

**INFORMATION BRIEF**

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**Minnesota House of Representatives**  
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# **Minnesota’s Petroleum Infrastructure: Pipelines, Refineries, Terminals**

Minnesota has no indigenous sources of petroleum so it must import both crude oil and refined oil products for use by its residents. The state has two refineries for crude oil and an extensive system of pipelines that distribute refined petroleum products throughout the state. This information brief describes the state’s infrastructure for importing, refining, and distributing crude oil and refined petroleum products.

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More than five billion gallons of petroleum products were produced in or imported into Minnesota in 2011.<sup>1</sup> As a state with no indigenous sources of petroleum, Minnesota must import both the crude oil its petroleum refineries process and additional quantities of refined products, such as gasoline and fuel oil, that its residents demand.

Minnesota has two petroleum refineries, which produce more than two-thirds of the state's petroleum products. The bulk of these products are refined from Canadian crude oil, supplemented by supplies from North Dakota's Bakken field. An extensive system of pipelines brings crude oil to Minnesota's refineries and distributes refined products throughout the state, including products from refineries located in three other states. Twenty-five major petroleum storage terminals along these pipelines, 15 in Minnesota, store refined petroleum products. The stored products are accessed by rail and truck for delivery to retailers throughout Minnesota.

## Crude Oil Pipelines

### Canadian Crude

About three-fourths of the crude oil used by Minnesota's refineries is imported from Canada, placing Minnesota among the states with the highest proportion of crude coming from this source. In 2011, Canadian imports to the Flint Hills Resources Pine Bend Refinery in Rosemount and the St. Paul Park Refinery averaged approximately 237,000 barrels per day.<sup>2</sup>

Crude oil from the western Canadian province of Alberta is transported to Minnesota's refineries on the world's longest crude and liquids pipeline system, the 3,100-mile Enbridge Mainline System. It originates in the Canadian supply hubs of Edmonton and Hardisty, proceeds southeast and enters the United States at Neche, North Dakota, then continues eastward to a large terminal station at Clearbrook, Minnesota, before heading to Superior, Wisconsin, and then further east. In Superior, there is an Enbridge storage terminal and a 45,000-barrel per-day refinery owned by Calumet Specialty Products Partners. The American portion of the Enbridge line is known as the Lakehead System. (See Figure 1, page 8)

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<sup>1</sup> Minnesota Department of Revenue, Petroleum Tax Unit, *2011 Minnesota Petroleum Taxes: Annual Report*, p. 3, <http://archive.leg.state.mn.us/docs/2012/other/120254.pdf>.

<sup>2</sup> <http://www.enbridgepartners.com/EEP/Main.aspx?id=2>;  
[http://www.energymattersmidwest.org/cm/pdfs/Western\\_Canadian\\_Crude\\_map2.pdf](http://www.energymattersmidwest.org/cm/pdfs/Western_Canadian_Crude_map2.pdf); Canadian Association of Petroleum Producers, *Crude Oil: Forecast, Markets & Pipelines*, June 2012, p. 15,  
<http://www.capp.ca/forecast/Pages/default.aspx>. The amount of Canadian crude imported by Minnesota was estimated by multiplying the volume of imports to the northern portion of Petroleum Administration for Defense District (PADD) II (consisting of Minnesota, Wisconsin, and North and South Dakota) by 80 percent, the proportion of total refining capacity in these states accounted for by Minnesota refineries. U.S. Department of Energy, Energy Information Administration, *Refinery Capacity 2012*, Table 3, Capacity of Operable Petroleum Refineries by State as of January 1, 2012, <http://www.eia.gov/petroleum/refinerycapacity/table3.pdf>. The Flint Hills refinery is owned by Koch Industries, Inc. The St. Paul Park refinery, formerly owned jointly by Ashland Oil Co. and Marathon Oil Co., and then solely by Marathon, was sold to Northern Tier Energy in October 2011.

