DEPARTMENT OF ECOLOGY
State of Washington

Crude Oil Movement by Rail and Pipeline

Quarterly Report: October 1, 2018 through December 31, 2018

January 2019
Publication 19-08-005

Publication and Contact Information

This report is available on the Department of Ecology's website at
https://fortress.wa.gov/ecy/publications/SummaryPages/1908005.html

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Table of Contents

List of Figures and Tables

Page

Figures

Tables

Introduction

To enhance crude oil spill preparedness and response in Washington State, on August 24, 2016, Ecology adopted the rule, Oil Movement by Rail and Pipeline Notification. The rule establishes reporting standards for facilities that receive crude oil by rail and pipelines that transport crude oil in or through the state.[1] Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public.

This rule is the result of 2015 Legislative direction to provide a better understanding of the changing risk picture for crude oil transported in Washington State as a result of the introduction of crude oil transport by rail and the associated changes in both the volume and properties of crude moving through Washington.

Timely notice of oil movement information is necessary for emergency responders and planners to effectively prepare for and respond to oil spills and other incidents associated with transporting crude oil by rail and pipeline. Providing adequate information about the dates, routes, and properties of crude oil can help protect people living and working near railroads and pipelines, the economy, and environmental resources of Washington State.

Ecology is required to publish information collected under the rule to its website on a quarterly basis. The quarterly reports provide:

- Aggregated information on crude oil transported by rail to facilities in Washington.
- Information about crude oil movement by pipeline in or through the state.
- Reported spills during transport and delivery of crude by rail and pipeline.
- Volume of crude oil transported by vessel.

The reports are intended to inform the public about the nature of crude oil movement through their communities.

The reporting period for this quarterly report is October 1, 2018 through December 31, 2018.

[1] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil by Rail Summary

Movement of crude oil by rail in Washington State began in 2012 and has continued to increase since that time. Rail routes transporting crude oil enter the state from Idaho near Spokane and from British Columbia near Bellingham, and Ecology continues to monitor other potential routes. Large segments of the rail routes travel along the I-5 corridor, and cross or run next to major waterways, including the Columbia River and Puget Sound. (See Appendix A for a map of railroad routes in the state.)

Capturing information on the properties of crude oil, the volume transported, and the routes used to transport it allows for proper planning, placement of resources, and opportunities to provide detailed information to responders in the event of a spill, ensuring a more effective overall response. The rule directs Ecology to gather this information by requiring facilities receiving crude oil by rail to report all scheduled crude oil deliveries to be received by the facility each week for the succeeding seven-day period. Facilities enter this information into Ecology's Advance Notice of Transfer (ANT) database.

Information reported by facilities on scheduled crude oil deliveries includes the region of origin of crude oil, the railroad route taken to the facility within the state (if known), scheduled time and volume in barrels (bbls) of the delivery, and gravity of the oil. Ecology uses the standard American Petroleum Institute (API) gravity ranges to define the Crude Type in the ANT database. (See Appendix B for the API gravity definition and Crude Type ranges.)

Ecology is required to aggregate the information provided on a statewide basis by route, week, and type of crude oil. Aggregate information from the ANT database is provided in Table 1 for the period October 1, 2018 through December 31, 2018, representing the 4th Quarter of 2018. Each week is numbered by calendar week and is aggregated by route and type of crude. The information provided includes:

- Total weekly volume in barrels (bbls) of crude oil transported by rail
- Route
- Region of origin
- Crude type
- Route volume
- Estimated number of railcars per route delivering crude oil (assumes each car holds 680 bbls)

Fourteen calendar weeks are reported in the 4th Quarter of 2018 starting at calendar week 40 and ending at calendar week 53.

