

Under the proposed action, crude oil would be transported to the project site by rail, unloaded and stored on site, and loaded onto tank vessels for transport from the project site. While the oil would likely originate as Bakken crude oil extracted from the Williston Basin,<sup>1</sup> it could also originate as diluted bitumen derived from oil sands in Alberta, Canada. It is anticipated that crude oil from the project site would be transported to refineries in the Puget Sound area and California.

This analysis considers existing and projected oil production at these sources, existing and planned infrastructure (e.g., transport capacity through pipelines and rail terminals) to move the projected volumes of oil, and the potential for the proposed action to result in additional crude oil development and production at these sources. The analysis also considers the potential for crude oil transloaded under the proposed action to be exported.

## **Q.1 Potential for Proposed Action to Affect Crude Oil Production**

For the proposed action to drive additional drilling, the capacity of existing or planned infrastructure to move oil out of the region would need to be constrained (referred to as *takeaway capacity*).

### **Q.1.1 Bakken**

The capacity of the proposed facility would be approximately 49,000 barrels per day. Current Williston Basin production is approximately 1.03 million barrels per day (mmb/d) (North Dakota State Industrial Commission 2016). While Bakken oil production boomed in recent years, it has slowed substantially because of the decline in oil prices that began in 2014 and oil production is now relatively flat. Despite these trends, takeaway capacity has been significantly expanded and further growth is planned.

This appendix presents forecasts of future oil production from the Williston Basin. These forecasts consider the impact of future oil prices on drilling activity. Current information on production forecasts and existing and planned takeaway capacity from the basin compiled by the North Dakota Pipeline Authority (NDPA) is presented Attachment 1.

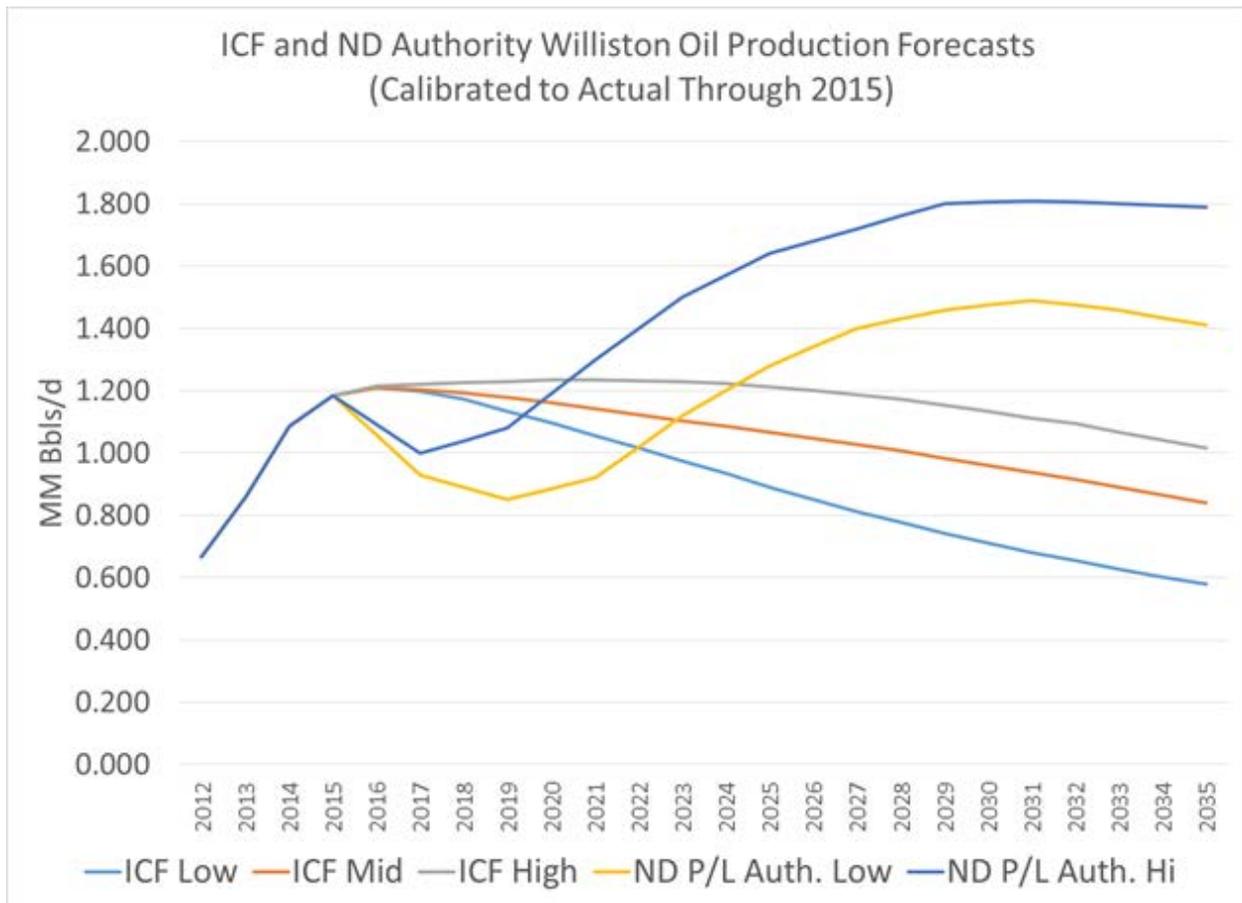
Figure 1 presents the ICF and NDPA oil production forecasts. Three ICF forecasts were developed based on differing oil price assumptions. The ICF model predicts that oil prices in 2020 will range from a low of \$59/oil barrel (bbl) to a high of \$84/bbl for West Texas Intermediate. The current West Texas Intermediate price is approximately \$46/bbl (July 2016). The ICF model predicts that the 2015 peak in oil production will be followed by a long-term gradual decline in Williston Basin oil production through 2035. The recently published NDPA forecast range is much more optimistic,