The recent increase in oil production from western Canada,<sup>3</sup> mostly from oil sands deposits, has stimulated the expansion of Enbridge's pipeline capacity to transport crude to Minnesota refineries and through Minnesota to refineries in other states. In the last five years, Enbridge has completed three new pipeline projects designed to achieve this objective:

- The Alberta Clipper project, a pipeline running parallel to Enbridge's existing line to Clearbrook that increased the system's capacity by 450,000 barrels per day, began operating in 2010. In October 2012, Enbridge filed an application with the Minnesota Public Utilities Commission to boost capacity on this line by 27 percent, to 570,000 barrels per day.<sup>4</sup> One month later the company filed an application with the U.S. State Department seeking to add pumps and upgrade existing facilities in Minnesota to increase the line's annual capacity to 800,000 barrels per day.<sup>5</sup>
- The LSr project, a 313-mile pipeline between Cromer, Manitoba, and Clearbrook, also paralleling Enbridge's Mainline, was completed in 2009 and carries 186,000 barrels per day of light and medium density crude oil, freeing up Enbridge's other lines to transport exclusively heavier Canadian crude.<sup>6</sup>
- The Southern Light Diluent project, a 652-mile pipeline from Chicago to Clearbrook, came into service in 2010, bringing light oil products, known as diluents, to western Canada in order to facilitate the physical shipment of heavy crude from that area by mixing it with these lighter products.

At Clearbrook, the Canadian crude is transferred to the Minnesota Pipeline (MinnCan),<sup>7</sup> whose original line runs southeast to a terminal in Cottage Grove (in southern Washington County) before splitting into separate lines serving both of Minnesota's refineries. MinnCan's capacity was expanded by 165,000 barrels per day in 2010 by construction of a new line adjacent to the

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<sup>3</sup> These Canadian supplies have displaced crude oil supplies from Mexico and Venezuela that were traditionally shipped northward to the Midwest from the Gulf of Mexico. National Petroleum Council, Oil Infrastructure Subgroup of the Resource and Supply Task Group, Paper #1-7, *Crude Oil Infrastructure, Working Document of the NPC North American Resource Development Study*, released September 15, 2011, [http://www.npc.org/Prudent\\_Development-Topic\\_Papers/1-7\\_Crude\\_Oil\\_Infrastructure\\_paper.pdf](http://www.npc.org/Prudent_Development-Topic_Papers/1-7_Crude_Oil_Infrastructure_paper.pdf).

<sup>4</sup> David Shaeffer, "Oil pipeline through state to be upgraded," *Star Tribune*, October 8, 2012, <http://www.startribune.com/business/173178811.html>.

<sup>5</sup> *Application of Enbridge Energy, Limited Partnership for an amendment to the August 3, 2009, Presidential Permit for Line 67 to increase the operational capacity of pipeline facilities at the international boundary between Canada and the United States*, filed November 20, 2012, <http://www.state.gov/e/enr/applicant/applicants/202433.htm>.

<sup>6</sup> The crude oil transported by the LSr pipeline is extracted from Williston Basin deposits in the provinces of Manitoba and Saskatchewan. Its construction allows an additional 33,000 barrels per day of heavy crude to be transported on other Enbridge pipelines. Direct testimony of Adam J. Hennen, Minnesota Department of Commerce, *In the Matter of the Application of Enbridge Pipelines (Southern Lifts) LLC for a Certificate of Need for a Crude Oil Pipeline*, MPUC Docket No. PL9/CN-07-464, October 5, 2007, p. 32.

