the Project, Enbridge plans to install eight new pumping stations, including valves, metering, monitoring equipment, and associated electrical facilities. Four of the new pumping stations will be installed adjacent to existing pumping stations. The final number and location of the pump stations will depend on the approved route, power availability, and detailed

hydraulic modeling. The stations will be spaced an average of approximately 42 miles apart. The current proposed locations of the Project's pump stations are as follows in Table 8.1.D-1.

Table 8.1.D-1
Pump Station Locations

Facility Name	MP	County	State	Type
Donaldson	25.1-W	Kittson	MN	Pump Station
Viking	59.4-W	Marshall	MN	Pump Station
Plummer	88.3-W	Red Lake	MN	Pump Station
Clearbrook	121.5-W	Clearwater	MN	Terminal Connectivity, Pump Station, PIG Receiver/Launcher, and injection from existing tanks 61, 62, 63 and 64
Two Inlets	45.6-E	Hubbard	MN	Pump Station
Backus	96.1-E	Cass	MN	Pump Station, PIG Receiver/Launcher
Palisade	150.8-E	Aitkin	MN	Pump Station
Cromwell	195.5-E	Carlton	MN	Pump Station

E. Engineering Data

1. Pipeline System Map

A pipeline system map showing the route, mileage, location of pumping stations, mainline valves, petroleum storage facilities, and interconnections:

A map of the Project is provided in Appendix A.

2. Pipe & Valve Specifications

Specification for pipe (diameter, length, wall thickness, grade, and maximum allowable operating pressure):

Pipe specifications for the Project were carefully designed to fulfill all regulatory safety requirements for pipeline operation.

The determination of an appropriate pipeline wall thickness is governed by design criteria in the Code of Federal Regulations which incorporate numerous safety factors.[2] A minimum wall thickness requirement for pressure containment is calculated for the entire mainline to satisfy the desired MOP, thereby ensuring the mainline system can withstand normal operating pressure at the designed wall thickness. In addition, short lengths of heavier-wall pipe will be utilized at railways, roads, and water crossings The wall thickness, which will vary between .515-inch and .750-inch, and lengths of these sections will be determined on a site-specific basis during detailed engineering for the finale route. The increased wall thickness designed at these crossings is primarily implemented to account for the additional stress caused by exterior loads and additional stress encountered during installation.

Pipe for the Project will be made of low carbon, high-strength GX-70 steel and will be manufactured using a submerged arc welded (SAW) welding process. Table 8.1.E.2-1 summarizes the design parameters and estimated quantities of pipe required for the Project, which may be modified during detailed design engineering.

Table 8.1.E.2-1
Mainline Pipe Design Parameters

Design Parameter	Specification
Pipe Size (Diameter)	36-inch outside diameter (NPS 36)
Estimated Length	337 miles
Wall Thickness	
Nominal	0.515 inch
Road Bore	0.600 inch
Cased Railroad	0.600 inch
Uncased Railroad	0.750 inch
Horizontal Directional Drill (HDD)	0.750 inch
Coating, mainline	14 mils Epoxy Bonding
Coating, trenchless	40 mils Epoxy Bonding ABR
Grade (Pipe Type)	X70 carbon steel pipe manufactured according to API Specifications 5L PS2
Maximum Operating Pressure[3]	1440 psig

[2] *See* Code of Federal Regulations (CFR) – Title 49 – Transportation, Part 195 – Transportation of Hazardous Liquids by Pipeline.

[3] Rule 7853.0530, subp. 1(E)(2) asks the applicant to provide the "maximum allowable operating pressure" for pipe. However, "maximum allowable operating pressure" is not applicable to crude oil pipelines, and instead, pressure is measured as "maximum operating pressure."

Specifications for valves (diameter, American National Standards Institute rating, and maximum operating pressure):

The valves to be installed will be 36-inch ANSI 600 weld end by weld end, full port, rising stem gate valves. These valves will be manufactured in accordance with API Standard 6D "API Specification for Steel, Gate, Plug, Ball and Check Valves for Pipeline Service." Table 8.1.E.2-2 summarizes the current design parameters of the valves, which may be modified during detailed design engineering.