Table 1: Crude oil movement by rail

Calendar week 40

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	66,915	98
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	568,000	835
1B, 2, 3	Alberta	Heavy Crude	117,401	172
5	Alberta	Light Crude	66,000	97
Weekly totals			**1,143,316**	**1,679**

Calendar week 41

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	131,994	194
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	564,500	830
1B, 2, 3	Alberta	Heavy Crude	116,228	170
5	Alberta	Light Crude	68,000	100
Weekly totals			**1,205,722**	**1,771**

Calendar week 42

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	196,813	289
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	497,500	731
5	Alberta	Light Crude	136,000	200
5	North Dakota	Light Crude	71,500	105
Weekly totals			**1,291,813**	**1,898**

Calendar week 43

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	552,000	811
1B, 2, 3	Alberta	Heavy Crude	116,000	170
5	Alberta	Light Crude	136,000	200
Weekly totals			**1,194,000**	**1,754**

Calendar week 44

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	65,012	95
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	699,500	1,028
5	Alberta	Light Crude	68,000	100
Weekly totals			**1,157,512**	**1,700**

Calendar week 45

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	133,533	196
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	705,500	1,037
1B, 2, 3	Alberta	Heavy Crude	113,625	167
Weekly totals			**1,277,658**	**1,877**

Calendar week 46

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	134,505	197
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	635,000	933
Weekly totals			**1,094,505**	**1,607**

Calendar week 47

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	208,175	306
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	777,000	1,142
1B, 2, 3	Alberta	Heavy Crude	56,808	83
5	Alberta	Light Crude	68,000	100
Weekly totals			**1,499,983**	**2,204**

Calendar week 48

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	Alberta	Light Crude	664	1
1A, 2, 3	North Dakota	Light Crude	271,551	399
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	494,000	726
1B, 2, 3	Alberta	Heavy Crude	58,669	86
4, 5	Alberta	Heavy Crude	1,680	2
5	Alberta	Light Crude	68,000	100
Weekly totals			**1,284,564**	**1,887**

Calendar week 49

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
5	Alberta	Light Crude	8,582	12
1A, 2, 3	North Dakota	Light Crude	134,003	197
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	840,500	1,236
1B, 2, 3	Alberta	Heavy Crude	116,688	171
4, 5	Alberta	Heavy Crude	9,520	14
Weekly totals			**1,499,293**	**2,203**

Calendar week 50

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	204,286	300
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	640,500	941
1B, 2, 3	Alberta	Heavy Crude	57,000	83
4, 5	Alberta	Heavy Crude	1,120	2
Weekly totals			**1,227,906**	**1,803**

Calendar week 51

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	135,358	199
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	850,500	1,250
1B, 2, 3	Alberta	Heavy Crude	58,737	86
Weekly totals			**1,434,595**	**2,108**

Calendar week 52

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	133,326	196
1A, 2, 3, 4	North Dakota	Light Crude	195,000	286
1A, 2, 3, 4, 5	North Dakota	Light Crude	712,000	1,047
1B, 2, 3	Alberta	Heavy Crude	113,519	166
Weekly totals			**1,153,845**	**1,695**

Calendar week 53

Route Segments	Region of Origin	Crude Type	Volume (Bbls)	Est # Cars
1A, 2, 3, 4	North Dakota	Light Crude	130,000	191
1A, 2, 3, 4, 5	North Dakota	Light Crude	215,000	316
Weekly totals			**345,000**	**507**