<sup>7</sup> The Minnesota Pipeline is operated by Koch Industries, Inc., and is owned by Flint Hills Resources (74.16 percent), Northern Tier Energy (17 percent), and Trof, Inc. (8.84 percent). Northern Tier Retail, LLC, *Amendment No. 4 to Form S-4 Registration Statement*, filed with the U.S. Securities and Exchange Commission on May 11, 2012, p. 103, <http://yahoo.brand.edgar-online.com/>.

existing line to Cushing in Morrison County, where, as shown in Figure 1, it then branches off into a new loop that travels west and south of the Twin Cities before turning northward in Dakota County to reach Cottage Grove. Minnesota Pipeline's expanded capacity is about 455,000 barrels per day and can be further expanded to 640,000 barrels per day.<sup>8</sup>

A small amount of Canadian crude also reaches Minnesota's refineries through the Kinder Morgan Express and Platte pipeline systems. The former runs from Hardisty, Manitoba, through Montana and Wyoming, connecting with the Platte System in Casper. It eventually links with the Wood River Pipeline in Illinois, through which crude is shipped northward through Freeborn County to the Twin Cities.

## Domestic Crude

Minnesota obtains a small amount of domestic crude oil from the Wood River Pipeline (owned by Koch Pipeline Company), which is connected to pipelines that transport crude produced in Gulf Coast states.

However, the bulk of the domestic crude refined in Minnesota originates in North Dakota oilfields, whose production has greatly increased in recent years through the advanced technologies of hydraulic fracturing (fracking) and horizontal drilling. As a result, the capacity of Enbridge's North Dakota Pipeline, which extends to the northeastern tip of Montana and terminates in Clearbrook, Minnesota, was expanded from 80,000 to 210,000 barrels per day in June 2012.<sup>9</sup> Approximately 60,000 barrels per day of this volume is delivered to the Minnesota Pipeline for transportation to Twin Cities refineries; the balance is shipped to Superior, Wisconsin.<sup>10</sup>

Minnesota's refineries cannot absorb additional crude supplies at this time. Projected increases in North Dakota's oil production have led Enbridge to develop projects to bypass shipping "bottlenecks" at Clearbrook and at Cushing, Oklahoma, and transport this oil to areas with excess refining capacity.<sup>11, 12</sup>

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<sup>8</sup> *Ibid.*, p. 104.

<sup>9</sup> U.S. Federal Regulatory Commission, *Enbridge Pipeline (North Dakota) LLC, Order Accepting Tariff*, Docket No. IS12-548-000, September 14, 2012, 140 FERC ¶ 61,193, p. 1.

<sup>10</sup> *Ibid.*, Appendix A, *Affidavit of Bruce Macphail in Support of Petition for Declaratory Order*, p. 2.

<sup>11</sup> Currently, 74 percent of North Dakota crude is gathered by truck; only 26 percent is shipped to market by pipeline, according to the North Dakota Pipeline Authority. Amy Dalrymple, "Enbridge proposes another pipeline to Superior," *Duluth News Tribune*, November 4, 2012, <http://www.duluthnewstribune.com/event/article/id/248764/>; David Shaeffer, "Getting beyond an oil bottleneck," *Star Tribune*, November 8, 2012, <http://www.startribune.com/business/177792221.html>.

<sup>12</sup> As one Enbridge official stated to Congress: "[W]e must address the need for capacity south of Clearbrook to link to refineries hungry for Bakken sweet crude supply. . . [in order] to ensure Bakken crude will have access to refineries already connected to the Enbridge system in Chicago, Detroit, Toledo, and eastern Canada, as well as . . . [those] along the Gulf Coast, home of more than 50 percent of America's refinery capacity." Prepared Statement of Kevin Hatfield, Senior Director, Gathering Systems, Enbridge Pipelines (ND) LLC, *Hearing before the U.S. House of Representatives Oversight and Government Reform Committee*, Fargo, North Dakota, July 14, 2012, p. 3.