Table 8.1.E.2-2
Valve Design Parameters

Design Parameter	Specification
Diameter	36-inch outside diameter (NPS 36)
American National Standards Institute Rating	ANSI Class 600
Maximum Operating Pressure	1440 psig

Enbridge conducted an Intelligent Valve Placement (IVP) analysis for the Project's Preferred Route, to ensure that the proposed valve placement complies with federal law, and the operational needs of the Enbridge Mainline System. Based on the preliminary engineering design studies, 27 mainline valves will be installed in Minnesota. Valves will be installed near major rivers, other environmentally sensitive areas, population centers, and pump stations. The number and location of the valves may change as a result of a detailed engineering study currently underway.

For further information regarding the IVP, see Section III.A.3 of the Safety Report (Appendix B).

3. Pump Specifications

Representative pump specifications including diameter, maximum operating pressures, and maximum capacities:

Enbridge plans to install eight pump stations as part of the Project. Table 8.1.E.3-1 provides a summary of specifications for each proposed pump station:

Table 8.1.E.3-1
Line 3 Replacement Project Pump Station Specifications

Station	# of Units	Inlet Diameter (Inches)	Pump Maximum Operating Pressure* (psig)	Annual Average Capacity (kbpd)	Maximum Power Capacity of Motors (hp)
Donaldson	3	24	1,440	760	7000
Viking	2	24	1,440	760	7000
Plummer	2	24	1,440	760	7000
Clearbrook	4	24	1,440	760	7000
Two Inlets	3	24	1,440	760	7000
Backus	3	24	1,440	760	7000
Palisade	3	24	1,440	760	7000
Cromwell	3	24	1,440	760	7000

* Pump Maximum Operating Pressure is based on design temperature of 56.5° C.

4. Prime Mover Specifications

Representative prime mover specifications including type, allowable maximum power capacity in horsepower, efficiency, allowable maximum and minimum operating temperatures, and energy requirement in Btu per barrel per mile of petroleum product pumped:

All prime movers are 6,600 volt, three phase electrical motors, which will drive the proposed pumps. The allowable maximum power capacity of each motor is 7,000 hp. The minimum design efficiency of these motors is 96 percent at 100 percent load. They are designed to operate (both start and run) at ambient temperatures of 104°F to -40°F. The energy requirement to operate these motors is approximately 21.3 Btu/barrel/mile. This is based on an annual throughput of 760 kbpd for the 36-inch pipeline. The expected power requirement of the prime movers is shown in Table 8.3.C-1.

Subpart 2: Construction

The applicant shall provide the following information pertaining to the proposed construction of the facility:

A. Construction Company

If known, the complete name and address of the company to be responsible for construction:

The construction contractor will be determined by competitive bid, considering only qualified pipeline contractors.

B. Construction Commencement & In-Service Dates

The proposed date for commencement of construction and the proposed in-service date:

Construction is anticipated to commence in the third quarter of 2016, pending approval of this Application from the Commission. The Project has a planned in-service date for the fourth quarter of 2017.

C. In-Service Date with Fully-Expedited Construction

An estimate of the in-service date if the construction were to be on a fully expedited basis:

Enbridge expects that construction will be on a fully-expedited basis. Accordingly, under a fully-expedited construction schedule, the Project has a planned in-service date for the fourth quarter of 2017.

Subpart 3: Operation

The applicant shall provide the following information pertaining to the operation of the proposed facility:

A. Average Use of Full Design Capacity

The expected average percentage use of the full design capacity of the proposed facility during each of the first five years of operation:

See Table 3.5.2-4 in Section 3 demonstrating utilization of Line 3.