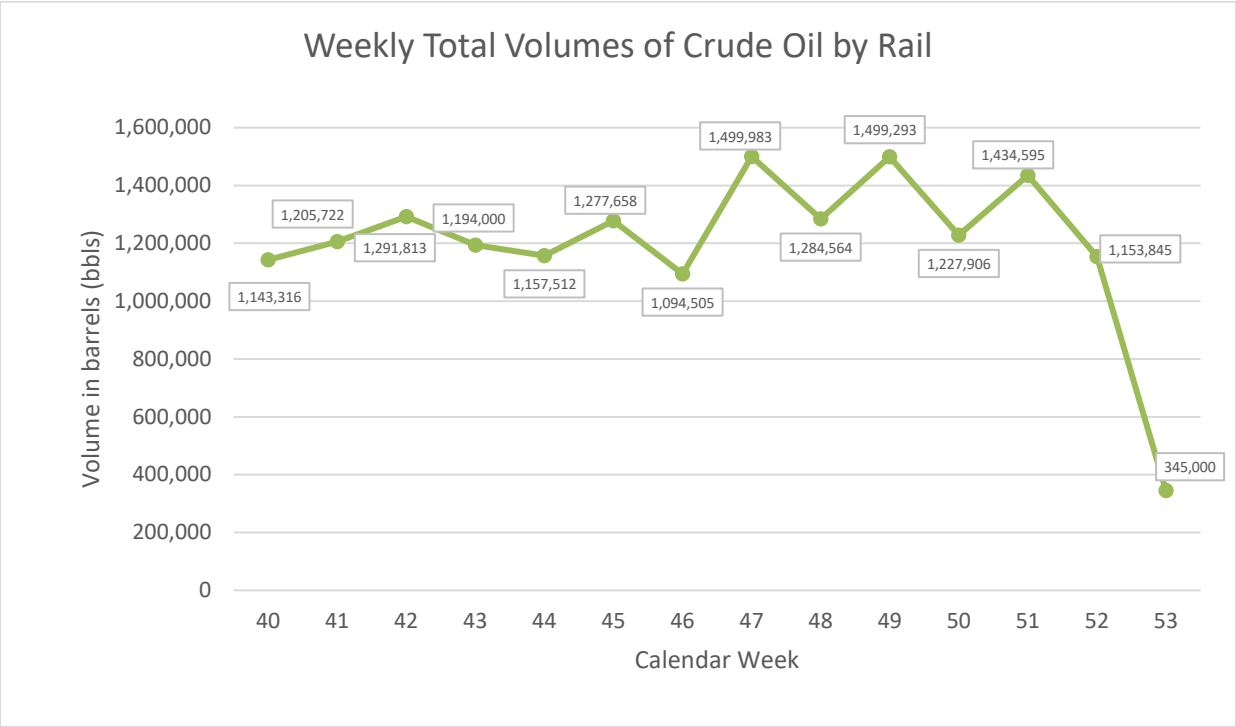
Note: *The data provided in Table 1 was reported to Ecology by the receiving facility into the ANT database as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

2018 Quarter 4 total volume (bbls): 16,809,712

A summary of the data shows:

- Two regions of origin were reported: North Dakota and Alberta.
- Two types of crude oil were reported: heavy and light.
- Routes 1A, 1B, and 2 through 5 were used to transport crude by rail.
- The total volume of crude oil transported by rail during the quarter was 16,809,712 barrels (706,007,904 gallons).
- The average weekly volume of crude oil transported by rail was 1,266,516 barrels (53,193,672 gallons) (excludes Week 53, which consists of two days only).
- The total number of rail cars moving crude oil by rail was 24,693 cars.
- The average number of rail cars per week moving crude oil by rail was 1,860 cars.
- 94.4 percent of crude oil transported by rail was light crude, and 5.6 percent was heavy crude.
- North Dakota was the region of origin for 90.7 percent of crude oil transported by rail, and Alberta was the region of origin for 9.3 percent of crude oil transported by rail.

Figure 1 shows the weekly total volumes of crude transported by rail for each calendar week in the 4th Quarter of 2018.



***Note**: Week 53 consists of only two days of reported ANT volumes due to the dates of the reporting period.*

Figure 1: Weekly total volumes of crude oil by rail for the 4th Quarter of 2018

The lowest weekly volume was 1,094,505 barrels (45,969,210 gallons) in Week 46. The highest weekly volume of crude transported by rail was 1,499,983 barrels (62,999,286 gallons) in Week 47.

Figure 2 displays crude transported by rail, by route, for the 4th Quarter of 2018.

