

James M. Jeffords Center's  
*Vermont Legislative Research Service*



**Tar Sands Oil**

Tar sands, also referred to as oil sands, are a mixture of bitumen, clay, water, and sand. Bitumen, an asphalt-like hydrocarbon that is black and viscous, can be extracted and processed to generate crude oil that can be further refined to develop asphalt, gasoline

Once the tar sands are mined, they are transported to an extraction plant, put into separation cells and processed with hot water, and then agitated to separate the bitumen from the sand, water, and clay. From this point, the bitumen can be collected and eventually processed into synthetic crude oil.<sup>5</sup>

If the deposits are too deep for mining, in situ methods are used for recovery. This process involves steam injection, which heats the bitumen making it less viscous and easier to retrieve.<sup>6</sup> This method generally reduces land disturbance and water consumption.<sup>7</sup>



### **Environmental Effects of Extraction**

There are various manners in which the technologies, mining

The US energy transportation grid includes 175,000 miles of pipelines that transport hazardous liquid in the form of crude oil or refined oil products.<sup>13</sup> The Pipeline and Hazardous Materials Safety Administration (PHMSA), a regulatory arm of the US Department of Transportation, oversees all pipelines including those that transport tar sands crude oil. The PHMSA established regulatory requirements for the “construction, operation, maintenance, monitoring, inspection, and repair of hazardous liquid pipeline systems.”<sup>14</sup>

### **Oil Spills**

According to the US Department of State’s (DOS) Final Environmental Impact Statement (EIS), “spills are likely to occur during operation over the lifetime of the proposed [Keystone] Project.”<sup>15</sup> There have been 14 recorded oil spills along the existing Keystone pipeline since operation began in June 2010. “Of those spills, 7 were 10 gallons or less, 4 were 100 gallons or less, 2 were between 400 and 500 gallons, and 1 was 21,000 gallons.”<sup>16</sup> The largest of these spills, which released 21,000 gallons of oil in total, occurred on May 7, 2011 at the Ludden, North Dakota pump station.<sup>17</sup> The PHMSA issued TransCanada a Corrective Action Order on June 3, 2011, after finding this failure to be of particular concern. The PHMSA Assistant Administrator of Pipeline Safety explains in their notificat

xflowing streams and rivers,  
xshallow groundwater areas,  
xareas near water intakes for drinking water or for commercial/industrial uses,  
xand, areas with populations of sensitive wildlife or plant species.<sup>20</sup>

In 2010, the largest tar sands crude oil spill took place in Marshall, Michigan along a pipeline owned by Enbridge Energy Partners. It was first estimated to have spilled 800,000 gallons of dilbit into a tributary along the Kalamazoo River.<sup>21</sup> As of November 12, 2012, however, 1,149,120 gallons of oil have been collected along the river and 180,205 cubic yards soil/debris have been disposed.<sup>22</sup> Because tar sands crude oil are much heavier than other forms of crude oil, the spill clean up has proven particularly arduous and is expected to take two more years to complete. After the spill, nearly 40 miles of the Kalamazoo River were closed to the public and it "resulted in over 220 areas of moderate-to-heavy contamination, including over 200 acres of submerged oil on the river bottom and over 300 solidified oil deposits."<sup>23</sup> Toxic diluents, such as the hazardous chemical benzene, are added to bitumen and pose serious health risks if released into the environment, particularly given the levels of toxicity released in the event of a spill are often unknown and not immediately detected.<sup>24</sup>

In response to public health concerns, the Michigan Department of Community Health, Calhoun County Public Health Department, and the Kalamazoo County Health and Community Services Department collaborated in developing a public health surveillance system to "describe the magnitude and distribution of human health impacts due to exposure to the spilled oil."<sup>25</sup> The research o -4(rvnTJ0.005 Tc -0.001 Tw 1.6.86 Td[(d o)0(th)114(te))-4(e)3(t)1w0(h,)5( i -35.2795 -2(21.6.86 Ta

crude oil].”<sup>28</sup> The PHMSA responded by contracting the National Academy of Sciences to carry out a complete, independent study of these concerns and should release their findings in the coming months.<sup>29</sup>

## **Gulf Coast Project**

As seen in Figure 1, the proposed pipeline extension labeled “Gulf Coast Project” would continue the flow of crude oil from Cushing, OK into Nederland and Houston, TX. The Gulf Coast Project, anticipated to be in service by mid-to-late 2013, will require the construction of 435 miles of 36-inch pipeline, as well as a receipt facility in Cushing and delivery facilities in both Cushing and Nederland.<sup>32</sup>