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<sup>1</sup> The Williston Basin rail terminals are primarily in North Dakota, but extend into Montana, South Dakota, and Saskatchewan, Canada.

showing a rebound in activity and production within a few years, with production then increasing to 2030 (Kringstad 2016).

**Figure 1. Williston Oil Production Forecasts**



Current takeaway capacity from the basin is about 1.83 mmb/day, which is well above the current production of approximately 1.03 mmb/day. (North Dakota State Industrial Commission 2016). About 1.0 mmb/day of current takeaway capacity is rail<sup>2</sup> and 0.7 mmb/day is pipeline capacity, while about 0.1 mmb/day of demand comes from regional refining (U.S. Energy Administration 2016). Takeaway capacity will grow by about 0.45 mmb/day in 2017 when the Dakota Access pipeline (currently under construction) is completed (Energy Transfer 2015). Two other pipelines with takeaway capacity of another 0.45 mmb/day are being planned for 2019 and 2020.

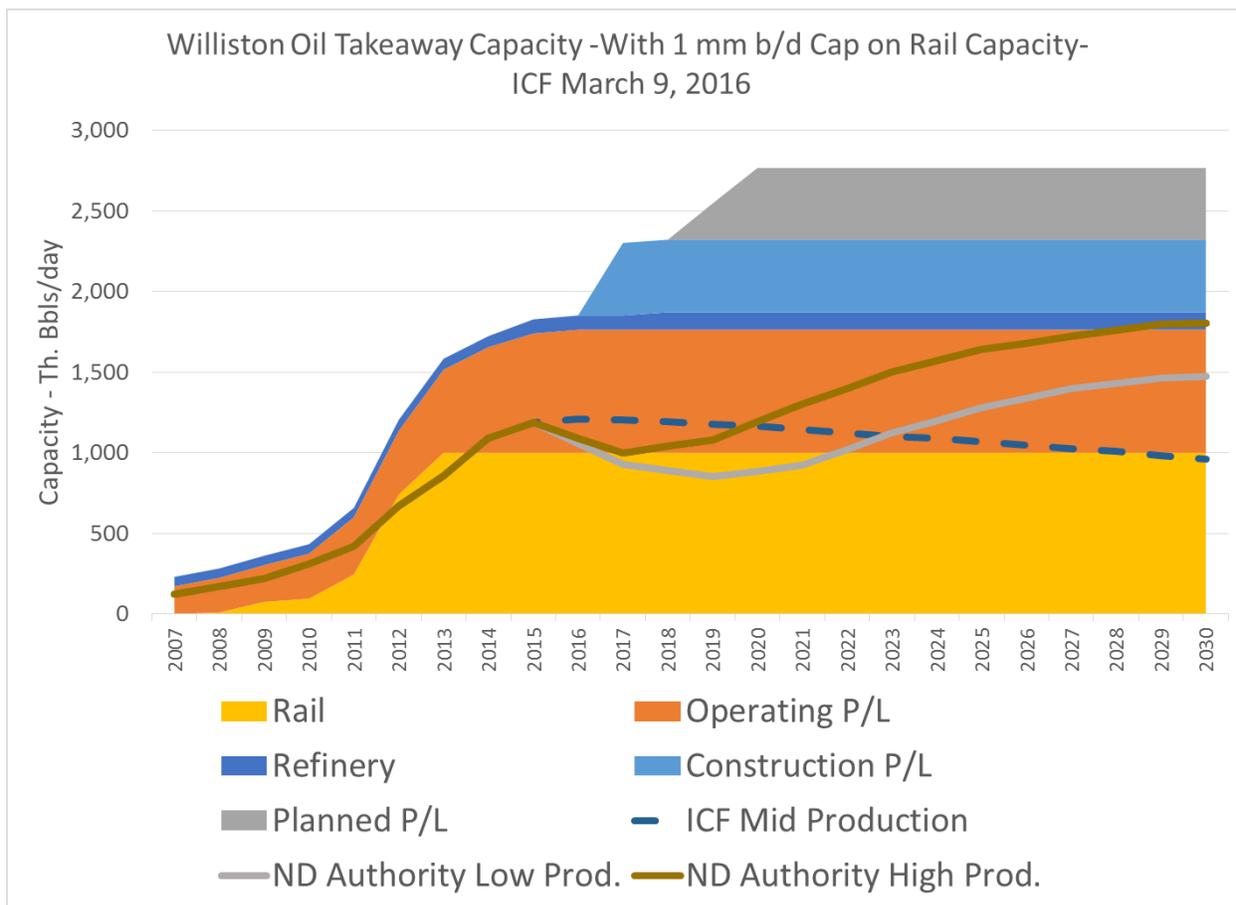
As shown in Figure 2, capacity is forecast by NDPA to increase to 2.77 mmb/day by 2020. The capacity of the proposed facility—49,000 barrels per day—represents about 2% of expected 2020