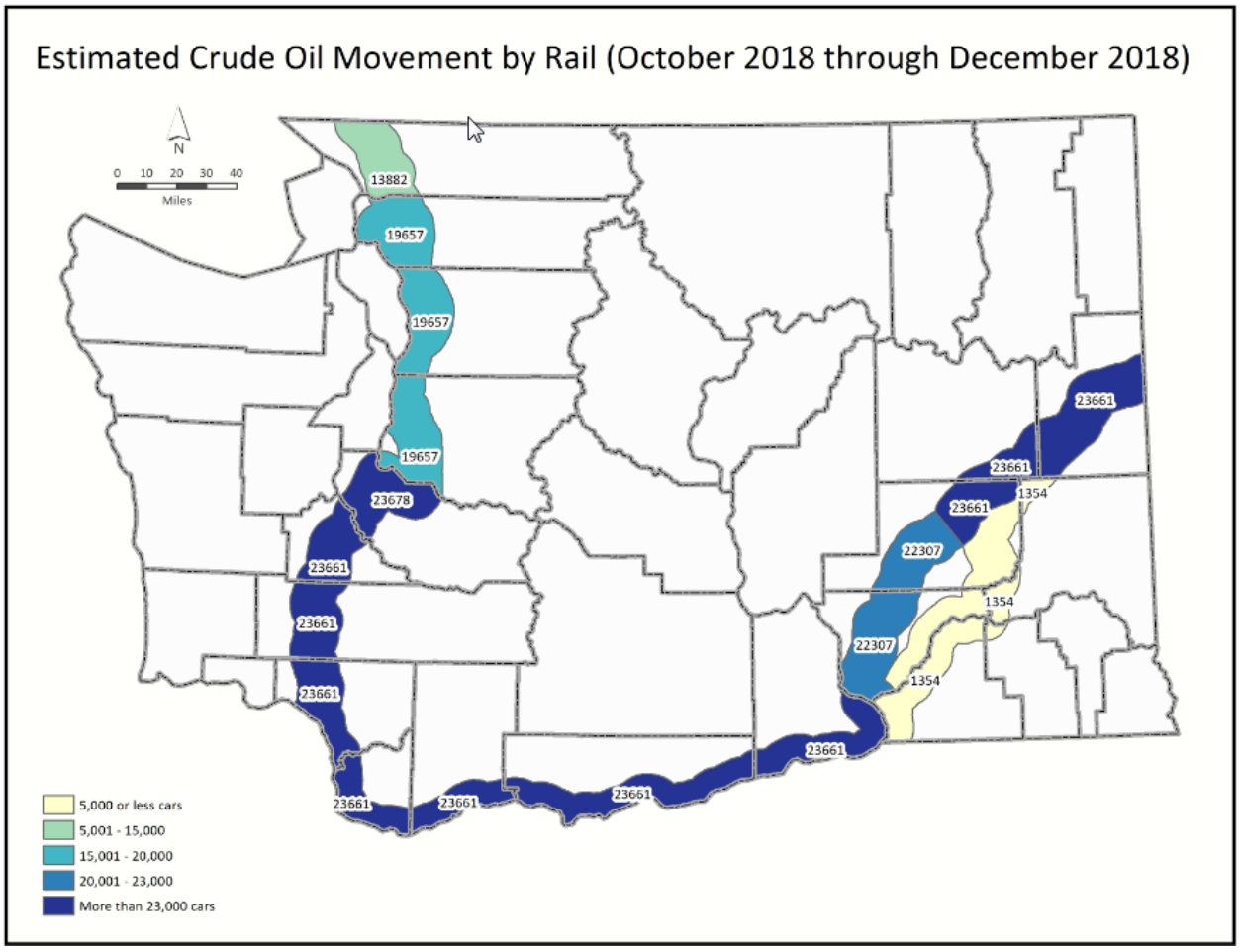


Figure 2: Crude oil movement by route for the 4th Quarter of 2018

Crude Oil by Pipeline Summary

Pipelines exist inland and may be located near waterbodies and populated areas. Knowing the types and quantities of crude oil transported through pipelines in Washington State helps Ecology properly plan for and execute a rapid, aggressive, and well-coordinated response to a spill.