B. Expected MOP and Capacity of Project at Peak Demand

The expected maximum operating pressure and capacity of the proposed facility at peak demand:

The Project's annual average capacity will be 760 kbpd using an MOP of 1,440 psig at the pump stations.

C. Expected Prime Mover Power Requirement at Each Station at Peak Demand

Expected power requirement from the prime movers at each station at peak demand (in kilowatts, thousands of cubic feet per hour, or gallons per hour):

To achieve the annual average capacity of 760 kbpd, eight new pump stations will be installed in Minnesota at the following Enbridge station sites as part of the Project. The expected power requirements from the prime movers at these stations at peak demand are:

Table 8.3.C-1
Power Requirement for the Prime Movers

Minnesota Station	Power Requirement (kW)
Donaldson	14,088
Viking	9,463
Plummer	9,463
Clearbrook	18,714
Two Inlets	14,088
Backus	14,088
Palisade	14,088
Cromwell	14,088

D. Expected Sources of Supply or Shippers of Petroleum Products

A list of expected sources of supply or shippers of petroleum products for transportation during the first five calendar years of operation, designated either as in-state or out-of-state, the expected dates and durations of the contracts with the 25 largest suppliers or shippers, the categories of petroleum products and quantities expected to be involved, and for sources of crude oil, the expected geographical areas of origin of the crude oil:

On January 27, 2015, the Commission issued an order granting Enbridge's request for a partial exemption from Minnesota Rule 7853.0530, subp. 3(D), which requires, in relevant part, "the expected dates and durations of the contracts with the 25 largest suppliers or shippers." In lieu of this requirement, Enbridge is providing the sources of supply of petroleum products transported during the five most recent years (designated as either in-state or out-of-state), actual deliveries of the top twenty-five shippers on a monthly and annual basis for the past five years, and information showing shipper support for the future utilization of the proposed capacity of the Project.

The Project is designed to transport in mixed service, i.e. batches of Light and Heavy. All of the crude oil that will be transported on the Project originates outside Minnesota. The primary geographical source for the crude oil is the WCSB.

Concurrently with filing this Application, Enbridge is filing tables showing the top twenty-five shippers' verified nominations and actual deliveries on the Enbridge Mainline System to Clearbrook and downstream of Clearbrook on a monthly and annual basis for the past five years in Docket No. PL-9/CN-15-340 pursuant to the Highly Sensitive Protective Order issued by the Commission on April 13, 2015. Redacted versions of the charts are provided in Appendix G. For additional information regarding the nomination process, see Section 7.0 (Rule 7853.0510, subp. 1(C)). For information regarding shipper support for the Project, see Section 3.

E. Expected Recipients of Crude Oil

A list of expected recipients of transported petroleum products during the first five calendar years of operation, designated either as in-state or out-of-state, the expected dates and durations of the contracts with the 25 largest recipients, and the categories of petroleum products and quantities expected to be involved:

On January 27, 2015, the Commission issued an order granting Enbridge's request for a partial exemption from Minnesota Rule 7853.0530, subp. 3(E), which requires, in relevant part, "the expected dates and durations of the contracts with the 25-largest recipients." Instead, Enbridge will provide alternative data regarding refineries directly or indirectly connected to Line 3.

As a common carrier pipeline, the recipients of the crude oil transported by the Project could be any number of refineries that are directly or indirectly connected to the Enbridge Mainline System, just as is the case today with Line 3. See Figure 1.2-1 in Section 1 for a map of the Enbridge Mainline System. In addition, Figure 8.3.E-1 shows the complex system of pipelines and refineries in the United States and Canada, and Table 8.3.E-2 lists those refineries that are directly or indirectly connected to the Enbridge Mainline System. As a result, all of these refineries, including Flint Hills and St. Paul, are expected recipients of crude oil from the Project during the first 5 years of operations.

Figure 8.3.E-1: Pipeline and Refinery Map (A full size of this map is enclosed as Appendix J).