The Bakken Expansion Project, which began operating in the first quarter of 2013, transports crude northward to Enbridge's Main Line in Cromer, Manitoba, and then through existing lines in Minnesota to Superior. This project expands capacity by 145,000 barrels per day.<sup>13</sup>

The Sandpiper Project, announced in November 2012 and projected to carry 225,000 barrels per day, would originate at Beaver Lodge, North Dakota, travel across Minnesota via a route located south of Clearbrook, and terminate at Enbridge's Superior terminal. It is expected to go into service in 2016.<sup>14</sup>

## Petroleum Refineries

### Minnesota Refineries

The Flint Hills and St. Paul Park facilities refined about 128 million barrels of crude oil in 2011.<sup>15</sup>

Flint Hills is almost four times larger than the St. Paul Park refinery: its operating capacity is 277,200 barrels per day, compared with the latter's 74,000.<sup>16</sup> They jointly produce the vast majority of petroleum products consumed in Minnesota.<sup>17</sup>

In 2012, the U.S. Department of Energy reported that the total output produced by the four refineries located in Minnesota, Wisconsin, and North Dakota (of whose total capacity Minnesota refineries represent about 80 percent) consisted of about 56 percent motor gasoline, 22 percent distillate fuel oil, and 7 percent asphalt.<sup>18</sup>

Fifty-one percent of the crude inputs to the St. Paul Park refinery in 2011 were from Canada, with the remainder from North Dakota. Some 375 million gallons of gasoline and diesel

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<sup>13</sup> "Bakken expansion project completed," *The StarPhoenix* (Saskatoon), March 5, 2013, <http://www.thestarphoenix.com/technology/Bakken+expansion+project+completed/8048959/story.html>.

<sup>14</sup> "Enbridge proposes another pipeline to Superior."

<sup>15</sup> According to the U.S. Energy Information Administration, the net input of crude oil to refineries in Minnesota, Wisconsin, North Dakota, and South Dakota in 2011 was 160.419 million barrels. [http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrr\\_r2b\\_1&f=a](http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrr_r2b_1&f=a). As discussed in footnote 2, Minnesota's refining capacity represents about 80 percent of the four-state total.

<sup>16</sup> *Refinery Capacity 2012*. These figures are based on a "calendar day," 24-hour operation including standard downtime for inspection, maintenance, and repair. The comparable figures for a "stream day"—with no allowances for downtime—are 320,000 and 84,500 barrels per day, respectively.

<sup>17</sup> In 2006, it was estimated that the refineries produced 65 percent to 70 percent of the gasoline consumed in Minnesota. State of Minnesota, Office of Administrative Hearings, *Findings of Fact, Conclusions and Recommendations, In the Matter of the Application of Minnesota Pipe Line Company for a Certificate of Need for a Crude Oil Pipeline And In the Matter of the Application of Minnesota Pipe Line Company for a Routing Permit for a Crude Oil Pipeline*, OAH 15-2500-17136-2, PUC Docket Nos. PL-5/CN-06-02 and PL-5/PPL-05-2003, November 17, 2006, ¶ 67.

<sup>18</sup> U.S. Department of Energy, Energy Information Administration, *Refinery and Blender Net Production*, [http://www.eia.gov/dnav/pet/pet\\_pnp\\_refp\\_dc\\_nus\\_mbbldp\\_a.htm](http://www.eia.gov/dnav/pet/pet_pnp_refp_dc_nus_mbbldp_a.htm).

produced at the refinery were sold to Super America and Marathon convenience stores that year, 90 percent of it in Minnesota.<sup>19</sup>

Canadian supplies currently represent about 90 percent of the crude oil inputs to the Flint Hills refinery, which is estimated to produce about half of Minnesota's gasoline and diesel supplies and 80 percent of the jet fuel used at the Minneapolis-St. Paul International Airport. It also supplies 30 percent to 40 percent of Wisconsin's transportation fuels, through Kwik Trip convenience stores and other retail outlets.<sup>20</sup>

Minnesota refineries exported about 137 million gallons of gasoline and 92 million gallons of fuel oil to other states in 2011.<sup>21</sup>

### **Non-Minnesota Refineries**

Minnesota also receives refined petroleum products from refineries in other states, including the following:

- Tesoro's 68,000-barrel per-day Mandan, North Dakota, refinery, which processes mostly low-sulfur crude from that state. About 65 percent of the gasoline and 20 percent of the diesel produced at the refinery are shipped to Minnesota. Refinery capacity was expanded from 58,000 to 68,000 barrels per day in June 2012.<sup>22</sup>
- The 45,000-barrel per-day Superior, Wisconsin, refinery purchased by Calumet Specialty Products Partners from the Murphy Oil Company in October 2011. It receives crude from Canada and North Dakota.
- British Petroleum's (BP) refinery in Whiting, Indiana, with a capacity of 405,000 barrels per day, which processes crude from Canada, West Texas, and the Gulf of Mexico.