Under the rule, transmission pipelines that transport crude oil in or through the state must provide Ecology biannual notice of all crude oil transported in or through the state.[2] Biannual notice must be submitted each year by July 31 for the period from January 1 through June 30, and by January 31 for the period from July 1 through December 31. Biannual notice provided by pipelines includes contact information for the pipeline and the total volume of crude oil transported in or through the state during the reporting period by state or province of origin.

The most recent biannual notices from pipelines covered the period from January 1, 2018 through June 30, 2018. Table 2 below provides the total volume of crude oil transported in or through the state by pipelines during this period.

Table 2: Crude oil movement by pipeline

Period	State or Province of Origin	Volume (bbls)
January 1, 2018 – June 30, 2018	Alberta	29,581,760

Note: *The data provided in Table 2 was reported to Ecology by the pipelines transporting crude oil in or through the state, as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

The next biannual notices from pipelines will cover the period from July 1, 2018 through December 31, 2018 and must be submitted to Ecology by January 31, 2019.

[2] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil Spills – Rail and Pipeline

Oil spills can have significant impacts to the public, environment, and economy. Ecology strives to protect Washington's environment, economy, and public health and safety through a comprehensive spill prevention, preparedness, and response program.

The rule directs Ecology to provide the number and volume of spills to the waters of the state during the transport and delivery of crude oil by rail and pipeline in each quarterly report.[3] For the period of October 1, 2018 through December 31, 2018, zero crude oil spills to the environment by rail or pipeline were reported. In the event there are spills to report in the future, Ecology will provide this information and include the date of the spill, the county where the spill occurred, the source, material, and volume of the spill.

[3] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil Movement by Vessel

In 2006, the state adopted rules for advance notice of oil transfers for vessels and facilities. Ecology has been receiving advance notice of transfer data for all transfers to or from vessels in Washington State since that time.

In order to provide a full picture of crude oil movement in Washington State, a summary of crude oil movement by vessel is provided below, which is in addition to the requirement for this quarterly report as described in the rule.[4]

Table 3 below provides the total volume of crude oil in barrels of inbound and outbound vessel transfers for the period of October 1, 2018 through December 31, 2018. Inbound vessel transfers refers to crude oil movement from vessels to facilities, while outbound vessel transfers refers to crude oil movement from facilities to vessels.

Table 3: Crude oil movement by vessel

Vessel transfers	Volume (bbls)	Volume (gals)
Inbound	26,603,207	1,075,334,691
Outbound	353,845	14,861,486
Total	**25,957,052**	**1,090,196,177**

Note: *The data provided in Table 3 was reported to Ecology into the ANT database as required by Chapter 173-180 WAC and Chapter 173-184 WAC. Ecology cannot confirm the data or verify its accuracy.*

A summary of vessel transfer data for the quarter shows:

- There were 80 total vessel transfers of crude oil (inbound or outbound).
- The average volume of crude oil transferred to or from vessels per week was 1,996,696 barrels (83,861,232 gallons).

[4] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

An Overview of Crude Oil Movement in Washington

A broad view of crude oil movement in Washington State can be seen when comparing the movement of crude oil transported into the state by vessel, rail, and pipeline.