<sup>2</sup> The NDPA “caps” the rail loading capacity at 1 mmb/day; however, they have also identified up to 1.355 mmb/day of known rail capacity. This analysis uses the 1 million cap.

takeaway capacity. Furthermore, even with an optimistic production recovery forecast by the NDPA, there is more than adequate takeaway capacity for Bakken oil.

In summary, the amount of takeaway capacity that will be built will greatly exceed expected future production levels, and therefore capacity out of the basin will not be an impediment to drilling. This means that the proposed action will not result in additional drilling or Bakken oil production solely due to the construction of the proposed facility.

**Figure 2. Williston Oil Takeaway Capacity**



### Q.1.2 Canadian Crude

Canadian crude oil production has increased by almost 75% over the past 10 years from 2.6 billion barrels per day in 2006 to 3.9 billion barrels per day in 2015 (National Energy Board of Canada 2016). It is reasonably likely that production will continue to grow slowly, but the rate of growth would depend on oil prices.

Crude oil derived from Canadian oil sands is primarily transported by pipelines to the U.S. Midwest and Pacific Northwest. These pipelines are at or near capacity. Therefore, growth in Canadian oil sands production is constrained by takeaway capacity. New pipelines have been proposed in Canada

to transport crude to the east and west coasts of Canada, but permitting issues have delayed construction. As a result, in the near term, the primary alternative crude oil transportation out of Canada is by rail.

In the absence of pipelines, Canadian crude oil can be moved by rail to the U.S. Gulf Coast or West Coast for processing or export. (A small amount of Canadian oil crude oil moves to the Eastern U.S. but growth in this market is unlikely because of unsuitable refinery configurations.) The most likely destination would be the Gulf Coast, which has a high capacity to process the heavier crude oil derived from oil sands. Processing in that location would also reduce heavy crude oil imports from Venezuela or Mexico. California and Washington State refiners can process some of the Canadian crude as well, but the low carbon fuel standard requirements in California may make it a less economical outlet for Canadian producers. Refinery configurations limit Washington State refiners' capacity to process the high volumes of bitumen in the oil sands crude oil.

Because Canadian production growth may be more constrained by takeaway capacity than Bakken growth, the proposed action would have a slightly greater likelihood of increasing Canadian oil production. However, transloading of diluted bitumen at the proposed facility would depend on several factors. If the proposed facility is transloading Bakken crude oil, capacity may be insufficient to handle Canadian crude oil. Moreover, to handle the heavy, viscous diluted bitumen, additional investment in storage tanks and other equipment would be required. Lastly, rail transport the West Coast would need to be more economically favorable than rail transport to the Gulf Coast.

## Q.2 Potential for Export of Crude Oil

With the lifting of the ban on exports of domestic crude oil, crude oil transloaded through the proposed facility could be exported. However, the economics of exporting crude oil from the proposed facility may be difficult to justify for U.S. producers. The freight cost to foreign ports can be high, especially on the smaller vessels that are likely to call at the project site due to draft restrictions in the navigation channel. The main tankers in the global crude oil trade are VLCCs (2 million bbls capacity), Suezmaxes (1 million bbls capacity), and Aframax (600,000 bbls capacity). These vessels can transport oil for much lower freight costs per barrel than those that would be used under the proposed action.