Among the refined products imported into Minnesota in 2011, the federal government estimated 66.5 million gallons of residual fuel oil.<sup>23</sup>

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<sup>19</sup> *Amendment No. 4 to Form S-4*, pp. 93, 102, 106.

<sup>20</sup> Interview with Jake Reint, director of communications, Flint Hills refinery.

<sup>21</sup> *2011 Minnesota Petroleum Taxes: Annual Report*, p. 3.

<sup>22</sup> James McPherson, "ND refinery plans outage for expansion project," *Associated Press*, June 1, 2012, <http://www.businessweek.com/ap/2012-06/D9VFFE00.htm>.

<sup>23</sup> U.S. Department of Energy, Energy Information Administration, *Minnesota Imports of Residual Fuel*, <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MREIMMN1&f=A>.

## Refined Products Pipelines and Terminals

Refined petroleum products are brought one step closer to consumers via a system of pipelines and 25 storage terminals, 15 of which are located in Minnesota.

The Magellan Midstream Partners pipeline system, the largest common carrier pipeline shipping refined petroleum products in the United States, distributes the largest proportion of the refined products produced in Minnesota's refineries. As shown in Figure 2, Magellan operates six terminals where trucks and, in some cases, rail cars, load these products for distribution to smaller storage facilities and retailers. Each of Minnesota's refineries also operates a terminal where these product transfers take place.

Refineries in other states also distribute refined products in Minnesota. The Mandan, North Dakota, refinery transports products through its proprietary NuStar Pipeline, which supplies the company's petroleum terminals in Moorhead, Sauk Center, and Roseville.<sup>24</sup> The Superior, Wisconsin, refinery distributes refined products to Minnesota through the Magellan Pipeline system and has a terminal in Duluth. BP's Whiting, Indiana, refinery brings petroleum products to Minnesota through a proprietary pipeline that enters the state in Fillmore County and delivers product to BP's terminal in Spring Valley and to the NuStar terminal in Roseville.

Eighty-three smaller terminals throughout the state store petroleum products for local distribution.<sup>25</sup> They are among the 418 petroleum products distributors licensed by the Minnesota Department of Revenue, including importers, refiners, petroleum storage facilities (bulk plants), and owners of truck and tanker fleets that distribute these products by truck to retailers and end users.<sup>26</sup> According to the Minnesota Department of Commerce, Minnesota also draws petroleum products from ten terminals located near its borders in adjacent states and in Canada.<sup>27</sup>