Figure 3 shows the estimated percentage of crude oil transported by vessel (inbound only), rail, and pipeline for the last four quarters, covering the period of January 1, 2018 through December 31, 2018.[5]

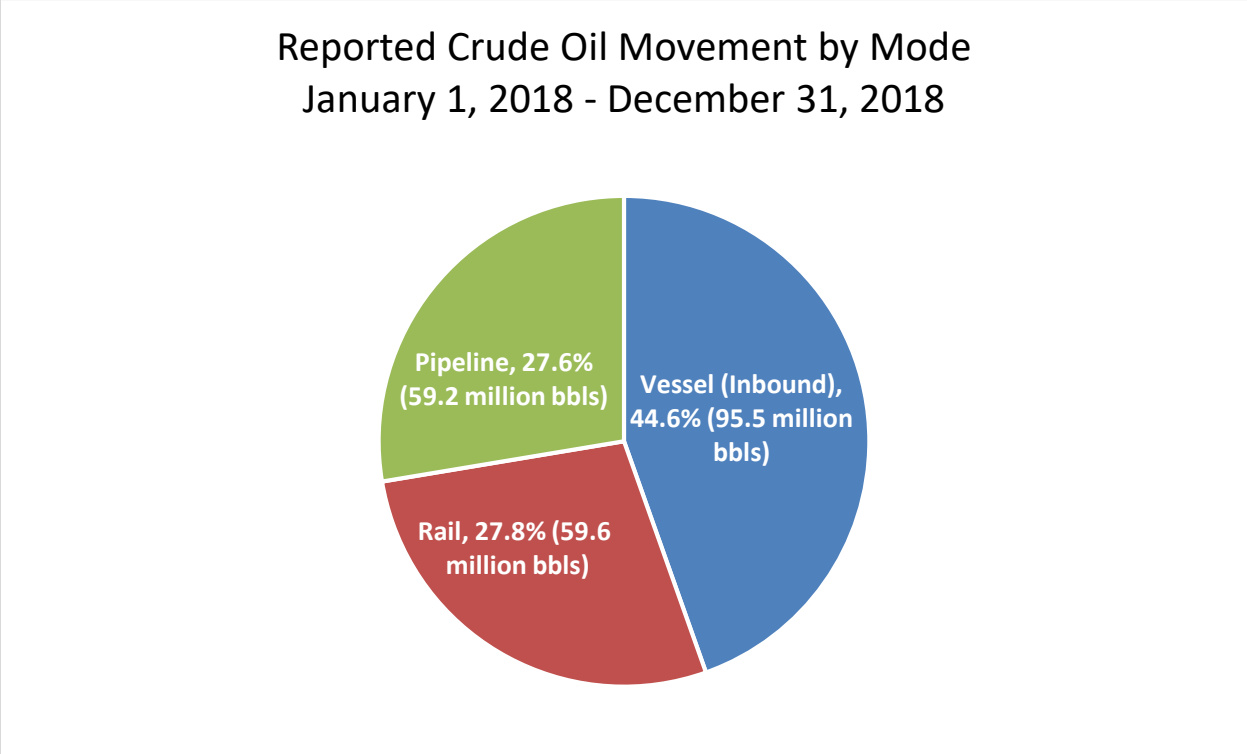
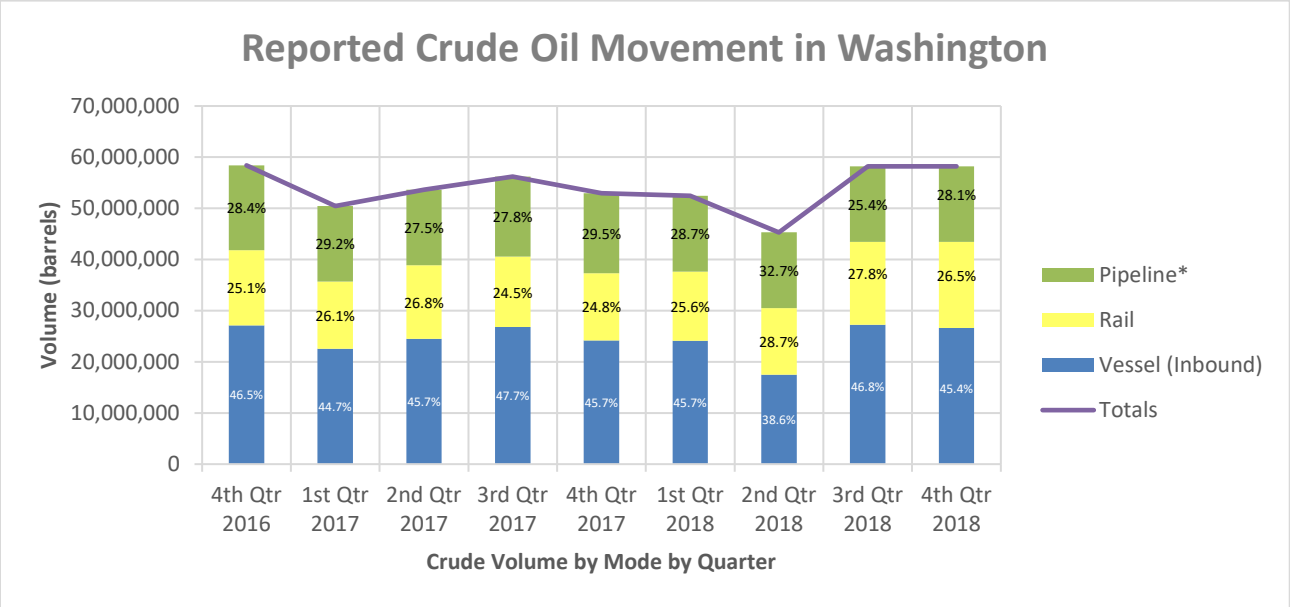