Therefore, West Coast refineries are the most likely destinations of crude oil transloaded under the proposed action. It would generally be more economical for Puget Sound refineries to receive crude oil directly via rail than transloading through the proposed facilities with the associated costs for terminal fees and marine chartering costs. However, it may be economical to transport to Puget Sound refineries via the proposed facility if refineries are restricted on their ability to receive and offload unit trains at specific refineries or if there are restrictions on additional unit trains through the Seattle corridor.

## Q.3 References

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**Attachment 1. Williston Crude Export Options**

US Williston Basin Crude Oil Export Options - Feb 17 2016 Update															
Year End System Capacity, Barrels Per Day															
Facility	ICF Category	2007	2008	2009	2010	2011	2012	2013	2014	2015*	2016*	2017	2018	2019	2020
Butte Pipeline	Operating PL	92,000	104,000	118,000	118,000	145,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000
Butte Expansion (Q3 2014)	Operating PL	0	0	0	0	0	0	0	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Tesoro Mandan Refinery	Refinery	58,000	58,000	58,000	58,000	58,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000	68,000
Enbridge Mainline North Dakota	Operating PL	80,000	110,000	110,000	161,500	185,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000	210,000
Enbridge Bakken Expansion Program (Q1-11/Q1-13)	Operating PL	0	0	0	0	25,000	25,000	145,000	145,000	145,000	145,000	145,000	145,000	145,000	145,000
Plains Bakken North (Up to 70,000 BOPD)	Operating PL	0	0	0	0	0	0	0	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Enbridge Sandpiper* (Q1 2019)	Planned PL	0	0	0	0	0	0	0	0	0	0	0	0	225,000	225,000
Dakota Prairie Refinery (Q2 2015)	Refinery	0	0	0	0	0	0	0	0	20,000	20,000	20,000	20,000	20,000	20,000
Thunder Butte Refinery (2018; timeline uncertain)	Refinery	0	0	0	0	0	0	0	0	0	0	20,000	20,000	20,000	20,000
Energy Transfer Partners Dakota Access (Bakken Pipeline) (late 2016)	Construction PL	0	0	0	0	0	0	0	0	0	0	450,000	450,000	450,000	450,000
TransCanada Upland Pipeline (2020)	Planned PL	0	0	0	0	0	0	0	0	0	0	0	0	0	220,000
Kinder Morgan Double H Pipeline (Q1 2015)	Operating PL	0	0	0	0	0	0	0	0	84,000	108,000	108,000	108,000	108,000	108,000
EOG Rail, Stanley, ND (Up to 90,000 BOPD)	Rail	0	0	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Dakota Plains, New Town, ND	Rail	0	0	0	20,000	30,000	30,000	30,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
High Sierra Donnybrook	Rail	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Crestwood COLT Hub, Epping, ND (Q2 2012)	Rail	0	0	0	0	0	120,000	120,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000
Hess Rail, Tioga, ND (Up to 120,000 BOPD)	Rail	0	0	0	0	0	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Bakken Oil Express, Dickinson, ND	Rail	0	0	0	0	100,000	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Savage Services, Trenton, ND (Q2 2012 Unit Trains)	Rail	0	0	0	0	0	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
Enbridge, Berthold, ND (Q4 2012)	Rail	0	0	0	0	0	10,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Great Northern Midstream, Fryburg, ND (Q1 2013)	Rail	0	0	0	0	0	-	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Musket, Dore, ND (Q2 2012)	Rail	0	0	0	0	0	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Plains, Ross, ND	Rail	0	0	0	0	20,000	20,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Plains - Van Hook, New Town, ND	Rail	0	0	0	0	0	35,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Global/Basin Transload Stampede	Rail	0	0	0	0	0	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Global/Basin Transload, Zap, ND (Estimate Not Confirmed)	Rail	0	0	0	0	20,000	40,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Enserco Gascoyne ND (Unit)	Rail	0	0	0	0	0	0	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000
Dakota Gold Plaza ND (Late 2015) (unit)	Rail	0	0	0	0	0	0	0	0	70,000	70,000	70,000	70,000	70,000	
Mountrail Rail - Palermo, ND	Rail	0	0	0	0	0	0	0	0	0	100,000	100,000	100,000	100,000	100,000
Northstar Transloading - Fairview, MT (Q3 2014)	Rail	0	0	0	0	0	0	0	20,000	180,000	180,000	180,000	180,000	180,000	180,000
Total		230,000	282,000	361,000	432,500	658,000	1,203,000	1,733,000	1,983,000	2,317,000	2,441,000	2,891,000	2,911,000	3,136,000	3,356,000

Source: North Dakota Pipeline Authority 2016.