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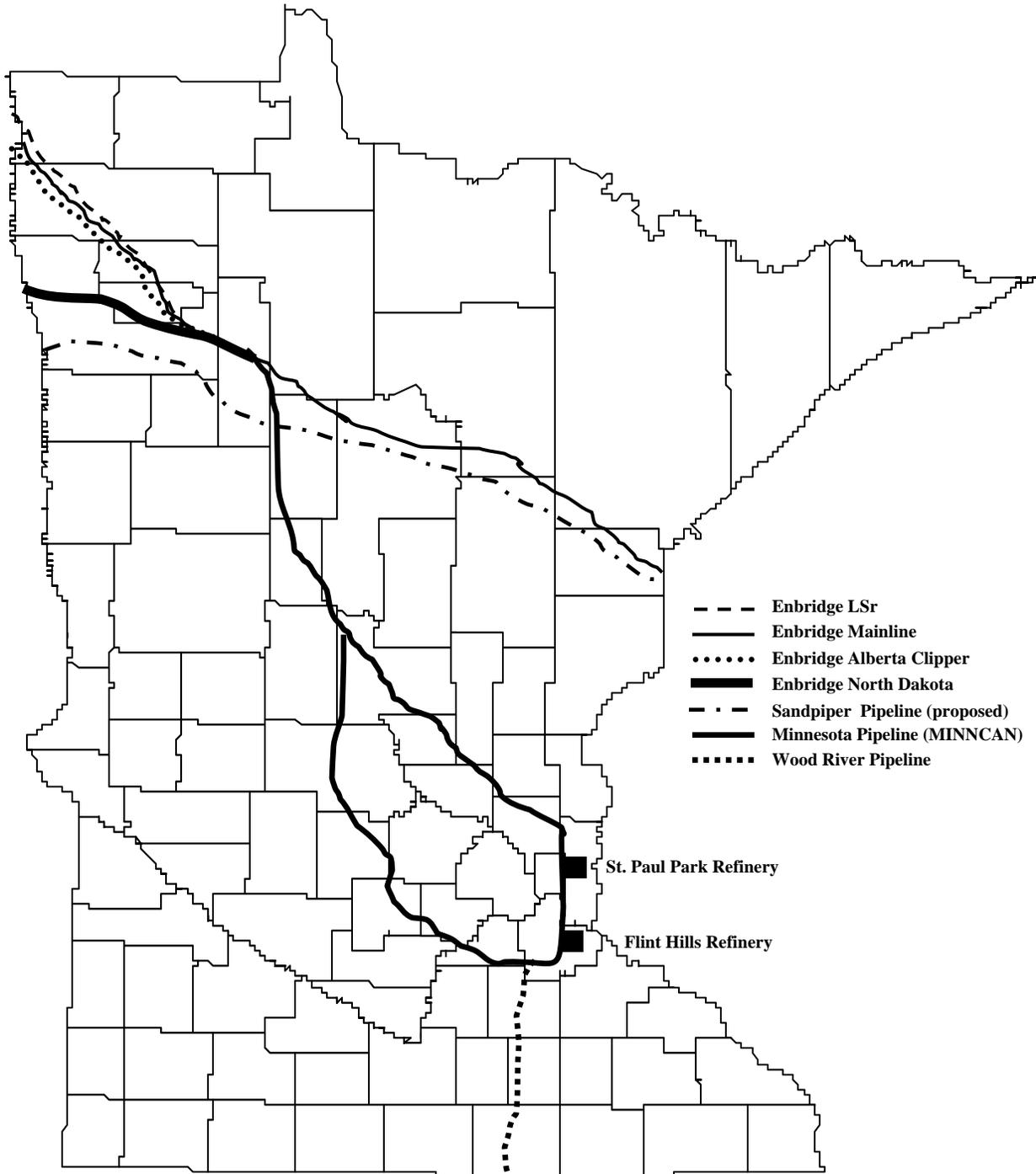
<sup>24</sup> Some products from the Mandan refinery are also transported to Minnesota by truck from Magellan terminals in the Dakotas.

<sup>25</sup> U.S. Census Bureau, *County Business Patterns 2010*, <http://censtats.census.gov/cgi-bin/cpbnaic/cppdetl.pl>.