Figure 3: 12-month crude oil movement by mode

Between January 1, 2018 and December 31, 2018, vessels were responsible for 44.6 percent of reported crude oil movement into the state, while rail was responsible for 27.8 percent and pipeline for 27.6 percent.

[5] The most recent biannual notices from pipelines were submitted to Ecology for the period from January 1, 2018 through June 30, 2018. The next biannual notices submitted by pipelines will cover the period from July 1, 2018, through December 31, 2018, and must be submitted to Ecology by January 31, 2019.

Figure 4 shows crude oil movement, by mode, for each quarter that rail and pipeline crude oil data has been collected, covering the period of October 1, 2016 through December 31, 2018.



Mode	4th Qtr 2016	1st Qtr 2017	2nd Qtr 2017	3rd Qtr 2017	4th Qtr 2017	1st Qtr 2018	2nd Qtr 2018	3rd Qtr 2018	4th Qtr 2018
Vessel (Inbound)	46.5%	44.7%	45.7%	47.7%	45.7%	46.0%	38.6%	46.8%	45.4%
Rail	25.1%	26.1%	26.8%	24.5%	24.8%	25.7%	28.7%	27.8%	26.5%
Pipeline	28.4%	29.2%	27.5%	27.8%	29.5%	28.2%	32.7%	25.4%	28.1%
Total %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Note*: *The most recent biannual notices from pipelines were submitted to Ecology for the period from January 1, 2018, through June 30, 2018. For previous quarters, Ecology estimated crude oil movement by pipeline for the period based on data provided in previous biannual notices.*

Figure 4: Quarterly crude oil movement by mode

Ecology will continue to receive information about crude oil movement and use the data to summarize changes over time.

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Appendix A – Washington Railroad Routes