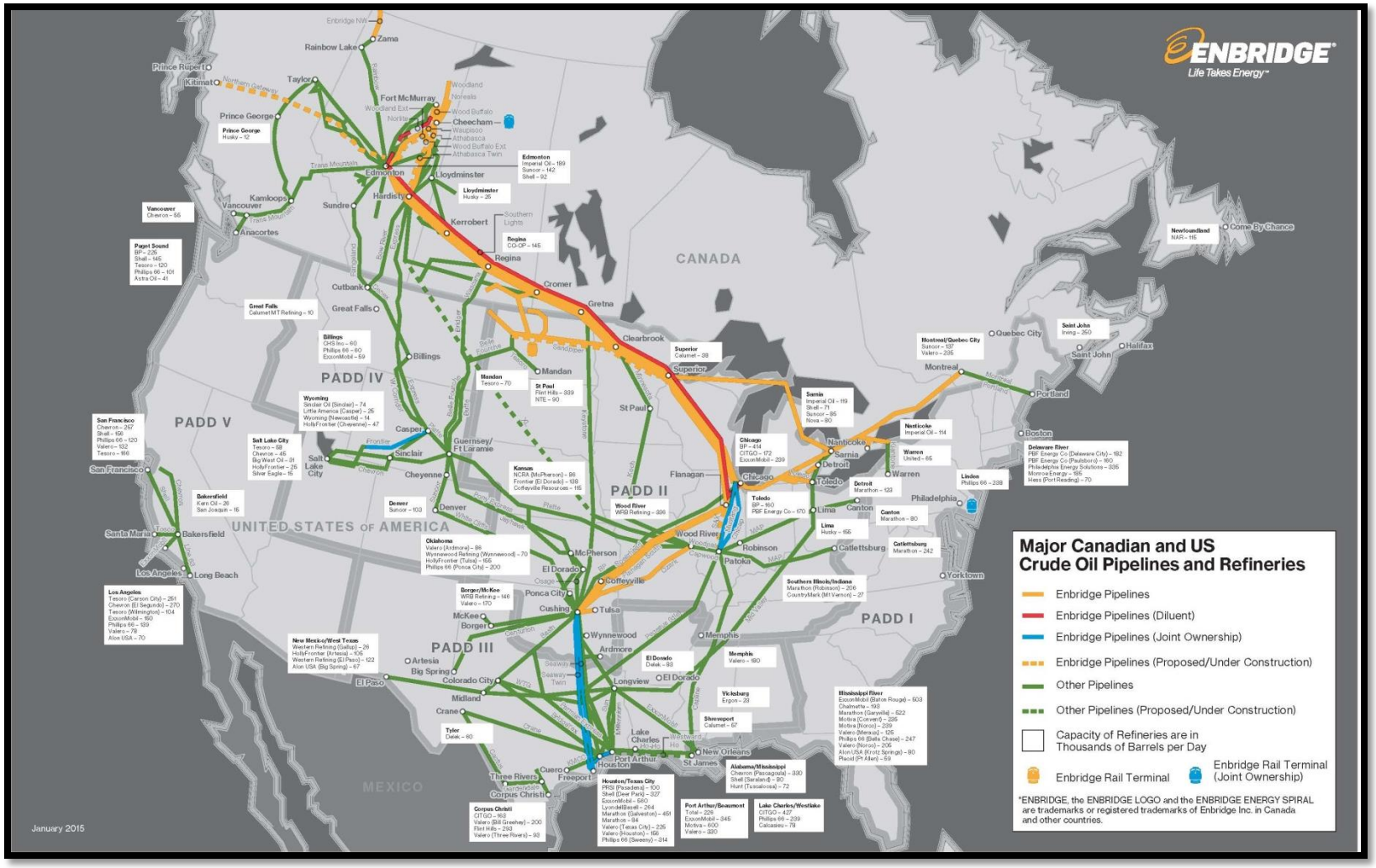

Table 8.3.E-2 Refineries Served Directly or Indirectly by Enbridge Systems				
Refinery	**Location**	**Capacity (barrels/day)**	**Connected Directly from Enbridge**	**Connected Indirectly**
PADD II - Minnesota and Wisconsin				
Northern Tier Energy	St. Paul Park, Minnesota	89,500		Yes
Flint Hills Resources	Rosemount, Minnesota	270,000		Yes
Calumet	Superior, Wisconsin	38,000	Yes	
Total		**397,500**		
PADD II - Illinois and Indiana				
ExxonMobil	Joliet, Illinois	238,600	Yes	
CITGO	Lemont, Illinois	172,000	Yes	
BP	Whiting, Indiana	413,500	Yes	
Total		**824,100**		
PADD II - Kentucky and Southern Illinois and Indiana				
Marathon	Robinson, Illinois	212,000		Yes
WRB Refining	Wood River, Illinois	336,000		Yes
Marathon	Catlettsburg, Kentucky	242,000		Yes
Total		**790,100**		
PADD II - Michigan and Ohio				
BP-Husky Refining	Toledo, Ohio	135,000	Yes	Yes
PBF Energy	Toledo, Ohio	160,000		Yes
Marathon	Detroit, Michigan	123,000	Yes	Yes
Marathon	Canton, Ohio	80,000		Yes
Husky	Lima, Ohio	155,000		Yes
Total		**653,000**		
PADD I - Pennsylvania				
United Refining	Warren, Pennsylvania	65,000		Yes
Ontario				

Table 8.3.E-2 Refineries Served Directly or Indirectly by Enbridge Systems				
Refinery	**Location**	**Capacity (barrels/day)**	**Connected Directly from Enbridge**	**Connected Indirectly**
Imperial Oil	Nanticoke, Ontario	113,500	Yes	
Imperial Oil	Sarnia, Ontario	119,000	Yes	
Shell Canada	Corunna, Ontario	77,000	Yes	