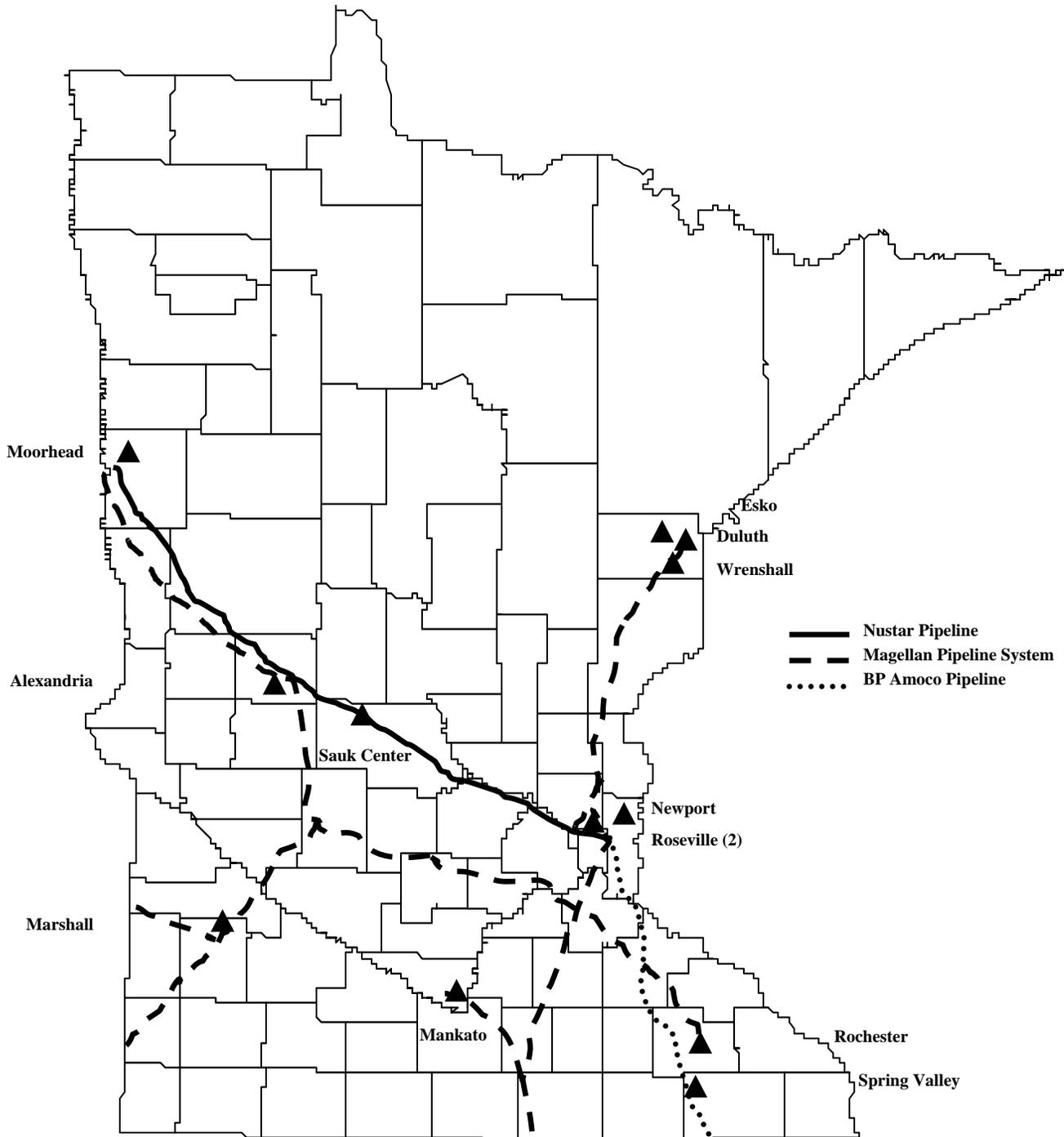
<sup>26</sup> *2011 Minnesota Petroleum Taxes: Annual Report*, p. 1.

<sup>27</sup> Julie Quinn, director, Division of Weights and Measures, Minnesota Department of Commerce.

**Figure 1: Crude Oil Pipelines and Petroleum Refineries**



## Figure 2: Refined Petroleum Products Pipelines and Terminals



**Notes:** (1) Terminals at the Flint Hills and St. Paul Park refineries are not shown on the map.  
(2) Both Magellan and Nustar operate terminals in Roseville.

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[www.house.mn/hrd/](http://www.house.mn/hrd/).