## **Keystone XL**

On May 4<sup>th</sup>, 2012, “TransCanada reapplied to the U.S. Department of State for a Presidential Permit to build the Keystone XL pipeline.”<sup>33</sup> Similar to the first proposal, this proposed pipeline extension, labeled “Keystone XL” in Figure 1, would run through Montana, South Dakota, and Nebraska connecting to the already existing Keystone Cushing Pipeline in Steele City, NE. The Keystone XL Project will require the construction of 1,179 miles of 36-inch pipeline, as well as receipt facilities in Baker, MT, and is expected to be in service by late 2015. The total project cost for the pipeline was originally estimated to be \$5.3 billion for the United States portion. However, with the new route in Nebraska, projects costs are expected to be even higher.<sup>34</sup>

## **Bakken Marketlink**

Currently, crude shale oil is produced in two U.S. states: North Dakota and Montana. Shale oil is oil embedded in shale rock, making extraction particularly expensive. With minimal production, transportation of shale oil to refineries has been limited to rail and truck. In March 2012, Bakken productions exceeded 500,000 bpd due to new rock fracturing technology, calling the need for a more economical way of transporting the crude oil. With receipt facilities built in Baker, MT, the Keystone XL pipeline will be able to deliver approximately 150,000 bpd of Bakken shale crude oil to Gulf Coast refineries. This project with TransCanada aids in meeting the anticipated quota of 1.3 million bpd and assists in the investment and support for Bakken shale oil production.<sup>35</sup>

## **Montana**

“Montana requires a certificate from the state’s Department of Environmental Quality (DEQ)” in order for the construction of oil pipelines to run through the state.<sup>36</sup> On December 22, 2008, TransCanada submitted an application for approval of the Keystone XL pipeline project to Montana’s DEQ. On March 30, 2012, the DEQ issued a certificate of Compliance for the pipeline

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<sup>32</sup> Paul W. Parfomak et al., “Keystone XL Pipeline Project: Key Issues,” p. 4.

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<sup>34</sup> Paul W. Parfomak et al., “Keystone XL Pipeline Project: Key Issues.”

<sup>35</sup> Paul W. Parfomak et al., “Keystone XL Pipeline Project: Key Issues.”

<sup>36</sup> Paul W. Parfomak et al., “Keystone XL Pipeline Project: Key Issues,” p. 15.

project.<sup>37</sup>

## South Dakota

South Dakota requires a permit to be issued from the state Public Utility Commission (PUC) in order for the construction of oil pipelines to run through the state.<sup>38</sup> On March 12 2009, TransCanada applied for a permit to South Dakota's PUC for the construction of the Keystone XL pipeline. In February 2010, pipeline

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**Figure 2: Keystone XL Preferred Alternative Route in Nebraska**  
Source: Paul W. Parfomak



Currently, Vermont's liquid pipelines do not transport tar sands crude oil. The Portland Pipeline Corporation (PPC), a subsidiary of The Portland-Montreal Pipe Line Corporation (PMPL), "operates all 175 miles of hazardous liquid pipelines in Vermont, 117 of which are in service. The remaining pipelines are retired."<sup>46</sup> The pipeline in service cuts through the Northeast corner of Vermont, carrying crude oil from Portland, Maine to Montreal, Canada for refinement.<sup>47</sup> In a December 2012 statement posted on the PMPL website, the company responds to concerns over the possibility of transporting tar sands from Alberta, Canada through their pipelines to Portland, Maine. Doing so would require PMPL to reverse the flow of the pipeline used for that purpose. The company affirms that "while [they] do not have an active project to reverse the flow in either of [their] pipelines, if there is a demand for doing so in the future, [they] will consider it."<sup>48</sup>

When examining alternative routes for the Keystone XL pipeline, the proposed Enbridge Trailbreaker Project was considered. The proposed pipeline would have used the Northeast pipeline owned by PMPL that cuts through the Northeast Kingdom of Vermont. A lack of "firm volume commitments" to proceed left the project dormant, and in 2010 Enbridge made the decision to let go of the proposal. Therefore, this route was not further discussed as an alternative to the current Keystone XL proposed route.<sup>49</sup>

### **Conclusion**

Bitumen, a hydrocarbon that can be extracted from tar sands, can be processed to generate crude oil. Depending on depth and viscosity, either mining or in situ methods can be used to extract tar sands. Tar sands extraction and processing into crude oil can a2y

state approved the revised route submitted by TransCanada, all states in which the Keystone XL extension would pass through approved the pipeline in their respective state committees. With new shale rock fracturing technology, Bakken shale oil producers have partnered with