Suncor	Sarnia, Ontario	85,000	Yes	
Nova Chemicals (Canada)	Corunna, Ontario	80,000	Yes	
Total		**474,500**	**Yes**	
PADD III - Cushing				
CVR Energy	Coffeyville, Kansas	115,000	Yes	
WRP Refining	Borger, Texas	146,000		Yes
Phillips 66	Ponca City, Oklahoma	200,000		Yes
HollyFrontier	El Dorado, Kansas	138,000	Yes	
NCRA	McPherson, Kansas	86,000	Yes	
HollyFrontier	Tulsa, Oklahoma	155,300	Yes	
Valero	Ardmore, Oklahoma	86,000		Yes
Valero	Sunray, Texas	156,000		Yes
CVR Energy	Wynnewood, Oklahoma	70,000		Yes
HollyFrontier	Artesia, New Mexico	105,000		Yes
Total		**1,257,300**		
PADD III – United States Gulf Coast				
PRSI	Pasadena, Texas	100,000	Yes	
Deer Park Refining	Deer Park, Texas	327,000	Yes	
ExxonMobil	Baytown, Texas	560,500	Yes	
Lyondell Basell	Houston, Texas	263,800	Yes	
Phillips 66	Sweeny, Texas	247,000	Yes	

Table 8.3.E-2 Refineries Served Directly or Indirectly by Enbridge Systems				
Refinery	**Location**	**Capacity (barrels/day)**	**Connected Directly from Enbridge**	**Connected Indirectly**
Valero	Houston, Texas	88,000	Yes	
Valero	Texas City, Texas	225,000	Yes	
Marathon	Texas City, Texas	451,000	Yes	
Marathon	Texas City, Texas	84,000	Yes	
Total	Port Arthur, Texas	225,500		Yes
ExxonMobil	Beaumont, Texas	344,600		Yes
Motiva	Port Arthur, Texas	600,300		Yes
Valero	Port Arthur, Texas	330,000		Yes
Total		**3,816,700**		

For additional discussion of supply and demand for the crude oil to be transported by the Project, see Section 3 of this Application.