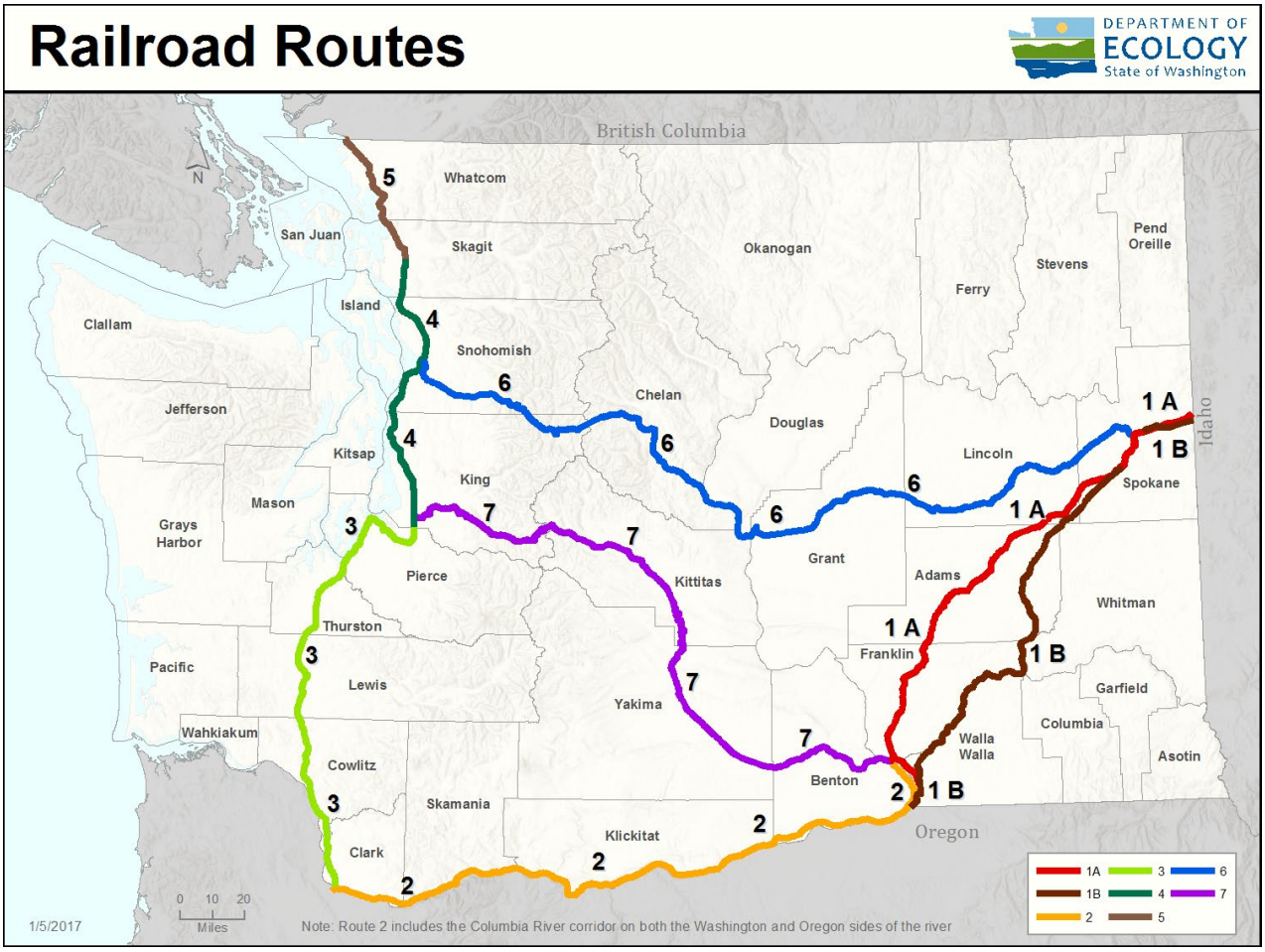

Figure 5: Railroad routes in Washington

Appendix B – API Gravity and Crude Oil Types

Information reported by facilities on scheduled crude oil deliveries includes the gravity of the oil. Ecology uses the standard American Petroleum Institute gravity (API gravity) ranges to define the Crude Type in the ANT database.

API gravity is the measure of the density of petroleum liquid in relation to the density of water and is used to classify oils as light, medium, heavy, and extra heavy. The lower the API gravity, the more likely it is to sink in water. Crude Type by API gravity is shown in the table below.

Table 4: Crude Type by API Gravity

Crude Type	API Gravity Range
Light Crude	31.2-50 API
Medium Crude	22.3-31.1 API
Heavy Crude	10-22.2 API
Extra Heavy Crude	0-9.9 API